


Special Study No. 7

# The Role of the Federal Government in Support of Research in Canadian Universities

by

John B. Macdonald

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Ernest Sirluck, Erich Vogt

with a

Minority Report

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L. P. Dugal

prepared for

The Science Council of Canada

and The Canada Council

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## TERMS OF REFERENCE

To examine and make recommendations on:—

1. The present level, sources, and conditions of financial support for research in the universities.
2. The broad purpose and objectives of the Government and the universities that should be served by the research support program.
3. The principles and policy that should be adopted in attaining these objectives.
4. The organization, mechanisms and management practices that will best meet the principles and objectives that are defined by the study.

# FOREWORD

The Science Council of Canada Act states that "it shall be the duty of the Council to give consideration to and make reports to the Minister on . . . the responsibilities of departments and agencies of the government of Canada in relation to those of universities, private companies and other organizations in furthering science and technology in Canada". Rapid growth of research in universities in recent years, and growing support from the Government of Canada pointed to the need for a comprehensive study of the role of the government in support of university research. The Science Council decided early in 1967 to commission such a study. Dr. John B. Macdonald, at that time completing his term as President of the University of British Columbia, accepted the invitation of the Council and the Science Secretariat to direct the study. The tentative terms of reference were broad and failed to indicate whether the study was to concern itself with research in the natural sciences only, or was to embrace the whole spectrum of the universities' research interests, including the humanities and social sciences. Dr. Macdonald indicated his own view that the study should examine the full range and the Science Council agreed that a comprehensive study would be desirable.

After some months of discussion involving the Association of Universities and Colleges of Canada, the Canadian Association of University Teachers, the Social Sciences Research Council, the Humanities Research Council and the Canada Council, agreement was reached to have the Canada Council co-sponsor the study.

An Advisory Committee composed of nominees of the Science Council of Canada and the Canada Council has served as liaison between the two Councils and Dr. Macdonald and his Study Group. The Advisory Committee agreed to play an advisory rather than a steering role and the Study Group was given wide freedom of action. The Committee was made responsible for determining the minimum amount of factual information which the Study Group was to obtain; commenting on the data-gathering techniques proposed by the Study Group; and suggesting a list of possible further consultants to be added to the Study Group. The Science Secretariat was made responsible for the overall operation of the study and for officially retaining the services of the consultants. Finally it was agreed that members of the Advisory Committee were to be viewed as scholars from their respective fields and not as representatives of any specific agency.

The Study Group selected by Dr. Macdonald included the following: Dr. L. P. Dugal, a physiologist, Vice-Rector of the University of Sherbrooke; Dr. J. Stefan Dupré, a political scientist, Director of the Center for Urban

and Community Studies, University of Toronto; Dr. J. B. Marshall, a biologist, Awards Officer for the National Research Council; Dr. J. Gordon Parr, an engineer, Dean of the Faculty of Engineering, University of Windsor; Dr. Ernest Sirluck, a scholar in English, Dean of the School of Graduate Studies, University of Toronto; and Dr. Erich Vogt, a physicist, Professor of Physics, University of British Columbia. Dr. Macdonald's own field was microbiology. Dr. Guy Rocher, a sociologist, Vice-Dean of the Faculty of Social, Economic and Political Sciences, University of Montreal, assisted the group as a participating consultant but did not share in the writing of the report because he was on leave at the University of California (Berkeley) during the latter stages of the report.

The Study Group conducted its work in the following ways. Visits were paid to most of the Canadian universities to hold discussions with faculty and administrators. Visits were paid to departments and agencies of the Federal Government to seek information on policies and practices. Briefs were invited from universities, Federal Government agencies, provincial research councils, provincial grants commissions, foundations and voluntary agencies, the Association of Universities and Colleges of Canada, the Canadian Association of University Teachers, the Humanities Research Council, and the Social Sciences Research Council. Documents and statistics bearing on federal support and university research were collected and studied. A major survey in the social sciences and humanities was directed to department chairmen and faculty members in all Canadian universities. This aspect of the investigation was conducted by Dr. Cicely Watson of the Ontario Institute for Studies in Education with the advice of Dr. Hugh Thorburn, President of the Social Sciences Research Council, and representatives of the social sciences and humanities sitting on the Advisory Committee. The purpose of this study was to assemble detailed factual information about research activity and funding in the universities; such information was considered by the Canada Council to be urgently needed. The results will be published separately from the present report. Additional surveys were conducted by the Study Group on forecasts of building requirements for research; funding of research from general revenues of the universities; support of graduate students through university and provincial revenues; and administrative practices in the university relative to research.

The Study Group met frequently to examine data and develop recommendations. In addition, the Advisory Committee met five times before the Report was completed; at the last three meetings members of the Study Group were in attendance and presented progress reports which were discussed in some detail.

The report which follows is one of great importance in the evolution of research in the universities and the emergence of a larger role for the Federal Government in support of university research. The numerous recommendations deal with goals, policies, organization, management and financing of university research. They point to new directions for both government and

the universities and they provide a thoughtful foundation for the emergence of attitudes and practices designed to strengthen and make more meaningful the partnership of universities and government in the enrichment of Canadian society.

Roger Gaudry,
*Chairman,*
*Advisory Committee on Support of Research in the Universities.*

# ACKNOWLEDGMENTS

We, the members of the Study Group, wish to express our appreciation to members of the staff in the Science Secretariat who assisted throughout this investigation. We are particularly grateful to our Executive Secretary, Mr. John Fieldhouse and our Secretary, Mrs. Beatrice Harrison. Mr. Sydney Forman, liaison officer for the Science Secretariat facilitated our work on many occasions and we are grateful to Mr. George McColm for his great knowledge of sources of information and his generosity in helping us to obtain important documentation. Mr. Zachariah Kay, Chief, Liaison Division, Education Support Branch of the Department of the Secretary of State, collaborated with us in the collection of statistical and descriptive information about the role of government departments and agencies in supporting university research. In addition, we are grateful to both Mr. Kay and the Secretary of State for making Mr. Kay's services available to the Study Group during the latter stages of our investigation. The generous co-operation of the departments and agencies of the Federal Government in making information available and in assisting us to understand their policies is deeply appreciated.

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## SUMMARY OF RECOMMENDATIONS

The Study Group *recommends that:—*

1. *Federal research councils be organized in such a manner that, when taken together, their terms of reference will encompass all disciplines recognized by Canadian universities.*

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2. *The Medical Research Council be reconstituted as a Health Sciences Research Council and authorized to support research in all sciences related to health.*

(*Page 101*)

3. *The National Research Council be reconstituted so as to have as its sole responsibility the support of scientific and engineering research in universities and related institutions.*

(*Page 105*)

4. *The mandate of the Canada Council to support research in the humanities and social sciences be terminated.*

(*Page 106*)

5. *The Federal Government create a Humanities and Social Sciences Council having as its prime function the support of research in Canadian universities.*

(*Page 107*)

6. *There be established an Intercouncil Co-ordinating Committee.*

(*Page 107*)

7. *The National Research Council, the Health Sciences Research Council, and the Humanities and Social Sciences Council each receive the status of an agency corporation of the Government of Canada.*

(*Page 110*)

8. (*a*) *Appointments by Cabinet to membership on research councils be preceded by a broad canvass of researchers, universities and the greater public;*
   (*b*) *The number of members on each council be no smaller than 19 and no larger than 24;*

(c) *Two or more of the senior executive officers of each council be full members of council;*

(d) *Save for the senior executive officers, members be appointed on a rotating basis to three-year terms once renewable; and*

(e) *The total membership of each council at any point in time offer a judicious blend of researchers, university administrators and the greater public.*

(*Page 111*)

9. *The Science Council of Canada Act be amended so as to provide for appropriate representation on the council of the social sciences.*

(*Page 113*)

10. *The Government of Canada create a Canadian universities research advisory committee to make available to Treasury Board advice on the allocation of public funds for sponsored research in Canadian universities.*

(*Page 114*)

11. *The research grants of the federal research councils cover all the normal direct costs of university research whenever these grants are made.* (See also recommendation 23.)

(*Page 119*)

12. *In the interest of a strong program of research, the primary considerations of all councils in judging grant applications be the merit of the proposals and the qualifications of the applicants to carry them out.*

(*Page 121*)

13. *Membership on review committees be for limited terms and that replacement members be selected by a system which does not depend on the judgment of members of the committee.*

(*Page 122*)

14. *Each of the federal research councils consider applications for group grants or program grants in addition to individual project grants.*

(*Page 122*)

15. *Funding of Major Proposals should be available where the submission warrants such action.*

(*Page 123*)

16. *All the federal research councils be prepared to consider applications for Negotiated Development Grants designed to build on strength.*

(*Page 126*)

17. *All the federal research councils be prepared to consider applications for Strategic Development Grants designed to initiate new programs.*

(*Page 127*)

18. *Subject to initiation by the councils of a program of Strategic Development Grants, non-adjudicated general purpose grants be discontinued.*

(*Page 128*)

19. *All councils offer post-doctoral fellowships for recent graduates to enhance their qualifications for a career in research.*

(*Page 129*)

20. *Research leave fellowships be available through each council.*

(*Page 129*)

21. *The councils not engage in programs such as the Medical Research Associateships.*

(*Page 131*)

22. *The present form of NRC grants to university computing centres be discontinued, and that computing for research be supported from the normal operating grants of all federal research councils.*

(*Page 133*)

23. *The federal research councils meet the full indirect costs arising from council-supported research in each university.*

(*Page 137*)

24. *The indirect cost allowance payable by the federal research councils over and above the direct research support be 35 per cent of the direct research support given to each university.*

(*Page 143*)

25. *A system be established to referee cases that might be exceptions to the normal pro-rata payment of indirect costs. Cases to be considered could be initiated either by the councils or the universities.*

(*Page 144*)

26. *The Federal Government, through the Privy Council Office or some other appropriate central agency, undertake a comprehensive study of government intramural laboratories with particular attention to:*
    (*a*) *the siting of such laboratories in relation to university campuses;*
    (*b*) *the terms under which intramural laboratories can be used by graduate students and researchers holding university appointments;*

(*c*) *the conditions under which government employees may teach in universities and engage in university research; and*

(*d*) *the advisability of placing certain designated laboratories under university management.*

(*Page 154*)

27. *Each mission-oriented agency engaged in research support establish, as appropriate, one or more advisory committees made up in part of university representatives and charged with:*

(*a*) *evaluating the balance between the agency's intramural and extramural research programs;*

(*b*) *advising the agency as to on-going research of relevance to the agency's mission; and*

(*c*) *advising the agency as to the disbursement of funds for the support of research relevant to its mission.*

(*Page 155*)

28. *The Federal Government designate an appropriate agency as responsible for the development and maintenance of a central register of all research projects and programs funded from federal sources.*

(*Page 157*)

29. *Each mission-oriented agency requiring research be directed to solicit and entertain university submissions for support of research projects, programs or Major Proposals relevant to its mission under generally the same terms and procedures as the councils.*

(*Page 157*)

30. *All mission-oriented agencies be directed to pay the full direct and indirect costs of any research they may support in universities.*

(*Page 158*)

31. *Supplementary remuneration to university researchers, where permitted by a university, be excluded from the base on which indirect cost allowances are calculated.*

(*Page 159*)

32. *In any instance where only the raw source material to which university researchers are to be given access is confidential, each government agency specify the terms under which researchers are to be given clearance and certify in advance the conditions under which findings based on this source material will be made public.*

(*Page 160*)

33. *Neither government nor universities attempt to enter into arrangements involving universities in work that cannot be published. Any exception to this principle should be subject to the most formal review procedures in both the university and the agency concerned.*

(*Page 161*)

34. *Any mission-oriented agency be eligible to apply for authority to fund the full start-up costs of university research institutes destined to be of service to governmental and industrial clients.*

(*Page 162*)

35. *The Federal Government thoroughly re-evaluate Section 2900 of the Income Tax Act Regulations to determine the advisability of including in the term "scientific research and development" research in the social sciences and humanities, and generally all research designed to improve decision-making in business.*

(*Page 163*)

36. *In co-operation with the universities, the Federal Government convene an annual conference of research administrators.*

(*Page 166*)

37. *Without exception, federal funding of university research projects or of research leave fellowships require prior endorsement of the project or leave by a responsible university administrator, and be channeled exclusively through universities.*

(*Page 171*)

38. *While retaining the over-riding right to audit the appropriate university accounts when circumstances clearly warrant, all federal agencies accept, without supporting vouchers and subject only to the university's own internal audit, university accounts of research project expenditures.*

(*Page 171*)

39. *When university projects are funded through a federal-provincial program, the federal auditing of provincial books require no evidence of university disbursements other than that which universities would normally be required to provide for projects supported solely by federal agencies.*

(*Page 172*)

40. *Each federal agency be authorized to negotiate common grant accounts in those universities where, in the joint opinion of the agency's representatives and the university's business officers, the number of research*

*projects concurrently receiving support is such as to make a common grant account desirable.*

(*Page 172*)

41. *The practice of funding university research projects by cost-reimbursement be discontinued.*

(*Page 173*)

42. *All federal agencies make their support available through advance instalments and that the instalments be no more frequent than quarterly and that no agency require universities to submit more than semi-annual fiscal reports.*

(*Page 173*)

43. *The practice of holding back a portion of research support funds to ensure satisfactory project completion be available only to mission-oriented agencies and be applied only against the personal remuneration of the principal investigator.*

(*Page 174*)

44. *All federal agencies be authorized, where the nature of the project warrants and subject to the funds being voted by Parliament, to enter into formal agreements to support research projects for periods of up to three years.*

(*Page 175*)

45. *Save in exceptional circumstances mutually agreed upon by the principal investigator and the supporting agency, the only substantive report required of projects whose duration is one year or less be the terminal report.*

(*Page 175*)

46. *Where the term of project support exceeds a period of one year, annual progress reports be the rule.*

(*Page 175*)

47. *All federal agencies engaged in the support of university research, and the councils in particular, develop a program of selective site visits appropriate to the scope of their research support activities.*

(*Page 176*)

48. *The test for the remuneration of research support personnel be each university's faculty and employee salary policy for the current academic year, and that therefore no agency impose ceilings on the remuneration of research support personnel.*

(*Page 176*)

49. *The Federal Government proceed to discontinue the use of contracts and grants for university research support in favour of a new legal instrument to be called a research agreement.*

(*Page 178*)

50. (*a*) *Program support be generally subject to the same management practices as project support;*
    (*b*) *The legal instrument for program support be a research agreement;*
    (*c*) *Program support be extended over terms of no less than three years; and*
    (*d*) *One year's notice be given upon the termination of program support.*

(*Page 178*)

51. *The funding of that portion of Major Proposals which relates to equipment operating and research expenditures be by research agreement.*

(*Page 179*)

52. *Negotiated and strategic development support be made available in the form of a grant.*

(*Page 179*)

53. *Research agreements not be used as the instrument of support where:*
    (*a*) *a piece of hardware is the end-product;*
    (*b*) *an agency is purchasing personal consulting services;*
    (*c*) *the end-product of the research is classified.*

(*Page 180*)

54. *Authority to enter into research agreements be extended to royal commissions and related bodies.*

(*Page 181*)

55. *The test for the remuneration of recipients of post-doctoral and research leave fellowships be each university's faculty and employee salary policy for the current academic year.*

(*Page 181*)

56. *Universities be reimbursed for the employer portion of any fringe benefits payable on behalf of staff holding federal research leave fellowships.*

(*Page 182*)

57. *When a university extends normal fringe benefits to post-doctoral fellows, the university be reimbursed for the employer portion of the fringe benefits payable on behalf of individuals holding federal post-doctoral fellowships.*

(*Page 182*)

58. *All remuneration to university research personnel arising from federal research councils and other agencies, including research leave and post-doctoral fellowships, be deemed taxable.*

(*Page 183*)

59. *The Federal Government study and implement appropriate means of remedying any anomalies arising from the taxation of remuneration paid to university research personnel funded by federal agencies.*

(*Page 183*)

60. *As a matter of urgent priority, a federal-provincial conference be convened to:*
    (*a*) *consider generally the means whereby the Federal Government can make a direct contribution to university buildings or parts of buildings which can be identified clearly as research facilities;*
    (*b*) *consider specifically the establishment of a federal research facilities corporation which would:*
        (*i*) *administer a research facilities fund supported by an annual federal vote having an initial level of $120 million per year;*
        (*ii*) *receive university applications for the support of building projects for research, such applications to have been approved by the president and board of governors, to specify total capital and operating costs, and to certify all contributions from non-federal sources;*
        (*iii*) *adjudicate, through all appropriate means including site visits, these applications on the basis of such criteria as merit and the need for balance among regions and among English and French language universities;*
    (*c*) *consider specifically an appropriate phasing out of the Health Resources Fund in favour of the research facilities corporation.*

(*Page 193*)

61. *The costs of scholarships and bursaries for full-time graduate students, both Canadian and non-Canadian, paid by the provinces or by the universities from their general purpose revenues, be recognized as allowable costs in computing the Federal Government's contribution to university education through the fiscal transfer arrangements.*

(*Page 203*)

62. *Concurrently with arrangements to allow graduate student awards as a cost in computing the fiscal transfer, the research councils adopt a policy of offering competitive scholarships limited to about 10 per cent of the full-time graduate enrolment.*

(*Page 203*)

63. *Concurrently with arrangements to allow graduate student awards as a cost in computing the fiscal transfer, the policy of permitting the support of graduate students through research grants be discontinued except when it can be clearly established that the services of the student are essential to the performance of the research.*

(*Page 204*)

64. *All support of foreign graduate students under the auspices of the Federal Government become a responsibility of the Canadian International Development Agency.*

(*Page 204*)

65. *The Federal Government, through the National Library, adopt as a firm objective a machine-readable National Union Catalogue.*

(*Page 229*)

66. *The National Library organize, finance and conduct a catalogue planning and development conference at which the research resources and catalogue condition of Canadian libraries are analyzed, their progress toward catalogue automation determined, and present co-operative (e.g., inter-institutional) and group (e.g., provincial) plans and undertakings recorded.*

(*Page 229*)

67. *On the basis of this information the National Library propound a program to support, expedite and extend catalogue automation in selected institutions and regional centres in such a manner that the first phase would bring the largest possible proportion of the country's research stock under automated control for the smallest investment consistent with the full development of the country's potentialities. These federal payments, made through the National Library, should be predicated upon:*
    (*a*) *the acceptance by all participants of a common format;*
    (*b*) *their agreement to deliver to the National Library, for use as input to the National Union Catalogue, copies of all tapes, discs, etc., containing catalogue information; and*
    (*c*) *their committing themselves to the systematic maintenance of catalogue automation, and the transmission of the resultant information to the National Union Catalogue, for a specified period of years.*

(*Page 229*)

68. *When this initial program has been negotiated and implemented, the National Library prepare a second program for the gradual enlargement of participation by institutions not included in the first but with an impor-*

*tant research capacity that could, at reasonable cost, be brought into the system.*

(*Page 229*)

69. *The Federal Government ensure that the information transferral needs of Canadian research libraries be a part of the specifications for any national communications system which it may develop or support, and that in the meantime it reserve a number of prime channels in all broad-band transmission systems developed in Canada sufficient to serve these needs.*

(*Page 231*)

70. *In fiscal 1970 the Humanities and Social Sciences Council distribute to Canadian universities not less than $2 million in support of the purchase of library research materials, to which should be added 100 per cent in consideration of administrative costs, and that in fiscal 1971 the amount be not less than $4 million, to which should be added the administrative cost allowance.*

(*Page 234*)

71. *The National Research Council and the Health Sciences Council entertain applications from universities for support of especially appropriate strengthening or development of library research capacity in science, engineering, and health fields respectively.*

(*Page 234*)

72. *The National Science Library revise its acquisitions policy by recognizing that it is neither possible nor desirable to bring together in Ottawa all publications capable of contributing to the development of science, technology and medicine in Canada, and that instead it develop, in collaboration with Canadian university libraries, proposals for a co-operative acquisitions program which, taken as a whole and in the context of the national system of research libraries proposed above, will make available within Canada the optimum library support for research and development in science, technology, and medicine.*

(*Page 237*)

73. *The National Library formulate an explicit acquisitions policy.*

(*Page 239*)

74. *One aspect of this policy be the development of a comprehensive collection of Canadiana.*

(*Page 239*)

75. *The National Library formulate its other collecting responsibilities in the context of the nation-wide system of research libraries recommended above and after consultation with the other participants, with a view to*

*assuming primary responsibility within this system for government documents, publications of international bodies, data banks, bibliography and library science, and certain agreed subject fields in which interaction with government is greatest, such as economics, political science, sociology, communications, law, etc.*

(*Page 239*)

76. *The chief responsibility in the Canadian research library system for collecting the materials of research and research training in the humanities and the traditional social sciences remain in the universities, and that the National Library collect in these fields only by way of planned supplementation to the acquisitions programs of other participants in the system.*

(*Page 239*)

77. *The National Library not develop a research capacity for local convenience which is not required for the national system.*

(*Page 239*)

## Chapter 1

# RELATION OF RESEARCH TO CANADIAN GOALS

### Growth of Research and Development

The problems of research and public policy are new. In the recent past, research was largely a pastime for a few fortunate individuals, who happily were able to indulge their curiosity without much dependence on the public purse. Today research is the serious business of nations.

Less than 100 years ago there was only one research laboratory in England, the Royal Institution. The first building in the world for research in physics, the Cavendish laboratory at Cambridge, was not built until 1871. In those days many opposed the introduction of experimental science into the University. Cambridge lecturers were considered to be learned men of high moral standards and it was thought to be an impertinence to subject their conclusions to the test of experiment. Lord Bowden recently observed that a generation ago the Cavendish laboratory was the most famous in the world; its total budget in 1912 for teaching and research was just over £3,000. Lord Rutherford, a Professor at Cavendish in the years following 1920, never had more than £2,500 a year to spend but he financed a dozen Nobel prize winners.

Research was inexpensive; few people were involved; and until the Land Grant Colleges were established in the United States it was conducted with disdain for any practical goal. What has happened since is well known. Research and development (R & D) expenditures have become very large and continue to grow at extraordinary rates. In 1963-64 gross expenditures in the United States on R & D amounted to $21 billion. The United Kingdom spent about $2 billion, France more than $1 billion and Canada $425 million (all in U.S. dollars). The £3,000 budget of the Cavendish laboratory in 1912 has become £300,000. Even more startling than the present high levels of expenditure has been the rate of increase. For 15 years the expenditures in the United States increased by about 15 per cent a year. In 25 years United States science expenditures multiplied 200 times.[1] Canadian R & D expenditures in the National and Medical Research Councils for university research increased at rates of 30 to 35 per cent a year for the past four years. The increases in the NRC-MRC budget for universities over 10 years, from 1958-59 to 1968-69, rose from $6.1 million to $88.3 mil-

[1] *Basic Research and National Goals, 1965.* U.S. Government Printing Office.

lion—almost 15-fold. Canada Council's research expenditures in the social sciences and humanities have approximately doubled three years in a row, after many years in the doldrums.

Studies by Derek Price, dealing only with scientific research in England, measured the rate of increase in scientific effort by examining such indicators as total scientific manpower, numbers of scientific papers, annual expenditures on scientific matters, and numbers of scientific journals. The conclusion supported in each case was that the trend is exponential with a doubling of the scientific effort every 10 or 15 years. The rate of doubling in the United States (and probably in Russia) is even faster.

Research dollars, whether spent in universities or by industry or by government, will have an impact on the kind of country Canadians create and the kind of life they will lead. The amount of money will be important but of more profound influence will be how it is spent—the strategy of research expenditure. The choices are numerous. Research dollars can be used to stimulate economic gain and to accelerate the growth of our gross national product. Research dollars can help us to exploit more effectively the natural resources of our country. Research can let us share in the rewards of technological innovation, improve the health and longevity of Canadians, enrich our cultural resources, improve the quality of the environment in which we live, enhance individual intellectual opportunity and assist us to meet our international responsibilities toward the underdeveloped parts of our world.

All these and other research objectives are worthy. The extent to which we attain any or all of them should depend in the first instance on conscious decisions about the effort we are prepared to make. Research, of course, cannot ensure the attainment of our goals, but failure to engage in research in many instances would obstruct the possibility of reaching them. We need to know and evaluate our total research effort and we need to decide for individual goals what share of the total effort can be allocated wisely to research.

To seek for such decisions is to bring us squarely up against the question of Canadian goals. Enunciating such goals requires philosophic judgments rather than economic or scientific analysis. It is ultimately the task of all Canadians. Views are expressed by our citizens and by our leaders in business and industry, in the universities, in the arts, in the professions, and in politics. They are heard and sieved by all of us with a new order of efficiency through the complex networks of modern communication. Ultimately it is the task of the politicians to sense the wishes of the nation and to develop the machinery to respond to those wishes. The politician like other citizens has the right to dream and he can create his own image of Canada; but the politician has no monopoly when it comes to dreams. The kind of country we will have in the future will be determined by the wishes of the Canadian people to the extent that they are crystallized and translated into

action. What seems clear is that the immense strides in science and technology of this century have transformed our world and in doing so have imposed a new urgency on the thoughtful determination of goals and priorities. Every schoolboy can catalogue an impressive list of recent scientific or technical accomplishments. Likewise every thoughtful citizen is impressed with the predicament that science and technology have forced on modern man—limitless power for good on the one hand or universal genocide on the other.

Such contrasts are common. The achievements of science while opening great new opportunities, at the same time bring important new problems. The agricultural revolution has led to vast increases in urbanization and a host of urgent problems—crime, crowding, pollution, transportation, etc. Communication and transportation technology have opened the eyes of the people of the poor nations to how the rich nations live. Control of infectious disease has heightened the difficulties created by overpopulation and increased the incidence of starvation. Computers and automation are creating changes in society as yet only dimly seen. Discoveries in genetics hold the promise and the problems of change in the nature of man himself. Very often the achievements in one field create challenges for other fields. Commonly, as in the above list, scientific achievement creates challenges in the social sciences and humanities. Indeed the urgency of strengthening the social sciences and humanities to some extent is the direct result of scientific discovery and technical innovation.

We have reached a stage when many scientists believe that it is within our scientific and technological power to solve every major problem related to the physical needs and comfort of mankind. Yet the deeper problems of human behaviour and human values in a transformed world remain, and they will not be solved by technology. Indeed it is clear that they are heightened by technology. It is the paradox of our age that although scientifically we can accomplish almost anything, we have so far failed to solve most of the pressing and critical problems of our time—termination of the arms race, poverty, overpopulation, pollution of our environment, aggression. These greater issues are the concern of every man but they require especially the emerging skills of the social scientists, and they require an input of effort in these fields of a new order of magnitude. It seems not too bold to predict that we are on the threshold of a new scientific revolution involving the social sciences.

The phenomenal growth of research and development in the twentieth century has been centred on the natural sciences and engineering. The social sciences are only in the past decade beginning to gather momentum. Indeed their development is so recent that data and studies describing their status have only recently begun to appear. Such studies illustrate quantitatively that, although funds for social science research are increasing rapidly, commitments to the natural sciences remain very much larger. Since it has been estimat-

ed that as many as 90 per cent of the world's social scientists reside in the United States,[2] it is interesting to examine in that country the relationship of support for social science research to the support of research in the natural sciences. A study by Trist[2] estimated, for 1961, that $15,173 million was forthcoming from all sources in support of the natural sciences and $652 million in support of the social sciences. The growth has been proportionately faster in the past decade in the social sciences than in the natural sciences. The National Science Foundation indicated for the period 1956 to 1966 an average growth rate of 27 per cent in the social and psychological sciences and a rate of 20 per cent for all other sciences combined. In the United Kingdom in 1964-65, total research expenditures were estimated to be between £700 and £750 million; the social sciences received from this total about £3.5 million, less than 0.5 per cent. Our own studies indicate that currently in Canada the direct support of university research in the social sciences and humanities by the Federal Government (including scholarships) is about 11 per cent of that allocated to the natural sciences, engineering and health (Chapter 4). As noted by the Economic Council of Canada, "The support given to research in the social sciences in Canada has been totally inadequate . . . it is miniscule in relation to the social problems that now confront us."[3]

These data indicate that significant sums are now being spent on social science research but the scale is still relatively small. Criticisms have been directed at the organization of research in the social sciences on grounds that it is too individualistic, whereas the problems to which the social scientists can most effectively contribute are "big science" problems requiring complex organizational arrangements and the co-operation of large numbers of workers in various disciplines.[4] In Canada, the work of some Royal Commissions is illustrative of the way in which the social sciences can make important contributions, both basic and applied. Comparable developments and funding have been notably lacking in the universities.

Reisman has observed that western society is entering the "post-industrial age" when a common concern of increasing intensity is the "quality of life".[5] These issues have become more urgent as man becomes more and more aware that the scientific revolution offers him the prospect of solving his fundamental problems of food, shelter, disease, etc. What kind of world does he want? What are the higher values to which he should now direct more of his attention? It is to the social scientist and the humanist that he must look for help.

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[2] E. Trist, *International Study of the Main Trends of Research in the Social and Human Sciences,* UNESCO, 1968.

[3] Economic Council of Canada, *Fifth Annual Review,* 1968.

[4] See for example, Mabel Timlin and Albert Faucher, *The Social Sciences in Canada,* (Ottawa: Social Science Research Council of Canada, 1968).

[5] Quoted by E. Trist, *op. cit.*

While high hopes must be tied to the growing efforts of the social scientists to understand man, it is to the humanist that man must turn to see himself for what he is, in all his moments of triumph and tragedy, an endless series of contradictions. He can be avaricious or generous of heart, ruthless or compassionate, destructive or creative, expedient or visionary, but always with a potential to rise above his checkered past. Research for the humanist examines the drama of man through his long and tortuous climb, with all the failures and the folly, and the occasional moments of inspiration. The humanist has seemed to play a quiet and modest role, out of the limelight of a stage peopled by heroes and villains; yet if we are to survive we will heed not only the clinical probings of the social scientists but we will nurture the voice of scholarship; we will seek to see ourselves more clearly in the mirror that the humanist holds before us.

The conclusion from the foregoing is that decisions about the strategy of research expenditure are required in a modern country like Canada. They cannot be left to chance or lobbying. These decisions in the last analysis are political, and must reflect the goals of the country and the effort we are prepared to make toward them. The goals will involve investments of many kinds only one of which is for research, and the primary decision is to determine the goals. The research effort needed for each major goal is a secondary decision. Governments will be concerned with issues such as food production, exploitation of natural resources, energy and delivery of health care rather than with the relative priorities of agricultural research, geological research, atomic energy research and medical research.

**Government and Research Policy**

Most western countries do not attempt to develop a global R & D budget according to some high level government policy decision.[6] The reason for this is that research is so diverse and so variable in its potential contribution, depending on the goal, that it seems wiser to determine for each major mission (such as health or defence or industrial development) what contribution research can make. Since budgets tend to be built in this piecemeal way, great caution should be applied in drawing conclusions about R & D expenditures in different countries. The nation's goals and commitments can affect profoundly the level of research which is required. It is far more meaningful to compare expenditures in separate sectors such as agricultural research or medical research or defence or space research than it is to look at gross figures. This is not to say that no attention is paid to total expenditures. Indeed a number of countries, including the United States and the United Kingdom, are developing programmatic analyses of expenditures to determine what is happening and to make comparisons with other years and other countries. Such analyses are essential steps toward performance and program budgeting, a means by which governments are seeking to

[6] Belgium and France are exceptions.

improve their decision-making process. Government fiscal agencies, including Treasury Board in Canada, require budgetary procedures which will permit them to identify component parts in such a way as to analyze programs. In the case of research and development, this necessitates procedures that permit breaking out the research components of all agencies to provide more precise descriptions of government research performance.

The role of government in determining policy for research expenditure involves first setting the major goals. Beyond that, as pointed out in an OECD report,[7] government should: (1) ensure that departmental and other agencies employ "best practice" procedures, criteria and machinery in assessing particular projects; (2) participate in certain strategic decisions concerning important programs; and (3) exercise a "balance-wheel" function, i.e., increase or restrict the flow of resources to particular fields where this seems necessary from government's unique viewpoint of overall national priorities.

The criteria which governments can use in implementing these roles are: (1) the needs and opportunities of different fields and programs; (2) social needs and opportunities; and (3) needs and opportunities of the economic system. Although such criteria are difficult to apply, they are not impossible and it is within this framework that the ultimate decisions should be reached. The process is political but the staff analyses and reporting to allow the politicians to make their choices wisely require all the expertise the scientists, scholars and administrators can muster.

The weight of this discussion has emphasized the political nature of the ultimate decision-making. Other levels of decision, however, should not be political; indeed they are bound to be made incompetently if they are allowed to become political. They are the decisions within a general field of activity where expertise is essential. The political decision may over-emphasize "need" and underestimate "opportunity". Scientists and scholars within a field of research will be confronted with choices, often difficult, but their own first-hand knowledge is essential to the selection. Thus, once broad policy is established it is important to delegate and decentralize the authority as much as possible to those responsible for the performance of research.

Steven Toulmin[8] separates choices into commensurable and incommensurable alternatives. The latter would be represented by choices between resource allocation to medical, military, energy or fundamental research. Such choices are political. The former—for example, choices between different approaches to research on air pollution—are not political and should be made by the experts.

The distinction between issues requiring political judgment and those requiring expertise can be illustrated by an additonal example. How much basic research should be supported? This question was the topic of a major

[7] *Government and allocation of resources to sciences.* OECD Paris, 1966.
[8] Minerva, Vol. II, 3—"The Complexity of Scientific Choices: A Stocktaking".

study in the United States by the Committee on Science and Public Policy of the National Science Foundation.[9] The contributors observed that basic research, for the purpose of the question, falls into two categories. The first is basic research related to specific missions of government departments or agencies, where the mission has been determined by political decision. This type of basic research, not applied yet related to a mission, has been called "oriented basic research". Decisions about levels of expenditures of this type should be made by those responsible for accomplishing the mission. They are difficult, require expertise and depend primarily on a judgment about how much the mission will depend on basic research. Harvey Brooks suggested that experience has shown for science-related missions that basic research has usually accounted for 10 to 15 per cent of the total research effort, depending on the mission.[9] Obviously, in each case this should be an operational decision, not a political one.

There remains the question, how much basic research is not related to a mission? This category has been called "intrinsic basic research" and here the question is political, not scientific. Such research contributes to culture, to education, to social and economic well-being. In the latter instance its contribution may be distant and is always unpredictable. Research of this type is carried out mostly in universities. Harvey Brooks estimates that perhaps five per cent of those engaged in this activity are truly outstanding but that the others should be supported to provide much of the background for the top five per cent and for cultural reasons and to provide trained manpower.[9] Carl Kaysen suggests that basic research should be an overhead on applied research and development and set, in the United States, at its historical level of nine per cent.[9] The choice is incommensurable with alternative ways of spending public funds and therefore is a political decision.

**Universities and the Research Effort**

Universities occupy an unique position as part of Canada's resources for research. They have special responsibilities not shared significantly by other institutions. Traditionally and historically, they saw their research role as that of generating new knowledge *per se* and research of a basic nature was favoured. Basic research remains today and must remain a matter of the highest priority in universities. The primary role of universities, along with teaching, is the generation of new knowledge and it matters not whether the knowledge appears to be useful. As Samuel Johnson put it, "a desire of knowledge is the natural feeling of mankind". The nature of man demands that he continue to explore, and that, generation after generation, he seek to learn more about the universe and about himself. Research for its own sake is one of the noblest activities of man and one of the ways of enriching life. Most of the responsibility for preserving and nourishing the tradition of pure research is vested in the universities. In an age when new technologies are

[9] *Basic Research and National Goals 1965*, U.S. Government Printing Office.

transforming the world, it is important that society renew its dedication to the importance of research undertaken simply for the sake of learning. We should guard against the temptation to argue that governments should support basic research in universities because it "pays off" even though we know this often to be the case. Governments should support research because it is an important human enterprise in its own right.

The idea that research in universities should also play a role in the solution of practical problems is relatively new. Its beginnings in North America were associated with the Land Grant College Act of 1862 in the United States. The idea developed gradually and has had its most profound effect on universities in the United States. The graduates of the Land Grant Colleges developed new crops and new techniques of such value that two thirds of the food grown in the United States today is attributable to them. Moreover the new attitude had wider impact and produced a generation of graduates who transformed American industry. Still, there are many who cling to the earlier view that the function of the university is to conduct basic research only. It has continued to be looked upon as more prestigious and in some mysterious way more fitting for the academic than applied research. That view appears to be disappearing today in Canadian universities. In our hearings we have had clear indications of a growing interest in applied research, especially in the professional schools. We are sympathetic to this broadening of interest and this desire to make universities more relevant to contemporary society. Yet we see the university today and in the future as the primary focus of basic research and scholarly investigation unrelated to any particular applied mission. Long experience has proven the importance of such work and has established that this well-spring of purely scholarly activity provides the foundation for ultimate and unpredictable innovation. Thus, new views and new dimensions of the universities' research responsibilities must not diminish their commitment to fundamental investigation.

Equal in importance to the universities' role in generating new knowledge is the role of research in enhancing the quality of teaching. It is popular today to view research and teaching as competing interests in the university. Teaching is said to be neglected and the student is short-changed because of the degree to which the faculty concentrate on research. Promotion policies are said to recognize scholarly publication and international reputation and to pay lip service to the quality of teaching.

Job offers and salaries are determined by an international market which recognizes research accomplishment and prestige whereas teaching contributions, at best, gain local recognition. There is truth in the criticisms, and the problems deserve and are beginning to receive the attention of the universities. In giving attention to these issues we urge that sight not be lost of the highly valuable contribution of research to teaching. The point was made repeatedly in our hearings: one of the principal reasons for doing research in a university is to enhance the quality of teaching. The spirit of enquiry and the exploration of new frontiers which are characteristic of research breathe

life into the teaching process. The university is not a mere custodian of knowledge; it is a creator of knowledge, and because this is so it is a critic of today's knowledge. Theories are transient, subject to examination and revision in the light of new facts and new interpretations. Teaching founded on research will engender a spirit of enquiry and enhance the ability to reach critical judgments. These are central to the teaching role of the university.

A further function of research in a university is the development of manpower to conduct research. This role is primarily a function of the graduate schools. Here, research has a function which is more specific than that of enhancing teaching; it is a training function designed to qualify persons to be competent in the techniques, methods and discipline of research in a particular field in order that they may conduct research themselves. The manpower so produced may be absorbed into the economy in three principal ways. First, those so trained may remain with the university in a teaching and research capacity. With the great increases of past and future years in university enrolment, such persons have been required and will be required in large numbers. It is conceivable to view research training of this sort as part of a closed system where research and training for research are serving primarily to enhance our cultural resources and to improve the quality of our educational opportunities. Discovery resulting in innovation or contributions to the solution of practical problems in this view could be looked on as incidental by-products of the system. Although we view this cultural and educational role as important in its own right, it is plainly only a part of the manpower requirement.

The second reason research manpower is required is to meet the research functions of governments. Many, indeed most, departments of governments have some research requirements relative to their missions. In some the amount is small; in some it is substantial. In the Federal Government for example, departments and agencies such as Energy, Mines and Resources; Atomic Energy; the Defence Research Board; Agriculture; and the Economic Council have substantial expenditures and require large numbers of qualified research workers. The Canadian Government spent $241 million on intramural research in 1965. The provincial governments, too, draw on the research manpower trained in the universities.

The third sector requiring research personnel is business and industry. Although research activity of industry in Canada has lagged behind that of many industrialized countries, the effort in absolute dollars is substantial. Current expenditures in 1965 for research and development amounted to $284 million. By way of comparison, $146 million was spent in universities in that same year for research. Thus, industry has an important demand for research manpower.

We propose that Canadian universities accept one further role in research and that is to be prepared to make some greater commitments to research essential to Canadian goals. We visualize major research activity

required for various missions of the government being undertaken by the universities on behalf of the government. On this point we did not find universal agreement within the universities.

The division within the universities relates to two different views of the role of the university in public service. They have been developed thoughtfully in a publication of the Carnegie Foundation for the Advancement of Teaching.[10] One view sees public service as inappropriate to the university because it is inconsistent with basic responsibilities for teaching and the discovery of new knowledge; the other holds that the modern university must be fully engaged and that service is as much a responsibility as teaching and research. The fact is that all or most universities today engage in a wide variety of activities which can be classified as public service. Our concern here is with one only—research.

The fear of some is that if Canadian universities engage in large-scale contract research in the public interest they will be distracted from basic research and more particularly from teaching. Their fears are founded on experiences in the United States where some universities have become so heavily engaged in contract research for the Federal Government that their whole character has been distorted. It has been suggested that much of the student feeling of neglect and charges of irrelevancy of teaching is attributable to preoccupation of faculty with these major research undertakings.

Those who see a role for the university in public research missions argue that Canada cannot afford to establish all large government research installations divorced from graduate training, that such policies in the past help to account for present manpower shortages, that much of the research required by government (and perhaps industry) would be suitable for the training of graduate students, and that the universities have a large resource of research manpower which could be used more effectively in the Canadian interest than is now the case.

Within limits, we favour the latter view. To begin with, it is self-evident that the university must have society's support. In return, society must have access to the university's resources. There is no escape from that conclusion in the modern world. The urgency of the issues facing society, the dispassionate, non-political objectivity of the universities, the wealth of human resources within the university, and the fact that many times no other institution will have the capacity to meet the challenge, all are compelling reasons why the university must be flexible and prepared to give service in appropriate circumstances.

The ground rules, however, can be negotiated. Initiation should be with government departments. When government departments require a major development (such as a research institute) they should consider whether the mission could be accomplished as well or better in a university. Where the answer is affirmative they could explore the possibilities at the highest policy

[10] *Annual Report,* Carnegie Foundation for the Advancement of Teaching, 1966-67.

levels within the university. The university should ask itself (1) is the proposal consistent with its overall goals? (2) is the proposal one that can be undertaken without interfering with the university's teaching and research commitments? (3) is the program suitable for the training of graduate students? (4) can the university develop appropriate organizational and management practices to carry out the mission? (5) is the university competent to carry out the mission? If the answers to these questions warrant proceeding further a contract could be negotiated placing the management of the mission in the hands of the university.

The advantages of such arrangements are obvious. The university would be performing an important public service. The research would help to develop additional trained manpower. The interface between the university and society would be strengthened.

The difficulties are of two types. The first is an organizational one. University policies in respect to appointment, tenure and freedom to pursue one's own line of investigation do not appear to lend themselves readily to organized large-scale research missions. We believe these difficulties can be overcome without serious alteration of university practices. We would go further and state our conviction that, in the universities' interests, the organizational difficulties must be overcome. "Big science" is becoming a more important instrument of modern research—in not only the natural sciences and engineering but also in the social sciences and health sciences. While it must never replace "little science", it must take its place alongside of "little science". The universities have an obligation to demonstrate and teach the methods of "big science" because many of their graduates will be called upon to contribute to this approach to research.

The second difficulty is the danger of government and society looking upon the university as a pool of talent automatically on call and at the service of society. Those wishing to use the university need to be reminded constantly that teaching and research are the primary responsibilities of the university. Service is secondary. The talent is available in the first instance for the internal purposes of the university and only if proposals are consistent with the university's primary responsibilities should they be considered by the university. Government departments should look upon the possibility of making use of the university as a privilege, not a right. In the long run, society will be best served by adherance to this view of the role of universities.

Canadian universities and government departments have had little experience with the new role we are suggesting. For this reason, although we believe the principle is sound we suggest that any new arrangements should be approached cautiously on both sides. In particular, we would urge both sides to move slowly and not seek to set up large numbers of missions on

campuses. The experience gained by a few experiments will be useful in avoiding serious errors and improving the management and performance of future missions.

**A Government-University Research Partnership**

We close this Chapter by returning to the determination of research policy and the relationship between government and university in this regard. Is the determination of the level of support for university research a political decision or an operational decision? The answer is that it is basically a political decision. The foremost reason for supporting research in universities is to strengthen one of Canada's goals—to have strong universities. The mission here is the welfare of the universities themselves as a great cultural resource of the country. The universities provide an educated citizenry; they provide trained manpower for the complex needs of society; they provide a continuing critical examination of our world and ourselves; they contribute solutions to practical problems; they contribute to a healthier economy, healthier society and healthier people. Each of these contributions of universities requires research, and if the universities are to make their contribution they must have research support. The decision about the level of support is political because it is incommensurable with other choices for government investment. How much for medicare? How much for development of our natural resources? How much for defence? How much for social security? How much for housing? We believe that university research deserves a high priority in any such list of choices because the university is unique in that its welfare and the vigour of its research bears heavily on the successful attainment of most other social goals. We reiterate, however, the decision is essentially political.

It may be appropriate at this point to deplore an attitude which, through long tradition, has characterized the relationship of government and the universities in respect to support of research. In the past, government has too easily viewed itself in the role of the philanthropic patron dispensing its largesse to hungry academics as a form of charity. Indeed, even today for the purposes of income tax, personnel remuneration paid from certain government research grants is treated as a charitable gift. The academics and the universities for their part have been all too willing to approach government, hat in hand, with an attitude that they will be respectfully grateful for small mercies. These attitudes happily are disappearing in the relationships between university scientists and governmental agencies; they are becoming less common among the social scientists but in our hearings we frequently encountered an unbecoming plaintiveness among the scholars in the humanities and their supporters. For either university or government it represents a position which is undignified and misleading. The universities are a central pillar of our society without which society would be destitute. That fact is known to all parties when they think about it. Therefore we urge on both universities

and government that they approach the subject of research in a spirit of partnership in which indispensable contributions to Canada's welfare are being provided by each partner. This theme runs through our report and many of our recommendations reflect this viewpoint.

Two related assumptions follow. The partnership must be based on achieving quality of a high order in the decision-making process about university research. Neither party should be satisfied that its responsibilities are being met unless this objective is being achieved. In addition, partnership requires that each partner accept his full responsibility. For this reason we believe and counsel in what follows that for those categories of cost in which the Federal Government is prepared to participate, it should aim to meet the full cost. The concept of "grants-in-aid" is an echo from the past and is inappropriate in a viable and vigorous partnership. Again, these considerations recur throughout our report.

A second order policy decision is the decision about levels of support in different sectors of the university's activities. How much for social science, for humanities, for natural sciences, for health, etc.? This question should be answered on the basis of expert advice. The basic criterion is the welfare of the universities and allocations should be decided with this in mind. Related questions of need and opportunity will have to be examined, but the advisors will be concerned essentially with distribution which provides a healthy, varied and balanced spectrum of research activities in Canadian universities.

In dealing with such questions it will be important to segregate (though not ignore) university research purchased or sponsored by departments as contributions to their own missions. Such research should be justifiable independently of the welfare of the universities. However, its very presence in the university bears on the balance of university research and should influence the judgments made in those agencies whose mandate relates to the welfare of university research.

## Chapter 2

# RESEARCH AND DEVELOPMENT EXPENDITURES IN CANADA

The purpose of this Chapter is to indicate, so far as the available statistics permit, the level of research spending in Canada. Whether the level is adequate or not is difficult to evaluate objectively: comparisons with other countries are, as we will point out later, susceptible to misinterpretation; and graphs of expenditure (as a function of time) assume, perhaps rightly, that earlier expenditures were inadequate, but equally assume some higher target, which is not defined.

We have fairly complete figures for research expenditures in the natural and applied sciences, although even here the industrial contribution for recent years is not available. Data on research in the humanities and social sciences are woefully incomplete.

### Current and Capital Research Expenditures

The three major sectors of research and development activity are government laboratories, universities and industry. Federal Government laboratories depend, almost entirely, upon Federal Government funds for their work; provincial research councils draw substantially upon their respective provincial governments. Universities rely principally upon federal and provincial government sources, and industrial research and development are substantially financed by the corporations themselves, with some help from government.

The distribution for 1965 of source of funds and sector of performance is given in Table 2:1. However, this table refers essentially to scientific research and development and excludes most research in other areas. More recent figures are available and will be referred to for universities and government. Government is the main supplier of funds, accounting for more than half the total. Industry and government have been the main performers of research with the universities a poor third. This fact was the object of criticism in our hearings. Government was criticized for not relying more heavily on industry and universities for performance of research with government providing the funds. Industry was criticized for its limited research activity relative to other countries, and universities were criticized for paying too little attention to the solution of practical problems important to Canada. We believe there is justice in these complaints but point out that the current trend is to change the balance. University research is increasing proportion-

ately much faster than government research. For example, intramural Federal Government expenditures on scientific activities doubled between 1962-63 and 1967-68; Federal Government direct expenditures on scientific activities in educational institutions and also in profit-making organizations approximately quadrupled in the same period (Table 2:2). It is disappointing to see that the increase in proportion of expenditures in universities is almost entirely attributable to expenditures through NRC and MRC. In other words, mission-oriented agencies of the Federal Government have continued to rely very little on universities for performance of research of interest to the agencies (Table 2:3 and Figure 2:1). Actually for all agencies except NRC and MRC the amounts spent intramurally on scientific activities in 1967-68 was 76.2 per cent of the total, whereas only 1.8 per cent was spent in the universities. Table 2:4 and Figure 2:2 show that during the past several years, NRC and MRC expenditures in the universities have increased steadily as a proportion of the total. In 1967-68 combined NRC and MRC expenditures on scientific activity exceeded NRC's intramural expenditures for the first time.

The figures in Table 2:1 representing the contribution of funds from "Higher Education" to the Higher Education Sector of Performance arise from university budgets, which substantially depend upon provincial grants. These, in turn, are now the object of federal-provincial fiscal transfer arrangements (see Chapter 4).

Figure 2:3 shows federal expenditures on research and development in the natural and applied sciences as a function of time, and sectors of performance. Curve 1 reveals the trend of total Federal Government expenditures in research and development, including both current and capital amounts. Comparison with curve 2 shows that the proportion of government funds devoted to in-house research has declined since 1962 from about 80 per cent to 60 per cent. Curve 3 shows the current expenses of government in-house research. Government support of research and development in industry is shown in curve 4. The purpose of support program and other incentive schemes is, of course, to stimulate industrial research and particularly manufacturing enterprise. Curve 5 shows the extent of Federal Government support of research through NRC and MRC grants (but excludes scholarships and fellowships) and through grants and contracts from government departments.

Seven provinces now have provincial research councils[1] (British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick and Nova Scotia). Their total expenditures in 1965 were just under $10 million, of which seven per cent came from the Federal Government. The total expenditures of the research councils rose to $12.3 million in 1966—twice the 1963 figure but still a small percentage of Canada's total research effort.

[1] *Federal Government Expenditures on Scientific Activities 1965-66,* DBS, No. 13-401.

Industry supports its own research and development activities to the extent of approximately 70 per cent of the total costs.[2] During the period 1961-66, Canadian industry spent about $30 million per annum in supporting research outside the country. However, in 1965-66 this figure was almost equalled by research contracted to Canadian industry by foreign companies and governments. The amount of money flowing from industry to universities for research is very small. Table 3:1 shows support to the extent of $2.7 million in 1966-67.

**Research Expenditures in the Humanities and Social Sciences**

There is a paucity of information about research expenditures in the humanities and social sciences in Canada. Similar lack of data is common to most countries as pointed out in an OECD publication.[3] Apart from government expenditures, we have little idea of sources of funds, nor do we have a complete list of research performers. For example, a brief we received from a bank stated, "The Bank does engage in an organized, continuing and substantial programme of economic and financial research as part of its regular activities", but we do not know the total research commitment of banks. Large industries and business houses engage in similar work. There are cases where publishing houses support, directly or indirectly, the publication of scholarly works. Various foundations and institutes (e.g., The Arctic Institute of North America and the Canadian Council on Urban and Regional Research), drawing their funds from various sources, provide research support. Our data in all of these areas are so sparse that compilation is impossible.

Municipal government expenditures and provincial government funds (outside those directed to universities) are equally uncertain. The Ontario Institute for Studies in Education is an example of a substantially funded provincial research enterprise; and, to varying extents, government agencies at the local and provincial levels engage in research that relates to the economic and social well-being of their constituencies. Again, our information is incomplete.

Even at the federal level no adequate compilations of research expenditures in the social sciences and humanities exist, although it is clear that activity in these areas is growing. Research is conducted by the staffs of the National Museums, including the National Gallery, and of the National Library; the Economic Council and various other government agencies and departments maintain their own research staffs; royal commissions and task forces invest significant sums in research; grants-in-aid of research and other forms of support for scholarly work in the universities are administered by the Canada Council and small programs of a similar nature are conducted

[2] *Industrial Research and Development Expenditures in Canada, 1965,* DBS, No. 13-527.
[3] *The Social Sciences and the Policies of Governments.* OECD, Paris, 1966.

by a number of federal departments. In all the above instances, university personnel may be employed as consultants or may conduct work as grantees or contractors.

A publication of the Special Planning Secretariat of the Privy Council provides an index of extramural grants in the social and behavioural sciences.[4] This publication is useful but provides no measure of either contracts awarded or intramural research in these areas. The index shows a sum of about $4 million approved in 1967-68, and 83 per cent of the grants went to universities. This sum does not include Canada Council grants.

Table 4:9 records total sums from federal sources in the social sciences and humanities awarded to Canadian universities for research purposes in 1966-67 and 1967-68. The total figure for the latter year was $15.3 million (including scholarships). This figure contrasts with the support of research in the sciences, engineering and medicine which totalled $82.4 million in 1967-68.

The most complete data on research support are those for the university sector. Table 3:1 records total sums for sponsored, assisted and contracted research by year as recorded by DBS from data collected by the Canadian Association of University Business Officers. The total figure for 1966-67 was $80.7 million, of which $52.1 million came from the Federal Government. The latter figure is substantially less than our figure compiled by direct enquiry addressed to all the government departments and agencies (see Chapter 4). The discrepancy suggests that a sizeable sum finds its way into the hands of university personnel without being recorded as research income by the universities, and probably in many cases without the knowledge of the universities.

We record in Chapter 3, not only income for sponsored, assisted and contracted research from all sources, but also the provincial contribution to research. The grand total was reckoned to be about $257 million. We do not have complete data on how this sum was divided among the various areas of the universities' activities but the data in Table 3:5 are revealing. They record for six universities, whose total research income was about one third the national total, that 92.5 per cent of assisted research funds went to natural sciences, engineering and health sciences, 6.5 per cent went to the social sciences and about one per cent to humanities. These proportions are consistent with those reported above for distribution of federal support.

At this point three observations should be made. First, one cannot over-emphasize the deplorable lack of quantitative information about the extent of funds for and research in the humanities and the social sciences. With no firm baseline, it is particularly difficult to make projections of needs. Second, of the above categories of university research support in the humani-

[4] *Index of Federal Grants in Support of Extramural Research in the Social and Behavioural Sciences, 1967-68,* Special Planning Secretariat, 1967.

ties and social sciences, the Canada Council offers the largest component. For example, in 1967-68, although 29 departments or agencies of the Government were involved in at least some degree of support of the social sciences and humanities in universities, the Canada Council provided about one half of the total of $7.5 million—in addition to $6.5 million for fellowships. Third, the support of consultants and experts by Royal Commissions and Task Forces (see Chapter 4) should not be included in an assessment of the research performance of the university. The situation is similar to that of an industry retaining the services of a consultant. While such arrangements are mutually beneficial to the hiring agency and to the faculty expert, they do not legitimately attach to the university.

**Types of Research in the Sciences**

Three types of scientific research can be designated even though they may not always be clearly recognized. According to the Frascati Manual[5] upon which OECD returns are based "basic research" is "work undertaken primarily for the advancement of scientific knowledge without a specific practical application in view". "Applied research" is "the same but with a specific practical aim in view". "Development" is "the use of the results of basic and applied research directed to the introduction of useful materials, devices, products, systems, and processes, or the improvement of existing ones."

Criticisms have been made that Canada's component of basic research is inconsistently high in relation to national economic goals. About one fifth of Canada's total research expenditure in 1965 was designated as "basic" research.[6] However, it is difficult to attach very much meaning to the figure. For example, it would not be difficult to claim that all research attached to an atomic energy establishment is "applied"; for however "basic" it is, it should have in view the specific practical aim of assisting in the development of nuclear power. Dr. O. M. Solandt, Chairman of the Science Council of Canada, has stated, "In fact, the basic and applied research is all mission-oriented at Chalk River". Hence, according to the Frascati definition, all of Chalk River's research is "applied".

The hearings of the Senate Committee on Science Policy have tangled with the problem of the disposition of research funds between pure and applied research on a number of occasions. Dr. Richard R. Nelson, the Rand Corporation, stated[7] ". . . the United States started out to support basic scientific research, but is now engaged in support of basic technology in a large number of areas". Dr. Alexander King, Director of Scientific Affairs,

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[5] *Proposed Standard Practice for Surveys of Research and Development,* OECD, Paris, 1964.

[6] J. L. Orr, *Statistical Data on Industrial Research and Development in Canada,* Department of Industry, Ottawa, 1967.

[7] Senate of Canada, *Proceedings of the Special Committee on Science Policy,* No. 13, 1968, p. 259.

OECD, referred[8] to Japan's "level of technological innovation which is one of the highest in the world. Basic research and education are regarded by the Japanese as crucial ingredients of this. Also they are ingredients towards the success of the next phase in their development, in which an increasingly larger proportion of their innovations will come from their own laboratories."

It seems to be generally agreed that the establishment of a firm foundation in basic research is necessary to the eventual technological development and economic well-being of any country. The extent to which the basic research should itself be suggested by major technological objectives is, however, open to debate. The point at which the funding of technological projects should take precedence (as it already has in the United States and toward which, according to Dr. King, Japan is moving) depends upon variables that are beyond the scope of this Chapter—the definition of a science policy, the influence of foreign ownership, the extent to which basic research might be attached to a practical objective. It seems to depend just as much upon the viewpoint of the commentator. For example, while many engineers are displeased that Canada should spend as much as 0.25 per cent of its GNP on basic research, Professor P.M.S. Blackett, Advisor to the British Minister of Technology and President of the Royal Society, stated:[9] "I do not think that anybody will disagree about the importance of pure science, or with the fact that a material return cannot be calculated. I doubt if there are enough good people available in most countries to justify spending much more, say than 0.5 per cent of the GNP on pure curiosity directed science."

Table 2:5 shows for intramural expenditures on research and development the relation claimed by the federal departments between basic, applied and developmental work for 1967-68. Applied research apparently accounts for about 69 per cent of the total, basic research for 20 per cent, and development for only 11 per cent. We question the reliability of the division between basic and applied research because the decision about where to place a particular investigation is so subjective.

**International Comparisons of Research Expenditures**

According to OECD, the percentage of GNP spent on research and development by Canada in 1965 was 1.3 per cent.[10] This figure is sometimes compared unfavourably with that of other countries, notably the United Kingdom (2.3 per cent) and the United States (3.4 per cent in 1964). Comparisons of research expenditures between Canada and other countries are dangerous and are not particularly helpful. Even if one considers those countries which OECD brackets together on the basis of size and economic

[8] Senate of Canada, *Proceedings of the Special Committee on Science Policy*, No. 14, p. 277.

[9] Senate of Canada, *Proceedings of the Special Committee on Science Policy*, No. 5, p. 90.

[10] *The Overall Level and Structure of R & D Efforts in OECD Member Countries*, OECD, Paris, 1967.

structure, allowances must be made for such factors as the nature of the trade of the country, the extent to which foreign ownership dominates its industries, the effect of a few "big science" projects upon the total expenditure, and the influence of governments on industrial development and higher education. When comparisons are made of expenditures in sectors of research performance (industry, government, university) figures may be very misleading.

The practice of expressing research and development as a fraction of GNP likewise can be misleading. "Percentages of GNP devoted to research and development are useful in comparing a country's research and development effort with resources devoted to competing national objectives or to track its growth over time. International comparisons of GNP percentages, are, however, not good yardsticks for science planning. Such evaluation can be made only in the light of the research and development aims a country sets itself, some of which are more costly to realize than others."[11]

The comparison of university research expenditures with the existing state of the economy is particularly difficult to justify, because university research should, surely, be the vanguard—preceding national economic growth and equipping postgraduates for the future needs of the country.

Other difficulties arise in making international comparisons: to know to what extent research sponsored in government or industry may offer support to programs in the universities; to separate the research and educational components attached to government grants; to compare financing in unitary and provincial systems of government. Particular difficulties of definition and interpretation arise in the international use of the words "basic" and "applied".

For these reasons, we make no attempt at international comparisons of research funding, except to the extent that we have quoted Dr. King and Dr. Nelson to illustrate, qualitatively, changed disposition of funds with increased technological sophistication.

[11] *The Overall Level and Structure of R & D Efforts in OECD Member Countries,* OECD, Paris, 1967.

**Figure 2:1**

**FEDERAL SUPPORT FOR SCIENTIFIC ACTIVITIES IN THE UNIVERSITIES, 1959-60 TO 1968-69**

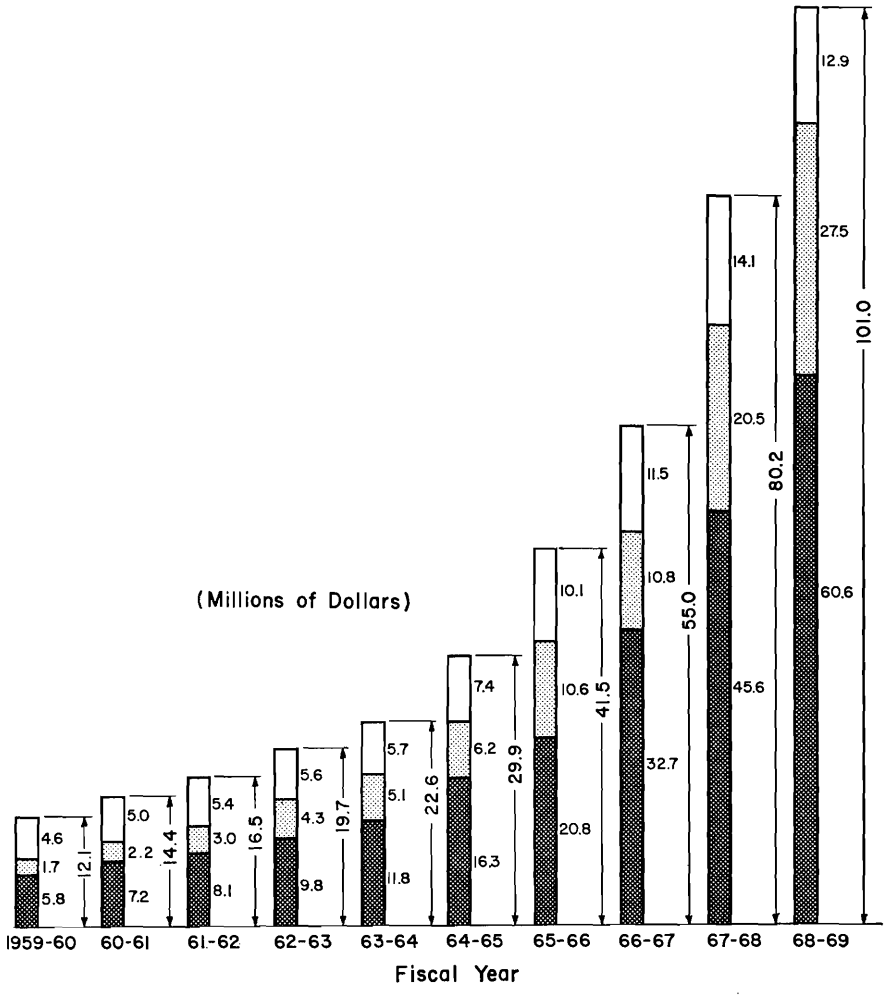
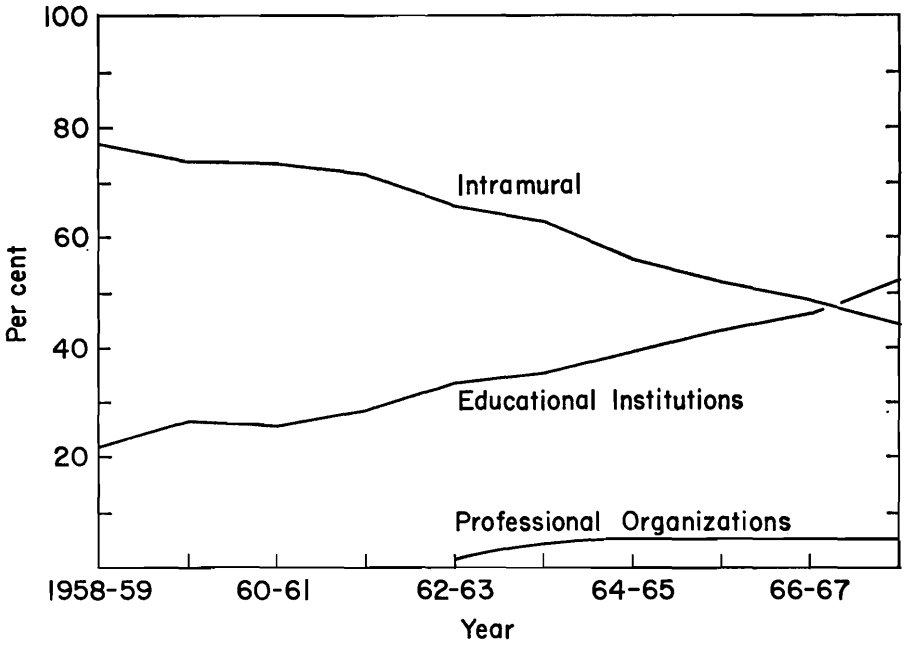


Figure 2:2

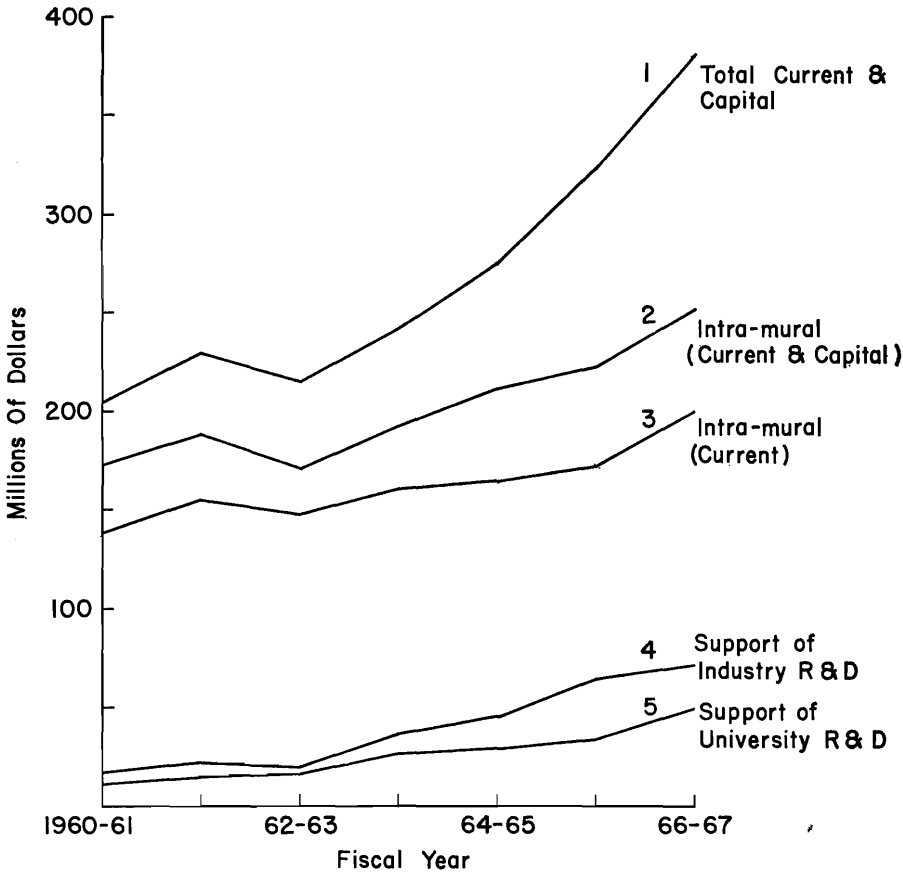
**PERCENTAGE DISTRIBUTION OF NRC'S TOTAL EXPENDITURES ON SCIENTIFIC ACTIVITIES**
**(including Capital Expenditures and Scholarships and Medical Research)**




SOURCES: DBS, No. 13-401.

Figure 2:3

**FEDERAL GOVERNMENT EXPENDITURES ON R & D, 1960-61 TO 1966-67**




SOURCES: DBS, No. 13-401.

**Table 2:1—Current and Capital Expenditures for Research and Development in Canada, by Sector of Performance and by Source of Funds, 1965**

(millions of dollars)

| Source of Funds | Sector of Performance | | | | |
|---|---|---|---|---|---|
| | Government | Industry | Higher Education | Private Non-profit | Total |
| Government | 241.5 | 49.9 | 57.0 | 2.6 | 351.0 |
| Industry | 1.4 | 208.5 | 3.0 | 0.1 | 213.0 |
| Higher education | — | — | 71.0 | — | 71.0 |
| Private non-profit | 0.7 | — | 9.0 | 4.4 | 14.1 |
| Foreign | 0.3 | 25.5 | 6.0 | 0.8 | 32.6 |
| **Totals** | **243.9** | **283.9** | **146.0** | **7.9** | **681.7** |

SOURCE: J. L. Orr, *Statistical Data on Industrial Research and Development in Canada*, Department of Industry, Ottawa, 1967.

**Table 2:2—Total Federal Government Expenditures on Scientific Activities, 1958-59 to 1967-68**

(millions of dollars)

NOTE: Data readjusted in May 1968 for the years 1963–64 to 1967–68.

| Year | Total | Intramural | | Educational Institutions | | Profit Organizations | | Others | |
|---|---|---|---|---|---|---|---|---|---|
| | | | % | | % | | % | | % |
| 1958–59 | 224.5 | 164.3 | 73.2 | 9.4 | 4.2 | 48.7 | 21.7 | 2.1 | 0.9 |
| 1959–60 | 214.4 | 178.7 | 83.3 | 12.1 | 5.7 | 21.2 | 9.9 | 2.4 | 1.1 |
| 1960–61 | 231.0 | 193.7 | 83.9 | 14.4 | 6.2 | 17.6 | 7.6 | 5.3 | 2.3 |
| 1961–62 | 261.3 | 218.6 | 83.7 | 16.5 | 6.3 | 21.0 | 8.0 | 5.2 | 2.0 |
| 1962–63 | 255.7 | 210.6 | 82.4 | 19.7 | 7.7 | 21.8 | 8.5 | 3.6 | 1.4 |
| 1963–64 | 320.0 | 255.7 | 79.9 | 22.1 | 6.9 | 37.8 | 11.8 | 4.4 | 1.4 |
| 1964–65 | 356.2 | 274.2 | 77.0 | 30.0 | 8.4 | 47.4 | 13.3 | 4.6 | 1.3 |
| 1965–66 | 425.5 | 309.1 | 72.6 | 41.7 | 9.8 | 68.1 | 16.0 | 6.6 | 1.6 |
| 1966–67 | 475.6 | 348.4 | 73.3 | 55.3 | 11.6 | 62.1 | 13.1 | 9.8 | 2.0 |
| 1967–68 | 601.5 | 417.6 | 69.4 | 74.9 | 12.5 | 87.7 | 14.6 | 21.3 | 3.5 |

SOURCE: DBS, No. 13-401.

**Table 2:3—Total Federal Government Expenditures on Scientific Activities, excluding NRC and MRC, 1958-59 to 1967-68**

(millions of dollars)

| Year | Total | Intramural | | Educational Institutions | | Profit Organizations | | Others | |
|---|---|---|---|---|---|---|---|---|---|
| | | | % | | % | | % | | % |
| 1958–59 | 196.7 | 142.6 | 72.5 | 3.3 | 1.6 | 48.7 | 24.8 | 2.1 | 1.1 |
| 1959–60 | 181.2 | 154.0 | 85.0 | 3.6 | 2.0 | 21.2 | 11.7 | 2.4 | 1.3 |
| 1960–61 | 193.4 | 165.6 | 85.6 | 4.9 | 2.5 | 17.6 | 9.1 | 5.3 | 2.8 |
| 1961–62 | 218.4 | 187.9 | 86.0 | 4.3 | 2.0 | 21.0 | 9.6 | 5.2 | 2.4 |
| 1962–63 | 210.6 | 181.0 | 86.0 | 4.7 | 2.2 | 21.3 | 10.1 | 3.6 | 1.7 |
| 1963–64 | 268.5 | 223.7 | 83.3 | 4.2 | 1.6 | 36.2 | 13.5 | 4.4 | 1.6 |
| 1964–65 | 295.0 | 239.5 | 81.2 | 5.7 | 1.9 | 45.2 | 15.3 | 4.6 | 1.6 |
| 1965–66 | 345.8 | 267.1 | 77.2 | 7.3 | 2.1 | 64.8 | 18.7 | 6.6 | 2.0 |
| 1966–67 | 373.8 | 297.8 | 79.7 | 8.3 | 2.2 | 57.9 | 15.5 | 9.8 | 2.6 |
| 1967–68 | 471.7 | 359.3 | 76.2 | 8.6 | 1.8 | 82.5 | 17.5 | 21.3 | 4.5 |

SOURCE: DBS, No. 13-401.

**Table 2:4—Total National Research Council Expenditures on Scientific Activities, including Capital Expenditures, Scholarships and Medical Research, 1958-59 to 1967-68**

(millions of dollars)

| Year | Total | Intramural | | Universities | | Profit Organizations | | Others |
|---|---|---|---|---|---|---|---|---|
| | | | % | | % | | % | |
| 1958–59 | 27.8 | 21.7 | 78.0 | 6.1 | 22.0 | — | — | — |
| 1959–60 | 33.2 | 24.7 | 74.4 | 8.5 | 25.6 | — | — | — |
| 1960–61 | 37.6 | 28.1 | 74.7 | 9.5 | 25.3 | — | — | — |
| 1961–62 | 42.9 | 30.7 | 71.6 | 12.2 | 28.4 | — | — | — |
| 1962–63 | 45.1 | 29.6 | 65.6 | 15.0 | 33.3 | 0.5 | 1.1 | — |
| 1963–64 | 51.5 | 32.0 | 62.1 | 17.9 | 34.7 | 1.6 | 3.2 | — |
| 1964–65 | 61.2 | 34.7 | 56.7 | 24.3 | 39.7 | 2.2 | 3.6 | — |
| 1965–66 | 79.7 | 42.0 | 52.7 | 34.4 | 43.2 | 3.3 | 4.1 | — |
| 1966–67 | 101.8 | 50.6 | 49.7 | 47.0 | 46.2 | 4.2 | 4.1 | — |
| 1967–68 | 129.8 | 58.3 | 44.9 | 66.3 | 51.1 | 5.2 | 4.0 | — |

SOURCE: DBS, No. 13-401.

**Table 2:5—Federal Government Intramural Research and Development Expenditures, by Department or Agency and by Type, Fiscal Year 1967-68**
(Estimates; thousands of dollars)

| Department or Agency | Research Budget | | | Basic Research | | | Applied Research | | | Development | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Life Sc. | Phys. Sc. | Total | Life Sc. | Phys. Sc. | Total | Life Sc. | Phys. Sc. | Total | Life Sc. | Phys. Sc. | Total |
| Agriculture | 35,819 | — | 35,819 | 3,591 | — | 3,591 | 28,748 | — | 28,748 | 3,480 | — | 3,480 |
| Atomic Energy of Canada | 1,526 | 49,003 | 50,529 | 1,526 | 8,733 | 10,259 | — | 34,546 | 34,546 | — | 5,724 | 5,724 |
| Energy, Mines and Resources— | | | | | | | | | | | | |
| Observatories | — | 4,126 | 4,126 | — | 2,847 | 2,847 | — | 1,032 | 1,032 | — | 247 | 247 |
| Geography | — | 1,289 | 1,289 | — | 900 | 900 | — | 309 | 309 | — | 80 | 80 |
| Geological Survey | — | 5,561 | 5,561 | — | 1,947 | 1,947 | — | 3,559 | 3,559 | — | 55 | 55 |
| Marine Sciences | — | 4,783 | 4,783 | — | 3,668 | 3,668 | — | 655 | 655 | — | 460 | 460 |
| Mines | — | 6,711 | 6,711 | — | 1,383 | 1,383 | — | 2,780 | 2,780 | — | 2,548 | 2,548 |
| Polar Continental Shelf | — | 69 | 69 | — | 46 | 46 | — | 10 | 10 | — | 13 | 13 |
| Water Resources | — | 3,089 | 3,089 | — | — | — | — | 3,089 | 3,089 | — | — | — |
| Fisheries | 12,103 | 3,603 | 15,706 | — | — | — | 10,180[a] | 1,003[a] | 11,183 | 1,923[a] | 2,600[a] | 4,523 |
| Forestry | 10,943 | 1,930 | 12,873 | 1,288 | — | 1,288 | 9,655 | — | 9,655 | — | 1,930 | 1,930 |
| National Health and Welfare | 3,682 | — | 3,682 | — | — | — | 3,162 | — | 3,162 | 520 | — | 520 |
| National Research Council | 4,875 | 38,111 | 42,986 | 2,660[a] | 17,808[a] | 20,468 | 1,680[a] | 17,023[a] | 18,703[a] | 535[a] | 3,280[a] | 3,815 |
| Northern Affairs | 2,254 | — | 2,254 | 751 | — | 751 | 751 | — | 751 | 752 | — | 752 |
| Transport | — | 3,256 | 3,256 | — | 181 | 181 | — | 1,540 | 1,540 | — | 1,535 | 1,535 |
| Canadian Armed Forces | 1,500 | — | 1,500 | — | — | — | 375 | — | 375 | 1,125 | — | 1,125 |
| Defence Research Board | 3,003 | 39,902 | 42,905 | — | — | — | 3,003 | 39,902 | 42,905 | — | — | — |
| Others | 865 | 1,068 | 1,933 | 250[a] | 280[a] | 530 | 200[a] | 275[a] | 475 | 415[a] | 513[a] | 928 |
| **Totals** | **76,570** | **162,501** | **239,071** | **10,066** | **37,793** | **47,859** | **57,754** | **105,723** | **163,477** | **8,750** | **18,985** | **27,735** |

[a]Extrapolation.

SOURCE: DBS, No. 13-401, *Federal Government Expenditures on Scientific Activities, 1966-67*, Ottawa, 1969.

## Chapter 3

# RESEARCH IN CANADIAN UNIVERSITIES

### Research Income

Income in Canadian universities and colleges for sponsored, assisted and contracted research has increased rapidly in recent years. The total available to the universities from all sources in 1961-62 was $26,437,000; the amount rose to $80,729,000 by the academic year 1966-67. The amount in 1966-67 represented approximately 16 per cent of the total ordinary income of the universities ($498.9 million). The income from various sources is shown in Table 3:1. Each year the Federal Government has been the primary source of funds, accounting for approximately 60 per cent or more of the total. The amount provided by the Federal Government increased gradually but at an ever-increasing rate over these years, as shown graphically in Figure 3:1.

Provincial support did not grow as quickly. The sharp increase shown between 1963-64 and 1964-65 from $1.6 million to $6.1 million was due largely to a change in accounting procedures in Ontario involving the University of Guelph.[1] It does not represent a real increase in the amount provided for support of research. In 1966-67 the income of Canadian universities for sponsored, assisted and contracted research from the federal and provincial governments combined accounted for 80 per cent of the total received by the universities.

Foundations were the second most important source of funds until 1963-64 but by 1966-67 accounted for only about nine per cent of the total income (versus 15 per cent in 1961-62).

One of the striking observations in Table 3:1 is the negligible income universities have received from municipal governments for support of research. The amount in 1962 for the whole country was only $3,000, and in 1967 a mere $81,000. Although they may have engaged consultants from the universities, it is obvious that municipal governments have not been turning directly to universities as sources of expertise to help provide solutions to the pressing problems of urban and metropolitan communities.

Neither have alumni shown interest in the support of research in universities, perhaps because they believe the requirements are so great they can be met only by governments. At any rate, alumni provided only $55,000 in 1966-67 for the support of research, whereas the support of universities for

[1] In Ontario the figure for 1964 was $371,000 and for 1965, $4,806,000.

all other purposes by alumni amounted to $908,000 in 1966-67 and $2.3 million in the previous year. Business and industry on the other hand placed more than half of their small total operating support of universities into the research field. Business and industry provided $2.7 million for the support of research and $2.2 million for other purposes. Perhaps business and industry see prospects for return on their investment as being brighter in research than in some of other aspects of the universities' activities.

Table 3:2 shows the income of Canadian universities and colleges for sponsored, assisted and contracted research by regions for the years 1961-62 to 1966-67. The proportion of federal funds going to each region has remained approximately constant since 1961-62. Foundation support increased modestly in all regions except Quebec. Foundation support for the country as a whole increased 79 per cent between the years 1962 and 1967. No increase occurred in Quebec.

The amount of research support is related to size of institutions in Table 3:3, which discloses a number of facts of importance to an understanding of research activity in universities. For the year 1965-66, the 16 largest universities received $58.8 million out of a total of $60.7 million distributed to all universities by all sources. By contrast, the 16 smallest universities received a total of only $289,000. Five universities received over 50 per cent of the total funds and 10 universities received 82 per cent of the total funds. Thirty-three institutions received less than $1 million and 21 received less than $100,000. Thirteen recorded no research income from any source. Clearly, the differences in levels of research activity in universities and colleges, as reflected by levels of financial support, are very large. Many of the smaller institutions in Canada engaged in teaching only at the undergraduate level have negligible research income.

**Research Expenditures by Sector of Activity**

Data on distribution of research expenditures according to sector of research activity are incomplete. We present below information bearing on federal contributions. In addition, we have detailed information from a few universities which we believe to be representative.

Table 3:4 records for five years federal expenditures for university research as reported by DBS. Research in the sciences, engineering and medicine accounted for most of the total, averaging more than 90 per cent. Figures obtained for two years through our own enquiries are shown in Table 4:9. They show that currently the category of sciences and engineering (including medicine) receive about 90 per cent of the total federal support and the social sciences-humanities sector 10 per cent.

The low level of recorded federal support for research in the social sciences and humanities is misleading because it fails to take into account sums from federal departments and agencies and sums from Royal Commis-

sions that have found their way directly into the hands of academics without appearing in the records of the universities or the contractors as contributions to the support of research in the universities. This matter is dealt with in Chapter 4.

The allocation of research funds to various sectors within the universities is summarized in Tables 3:5 and 3:6. The data on allocations are subject to some arbitrary definitions and are incomplete. Table 3:5 summarizes our own allocations based on a detailed departmental breakdown of the assisted research funds of six universities whose accounting offices provided us with the data (for 1966-67). The data are incomplete in that they omit funds provided by the universities out of their own general revenue (Table 3:7) and also omit research grants not administered by the universities (for example, Canada Council grants in the social sciences and humanities, as discussed in Chapter 4). A more complete breakdown without these two omissions was provided for us by the University of British Columbia and is given in Table 3:6. The six-university aggregate of Table 3:5 represents about 35 per cent of the total university research expenditures—the accounting office figures are precisely those used to achieve the Canadian total of $80.7 million for 1966-67, as given in Table 3:1. A rough measure of the incompleteness of these data is indicated by the summary of Table 3:6 which compares the accounting office percentages for the University of British Columbia with the corresponding percentages based on all research funds as recorded by the University's office of research administration. Our task in describing university research allocations would have been much easier if data comparable to those from the University of British Columbia were generally available.

The sector allocations of Table 3:6 are, at best, rough. First of all, each of the figures represents research income—not research expenditure. In the University of British Columbia little difference was noted between figures and percentages based on research income and those based on research expenditure. Secondly, we have assigned various university departments to sectors in the somewhat arbitrary fashion shown in Table 3:7. Thus all the research funds for agriculture are included under natural science, all those for computing science under engineering, all those for psychology under social science. Despite such arbitrariness, the tables show the rough pattern of university research allocations in the various sectors.

It is eminently clear from all the foregoing that the amounts being directed to the support of research in the social sciences-humanities are small. We felt it would be of interest to determine how the universities themselves allocated from their general purpose revenues, funds earmarked for the direct support of research, against which faculty members could apply. To this end, we directed a brief enquiry to the universities and colleges. Fifty-eight institutions replied and of these 35 indicated that certain

sums were designated for the direct support of research. Some ambiguity was evident, as indicated in comments accompanying one of the replies to the questionnaire. The sums designated as direct support of research were not intended to include regularly budgeted items for continuing support of research projects. The questionnaire was intended to elicit responses covering only funds earmarked in a general way for "research" out of which grants-in-aid would be made to individual faculty members. The ambiguity may have introduced some error but we do not think that difficulties in interpretation were significant.

The results (Table 3:7) list 10 institutions (unidentified) which reported sums earmarked from general revenues of $100,000 or more. With four exceptions, these universities gave substantially more of their limited support to sciences-engineering than to social sciences-humanities. For all institutions, 56 per cent of the allocated total went to sciences-engineering, 19 per cent to social sciences, and 14 per cent to humanities. Nevertheless, the proportion assigned to the social sciences-humanities is higher than appears to be the case for support from outside sources. In one university, the humanities received two thirds of the sum available and the social sciences one third; sciences, engineering and health fields received none. Evidently the universities have attempted to recognize the needs of the social sciences-humanities; at the same time it seems likely that they have responded to requests for support in ways which have recognized the persuasiveness of the applications. One could hardly postulate a policy that has deliberately favoured the sciences and engineering.

**Provincial Contribution to Research**

The federal contributions to research in Canadian universities have been "grants-in-aid", with the universities or provinces covering the remainder of the costs. With the exception of the Canada Council's contributions to building costs related to research in the social sciences and humanities (now terminated) and contributions to research facilities through the Health Resources Fund, research buildings have not been provided by the Federal Government. The provinces and gifts have provided most of the capital funds for research buildings. It is not commonly recognized that the provinces and their universities also make very large contributions to the operating costs for university research and training for research. The contributions come in a variety of forms; those easily identified are listed in Table 3:8 along with estimates of the corresponding contributions. A description of the estimates and an assessment of the provincial position in research are given below. The total provincial contribution constitutes almost half of the ordinary operating expenditures of the universities and is three and a half times as large as the assisted research funds received from the Federal Government.

The provincial contribution to research is a part of the total ordinary expenditures of the universities given in Table 3:9. The various forms of the provincial contribution are obtained by suitably regrouping and reallocating the university expenditures listed in Table 3:9.

The assisted research expenditures of Table 3:9 are 16.5 per cent of the total ordinary expenditures of the universities. The sources of these research funds are given in Table 3:1 and include Federal Government funds and direct grants for research from the provincial governments, foundations, etc. The federal funds total $51.0 million or 10.6 per cent of the total ordinary expenditures. The assisted research funds from provincial governments total $11.8 million or 2.4 per cent of the total ordinary expenditures (item 1, Table 3:8). These assisted research funds from provincial sources are grants or contracts made by provincial agencies and should not be confused with research funds provided by the universities from their own general revenue.

The funds which the universities spend on research out of their general revenue are listed in Table 3:7. They total about $3 million, or less than one per cent of the total ordinary expenditures (item 2, Table 3:8). This figure is incomplete because it excludes specifically budgeted expenditures for research for which no figure is available.

The universities contribute to research by using part of their general revenue for library purchases which may be regarded as research material. We treat library acquisitions as a direct cost (item 3, Table 3:8) and the other library costs as indirect (item 6, Table 3:8, also discussed in Chapter 6). The total library acquisition costs (Table 3:9) are $14 million. There is no reliable estimate of the fraction of this item which might be regarded as research. One estimate obtained from the librarian of a large Canadian university suggested that 85 per cent of the acquisition costs might be regarded as research. The fraction is undoubtedly lower at smaller universities. We therefore adopt a rather arbitrary fraction of 70 per cent leading to the estimate of $10 million for item 3, Table 3:8. This estimate could be in error by one or two million dollars. Such an error does not have any great effect on our overall assessment of the provincial contribution to research.

The universities contributed about $3.7 million to the costs of maintaining computing centres at Canadian universities in 1966-67 (Table 6:3). About two thirds of this amount may be regarded as a contribution to research yielding the estimate for item 4, Table 3:8.

Among the various provincial contributions to research, the largest single item is that for the salaries of university staff. It is also the most difficult component to estimate. A university has many complex inter-related functions. In the various duties of individual staff members, how does one sort out the time to be allocated to undergraduate teaching, to training for

research at the graduate level, to research for its own sake or to the administration of the various programs? Any effort to analyze staff salaries is fraught with difficulties. In our view, the most complete attempt to carry out such an analysis is that of the 1966-67 cost studies now in progress at each Canadian university under the co-ordination of the Association of Universities and Colleges of Canada (AUCC). Although these studies are not complete we have obtained preliminary results from a number of universities, both large and small, which provide the rough allocation of faculty salaries shown in Table 3:10. There are a number of aspects of these results which could easily cause widespread misunderstanding about the position of research in Canadian universities. Therefore, before we use the AUCC Cost Studies data of Table 3:10 to estimate the fraction of staff salaries to be allocated to research, we describe how the results of Table 3:10 were found and what they mean.

The allocation of the staff salaries forms the starting point of the AUCC Cost Studies and was obtained from a detailed questionnaire sent to each faculty member. The response rate from individuals was high and the results vary considerably from one university to another. For example, the staff members of the larger universities ascribe a larger fraction of their time to graduate training and research than the staff members of the smaller universities.

University research is inextricably interwoven with the work of graduate students being supervised toward the completion of their masters or doctorate studies. In the allocation of staff salaries there is one item of the mixture that can clearly be separated—the item of graduate instruction which pertains to the formal university lecture courses given at the graduate level (identified in Table 3:10). However, the supervision of the research work of graduate students is, perhaps, a more important part of the whole graduate training program and it cannot be easily separated from research carried out by the staff members themselves (research for its own sake or research in support of other programs such as that of undergraduate instruction). The AUCC Cost Studies attempted such a separation but we have combined their data into one item called "Graduate Supervision and Research" in Table 3:10. In addition to treating the data in this way we would like to warn against any other use of the AUCC data. It may be tempting to try to identify the costs of graduate supervision in order to obtain unit costs for graduate training but how can one do so? The separation of the AUCC Cost Studies was accomplished only by adopting at the beginning an attitude which clearly and arbitrarily polarizes the results. The instructions to individual respondents included the following: "It is recognized that there may be difficulty at times in deciding whether the directing of a graduate student's research activity should be allocated to research or to the supervision of thesis work. When the research activity of the graduate student contributes to the research programme of the faculty member, the larger

proportion of the supervision may be allocated to the research programme." As a result of this instruction a separation is accomplished; most of the mixture of research and graduate supervision ends up under the label of research. But this kind of separation is unrealistic and potentially harmful. It could lead to gross underestimates of the true costs of graduate training.

In interpreting the salary allocations of Table 3:10 it is important to note that the graduate supervision and research programs do not necessarily interfere with the other teaching programs. First of all, research is part of a very large work load; an estimate made at the University of Toronto[2] finds the average annual work week of staff at that university to be 48 hours. Secondly, much of the research work greatly strengthens the normal teaching programs.

The AUCC staff salary allocations are based on the responses of individuals and bear the weakness that individuals may not always be realistic in assessing their efforts on fashionable items such as research. The breakdown of salaries by faculties in Table 3:10 shows that the allocation of salaries to research is much more uniform than the allocation of research funds (Table 3:6). In the faculties receiving very little in funds for research, a professor may regard his general reading as research. Undoubtedly a bias of this kind exists in the AUCC Cost Studies analysis. On the other hand, the few data available to us on the publications of staff members also suggest that the publication rate is much more uniform than the distribution of assisted research funds. Good work goes on with inadequate support. Therefore, although we recognize the possibility of biases in the data of Table 3:10 we believe these data to be the best available at this time.

Our assessment of the proportion of staff salaries to be assigned to research will include all of the costs of graduate supervision and research. The graduate instruction costs are treated separately below. The combination of research and graduate supervision is taken, from Table 3:10, to be 29 per cent of the total cost of staff salaries. The staff salaries and associated group benefits are roughly 75 per cent of the total academic expenses of the universities.[3] Therefore the contribution of the provinces to staff salaries for research is 29 per cent of 75 per cent of $270 million, which equals the $59 million shown in Table 3:8.

The indirect costs of research are described in detail in Chapter 6 and are found to be about 35 per cent of the direct costs. Of the expenditures listed in Table 3:9, the indirect costs arise from plant maintenance (item 6), administration (item 4), library operating expenditures (item 2b), equip-

[2] B. L. Hansen and S. Sandler, "Report on a Study of Faculty Activities at the University of Toronto", Report OIR-9, September, 1967.

[3] This estimate is based on a comparison of the Canadian Association of University Business Officers (CAUBO) data summarized in Table 3:9 with the AUCC Cost Studies data of several Canadian universities. The remaining 25 per cent includes supplies and expenses (10 per cent), expenses of the offices of faculty deans (five per cent), university sponsored research (two per cent), etc.

ment and supplies and expenses (part of item 1), the operating costs of deans' offices (part of item 1), etc. On the other hand, the direct costs of the university are the faculty salaries and assisted research funds described above. The indirect costs (see Chapter 6) are allocated to the various direct costs on a pro-rata basis—although such an allocation is very arbitrary. The indirect expenditures in support of assisted research (item 6a, Table 3:8) are 35 per cent of the total assisted research funds ($80 millions). Similarly, the indirect costs of items 2, 3, 4 and 5 are also 35 per cent as given by items 6b and 6c, Table 3:8. The indirect costs of graduate instruction are larger and they are estimated separately below.

The above computation of indirect costs for research yields a result substantially below the result of the AUCC Cost Studies, largely because our pro-rata estimate has ignored some of the components of the indirect costs that are less easily identified. We leave a detailed discussion of how indirect costs are estimated to Chapter 6, but seek here to identify in broad terms how the AUCC Cost Studies estimates differ from ours and how they affect the present estimate of the provincial contribution to research. Figure 6:1 (page 146) shows how the indirect costs are estimated in two steps. First of all, the various indirect costs (plant maintenance, library operation, general administration, etc.) are combined with the various direct expenditures (research grants, faculty salaries) by appropriate accounting procedures. This yields the direct and indirect costs for assisted research grants and for each of the separate programs (undergraduate instruction, graduate instruction, research, general reading and study, etc.—Table 3:10) into which staff salaries can be divided. In the second step it is recognized that the basic programs of a university are undergraduate instruction, graduate instruction and research: therefore the total costs of the five non-basic programs (general reading and study, administration, non-instruction student service, professional organizations and community service) are considered as indirect costs of the basic three and reallocated to them by appropriate accounting procedures.

Our pro-rata allocation of indirect costs is more arbitrary but simpler than the accounting procedures of the AUCC Cost Studies, but the differences are not important. Of greater importance, we have here entirely neglected the second step described above while the AUCC Cost Studies do not. That is, we have not attempted to assess what fraction of the total direct and indirect costs of the five non-basic faculty salary programs might reasonably be regarded as a contribution to research. Largely because of this difference in treatment, the AUCC Cost Studies obtain a value of 74 per cent for the indirect costs of research instead of our 35 per cent. If we had adopted this larger percentage in the estimates of Table 3:8, the indirect costs (item 6) would have been larger by $18 million; the total provincial contribution would then be $199 million instead of $181 million. The value of $18

million for this secondary contribution is, at best, very rough. The accounting procedures adopted by the AUCC Cost Studies in this matter involved numbers of students and also the direct costs (without assisted research funds included) and are therefore not as appropriate for the reallocation to research as for the reallocation to undergraduate or graduate teaching. We did not find any alternative reallocation scheme which was clearly better or which suggested that the rough value of $18 million was grossly inaccurate.

The estimates of the costs of graduate instruction given in Table 3:8 are taken from the AUCC Cost Studies and include both the direct and indirect costs. The direct costs are those for faculty salaries and total about $12 million (six per cent of 75 per cent of $270 million—see Table 3:10). Here the indirect costs are much larger than for research—about 180 per cent instead of 35 per cent—because of two factors. First of all, many of the AUCC accounting procedures for allocating indirect costs involve the number of students as well as the direct costs; secondly, the reallocations of the five non-basic programs is included in the estimates. The AUCC accounting procedures appear more appropriate here than they do for estimating the indirect costs of research. Therefore the value of $34 million for graduate instruction is considered to be a reasonable estimate.

The costs of graduate student aid are estimated from Chapter 10, (Table 10:8). The total of direct provincial expenditures plus university expenditures from general revenues was about $7 million in 1967-68; an estimate of $5 million for 1966-67 seems reasonable.

Combining all of the items of Table 3:8, we find that the total research costs of Canadian universities were $265 million in 1966-67, or 55 per cent of the total ordinary university expenditures. Of this total $84 million, or 17 per cent, was for non-provincial assisted research and $181 million, or 38 per cent, for provincial contributions.

The total research expenditures of Canadian universities as we have assessed them may appear to be surprisingly large. They cast some doubt on the traditional picture of the universities according to which the dominant programs are undergraduate education and the training of the professional schools. Perhaps our view here has been too sweeping. We have included under "research" the whole gamut of postgraduate activity—from aid to graduate students to the research-for-its-own-sake carried out by faculty members. Also we have ignored the considerable support which the research and graduate programs provide for undergraduate teaching. Some of the costs for research and graduate training might reasonably be reallocated to the undergraduate programs. On the other hand, there has undoubtedly been a recent major change in the picture. The assisted research funds have grown greatly in the past few years, teaching loads have gone down and Canadian universities have undertaken a major commitment to research.

Although the total "research" expenditures are large, there are some less easily identified items which have not been included. First of all, there is the reallocation of the non-basic faculty programs discussed above which might have added about $18 million to the bill. Secondly, we have ignored any costs of training for research in the undergraduate or professional schools of the universities. Of the total ordinary expenditures of the universities ($481 million) about half can be ascribed to the undergraduate and professional schools. It would be very difficult to assess what part of these costs might be regarded as training for research. Somewhat more than half of the graduate students in Canadian universities originate from Canadian universities.[4] Most of these receive several years of training in the honours programs or professional schools whose instruction costs are roughly equal to those of the graduate schools. Hence, it may not be unreasonable to assume that the costs of training for research below the graduate level are significant.

The provincial contributions to research and graduate training of Canadian universities are comparable in amount to the federal funds paid to the provinces on behalf of the universities under the current fiscal transfer arrangements. A detailed description of the fiscal transfer arrangements is given in Chapter 4. The arrangements did not apply in the year 1966-67, for which our estimates of the provincial contributions were made. We can extrapolate our estimate to the following year, 1967-68, augmenting our total provincial contribution of $181 million by 20 per cent to $217 million. In the same year the total amount received by the provinces through the fiscal transfer arrangements relative to costs of the universities was about $270 million (see Chapter 4). It is interesting that the federal payments to the universities and to the provinces attributable to expenditures in the universities approximated the operating costs associated with the universities' major commitment to research and graduate training.

**Research Administration**

The increase in research in Canadian universities has stimulated some thought and some action in respect to administrative responsibilities within the universities. Among the universities with substantial research funds for sponsored or contracted research, there is an awareness that research developments can shape the character of the institution. In addition, a number of financial responsibilities and other commitments, including legal ones, devolve on the university when it endorses applications for support of research.

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[4] The only reliable data here are those for the natural sciences and engineering. Here O. H. Levine has analyzed the doctorate enrolments in Canadian universities for 1967-68 (*Profiles and Characteristics of Graduate Students Enrolled for the Doctorate in Science and Engineering at Canadian Universities*, National Research Council, Ottawa, March, 1968) and finds that 50 per cent of the doctorate students are non-Canadian. For further discussion of this point see Chapter 10.

The larger universities in Canada have adopted, or have in various stages of development, arrangements for dealing with these matters. The administration of research has two distinct components: the first is the purely administrative machinery required to deal with review of applications in respect to institutional commitments for salaries, indirect costs, space, equipment, continuing support; the supervision of expenditures to ensure that they are consistent with the terms of the grant or contract and the policies of the institution; preparation of required interim and final financial reports; and a variety of comparable implicit and explicit institutional responsibilities. The second category of research administration is that which deals with academic policy, the impact of proposals on institutional growth and balance, policies in respect to internal review of proposals, consulting, contract arrangements, the development and evaluation of major proposals, the distribution of the institution's own research funds, etc.

In general, these two components are being handled in entirely different ways. The administrative machinery for dealing with applications, grants and contracts is generally placed in the hands of an individual; policy matters are generally placed in the hands of one or more academic committees. What follows is descriptive of the range of administrative practices engaged in by the universities. It should be emphasized that few universities approach a position where they deal effectively with all or most of the following matters. Many universities on the other hand pay negligible attention to research administration. In recording the following compilation of practices, we urge all universities to adopt procedures appropriate to the scope and complexity of their research activities.

The responsibility for administration of grants and contracts in some instances is assigned to a vice-president for research administration. In others, the individual in charge may be designated a "grants officer" or given a similar title; in either case the duties are similar. The officer is responsible for:

1. review of applications to ensure that they are consistent with the policies of both the agency and the university;
2. signing applications and contracts for the university or recommending such signature when Board approval is required;
3. ensuring that institutional commitments are reviewed and are acceptable;
4. ensuring that progress and financial reports as required by the agency are provided;
5. maintaining statistical summaries of funding, digests of research projects, and computerized data descriptive of research programs;
6. ensuring that policies in respect to overhead, patents, inventory control are followed;

7. serving as the university's liaison officer with agencies providing funds;
8. maintaining current information for faculty about sources of funds and policies of funding agencies; and
9. preparing forecasts of the university's research programs and funding requirements for the use of funding agencies.

The extent of these tasks varies with the extent of research activity in each university. Those with sums involving several millions have at least one or two persons serving on a full-time basis.

Questions of academic policy are handled by academic committees. The most important requirement is for institutional review of major proposals that can modify the character and balance of the university's programs. These reviews are undertaken by academic development committees, forward planning committees, president's committees, or research boards. In most instances recommendations from these committees are considered by senates or faculty councils. Sometimes two or more committees with interlocking responsibilities will consider major proposals from different points of view. In one case the president is briefed in detail about each proposal involving $100,000 or more.

These research policy committees have an added responsibility in some institutions of adjudicating faculty requests for support from the university's own revenues. In some instances they are responsible also for the development of policies on such matters as consulting privileges for faculty, summer stipends, patents and inventions, research involving human subjects, or animal care.

**Numbers of Faculty and Forecasts**

Presented below are data on numbers of faculty in Canadian universities together with forecasts to 1975-76. Such information is relative because it indicates the changing size of the manpower pool in universities from which requests for support of research will emanate. The larger the pool, the greater will be the demand for support. Obviously, however, the size of the pool is only one of a number of factors that will affect demand. Others include changing emphasis on research, changing research methodology and costs, and development of research activity in new fields.

Data in Tables 3:11 and 3:12 show that the number of full-time university teachers has been increasing steadily and rapidly and reached 16,529 by 1967.[5] In recent years the proportion of all full-time university teachers involved in natural sciences, including engineering and health sciences, has been approximately 50 per cent (Table 3:12). Enrolments,

[5] For 68 universities and colleges. A higher figure, not relevant to our purposes, of 20,700 full-time academic staff in 386 institutions is reported by DBS, No. 81-220. All institutions offering one year or more beyond high school are included in the latter figure.

however, have been weighted in favour of the remaining areas, particularly at the undergraduate level (Tables 3:18 and 3:21). For example, in the year 1963-64 undergraduate enrolment in the "sciences-engineering" sector was 55,100; undergraduate enrolment in the "social sciences-humanities"[6] was 104,600. The difference at the graduate level was small in 1963-64—6,100 in sciences-engineering fields and 6,600 in the social sciences-humanities. The projection for 1970-71 is for a graduate enrolment of 16,800 in the sciences-engineering sector, and 25,100 in the social sciences-humanities. It is obvious from these figures that the ratio of students per faculty member in social sciences-humanities tends to be greater than in the science-engineering areas of the university's activities. Data bearing on this point are presented in Table 3:13 from a study by the NRC Office of Economic Studies. In 1963-64 the ratio of undergraduate students to university teachers was 8.4 to 1 in the pure sciences, 12.8 to 1 in the social sciences, and 29.3 to 1 in the humanities. The data lack precision and should be interpreted cautiously because they are based on the faculty in which students were registered and do not reflect the degree to which students in one faculty take courses in another.

The ratio of full-time students to full-time faculty has changed gradually over several years and is now close to 16 to 1 (Table 3:14). Assuming it remains the same, the number of full-time faculty will rise to 33,750 by 1975-76. Can the required new faculty members be found? Faculty required on a full-time equivalent basis, as estimated by the Office of Economic Studies, National Research Council, is shown in Table 3:15 and totals 47,900 in 1975-76 (versus 20,400 in 1966-67). To attain this number a total of between 40,000 and 53,000 (full-time equivalent) new faculty members, will be required between 1967-68 and 1975-76 (Table 3:16). This estimate takes account of those required because of added enrolment and the replacements required to take account of death, retirement and transfer out of the Canadian academic pool. Estimated supply of new faculty is shown in Table 3:17. The table estimates Ph.D's to be awarded as five per cent of total graduate enrolment. For five years (1961 to 1965) 4.5 per cent of graduates enrolled received Ph.D's each year and 50 to 55 per cent of the new Ph.D's are expected to remain with the universities. Gains from other countries and other sources are estimated arbitrarily at 200 per year. Twenty-nine per cent of new faculty are expected to have doctorates, based on experience to date and "After Graduation Plans of 1965 Doctorates of Sciences and Engineering".[7] Thus the total new faculty (full-time equivalent) to the year 1975-76 is estimated at 43,855, or enough to offset the anticipated need.

This analysis considers only the provision for enrolment and the capacity of the system to respond in terms of providing the required faculty. A

[6] The term "social sciences-humanities" is intended to cover all disciplines other than natural sciences, engineering and health sciences. For convenience, these latter groups are designated as the "sciences-engineering" sector.

[7] A. D. Armstrong, National Research Council, Ottawa, November, 1965.

number of other factors bear heavily on these estimates—in particular, the adequacy of capital resources to accommodate the anticipated demand for enrolment, both undergraduate and graduate, and, at the graduate level, the adequacy of funding for research to support a much enlarged program.

The NRC Office of Economic Studies has carried its analysis further by examining the needs for faculty and anticipated supply for (a) the sciences-engineering sector and (b) the social sciences-humanities sector. The total full-time equivalent faculty required to meet anticipated enrolment in the sciences-engineering sector is 16,600 (Table 3:18). The new faculty (full-time equivalent) to meet the enrolment and to provide for turnover is estimated to lie between 13,000 and 18,000 to 1975-76 (Table 3:19); the expected supply of new faculty is 13,440 (Table 3:20). The latter figure assumes 60 per cent of new faculty will hold the doctorate, because this is the percentage of present faculty in sciences-engineering holding the degree.

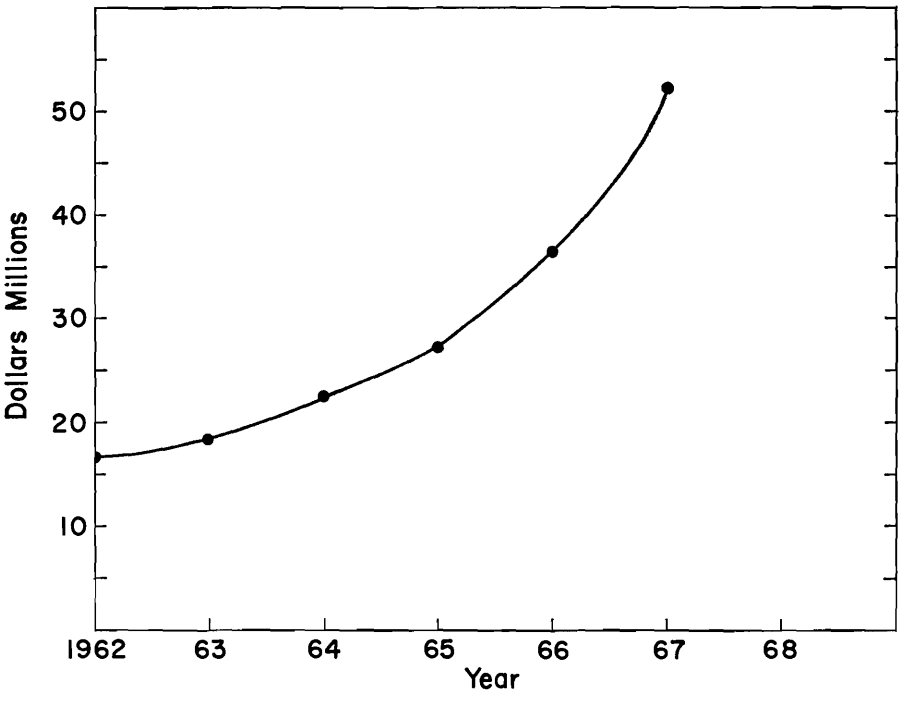
Requirements to meet enrolment growth to 1975-76 in the social sciences-humanities sector (382,000 full-time equivalent students) are 31,-300 faculty, on a full-time equivalent basis (Table 3:21). The new faculty required (maintaining the same student-faculty ratios as in the sciences-engineering sector) number between 27,000 and 35,000 (Table 3:22). It is estimated that the required number, 30,415, can be found (Table 3.23). However, the estimate assumes (a) a greater feedback of new doctorates into the universities than in the sciences-engineering sector, (b) smaller gains from other countries and sources outside the universities, and (c) a very much smaller percentage of new faculty holding the doctorate (15 per cent) than in the case of the sciences-engineering group (60 per cent).

The figure of only 15 per cent of new faculty in the social sciences-humanities sector holding doctorates is disturbing. In 1963-64, 60 per cent of sciences-engineering faculty and 33 per cent of social sciences-humanities faculty held doctorates; 44 per cent of all faculty held doctorates.[8] The outlook is for a decreased percentage of social sciences-humanities faculty holding the doctorate over the next several years. This porspect is attributable to the faster growth of enrolment in the social sciences-humanities sector creating larger demands for new faculty. The only ways in which this prospect can be nullified are by increasing the percentage of Ph.D's produced from the total graduate enrolment and by much larger gains of Ph.D's in the social sciences-humanities from other countries than has been anticipated. In this latter regard, we doubt the justification for estimating gains from other countries at a lower rate in the social sciences-humanities sector than in the sciences-engineering sector. However, assuming gains of even two or three times the number of Ph.D's in the social sciences-humanities category, beyond the figures shown in Table 3:23, significant shortages of Ph.D's in relation to anticipated enrolments will remain.

[8] A. D. Armstrong, *op. cit.*

Figure 3:1

INCREASE IN INCOME FROM FEDERAL SOURCES FOR SUPPORT OF RESEARCH IN UNIVERSITIES AND COLLEGES, 1962-67




SOURCE: DBS, No. 81-212.

**Table 3:1—Income of Canadian Universities and Colleges for Sponsored, Assisted and Contracted Research, 1961-62 to 1966-67**

| Source | 1961–62 | 1962–63 | 1963–64 | 1964–65 | 1965–66 | 1966–67 |
|---|---|---|---|---|---|---|
| | $'000 | $'000 | $'000 | $'000 | $'000 | $'000 |
| Federal Government | 16,737 | 18,640 | 22,714 | 27,277 | 36,630 | 52,120 |
| Provincial governments | 1,135 | 1,361 | 1,688 | 7,118 | 9,439 | 11,756 |
| Municipal governments | 3 | 4 | 19 | 44 | 25 | 81 |
| Alumni | 18 | 43 | 39 | 75 | 91 | 55 |
| Other gifts | 445 | 409 | 597 | 481 | 488 | 351 |
| Business and industry | 1,066 | 1,291 | 1,970 | 2,594 | 2,665 | 2,695 |
| Foundations, associations, etc | 3,976 | 4,639 | 4,889 | 4,759 | 5,693 | 7,021 |
| Religious organizations | — | — | 36 | — | 8 | — |
| Endowments | 414 | 439 | 495 | 667 | 756 | 788 |
| Other sources | 2,643 | 3,796 | 4,439 | 4,598 | 5,685 | 5,862 |
| **Totals** | **26,437** | **30,622** | **36,796** | **47,613** | **61,480** | **80,729** |

SOURCE: DBS, No. 81-212.

Table 3:2—Income of Canadian Universities and Colleges for Sponsored, Assisted and Contracted Research, by Region, 1961-62 to 1966-67

| Source and Region | 1961–62 | 1962–63 | 1963–64 | 1964–65 | 1965–66 | 1966–67 |
|---|---|---|---|---|---|---|
| | $'000 | $'000 | $'000 | $'000 | $'000 | $'000 |
| **Federal Government** | **16,737** | **18,640** | **22,598** | **27,277** | **36,630** | **52,120** |
| Western provinces | 4,867 | 5,618 | 7,168 | 8,176 | 10,681 | 15,295 |
| Ontario | 5,858 | 6,599 | 7,685 | 9,874 | 13,519 | 19,224 |
| Quebec | 5,119 | 5,273 | 6,296 | 7,483 | 10,267 | 14,304 |
| Atlantic provinces | 893 | 1,150 | 1,449 | 1,744 | 2,163 | 3,297 |
| **Provincial Governments** | **1,135** | **1,361** | **1,676** | **7,118** | **9,439** | **11,756** |
| Western provinces | 702 | 793 | 830 | 1,309 | 1,066 | 1,898 |
| Ontario | 292 | 313 | 371 | 4,806 | 7,081 | 8,537 |
| Quebec | 133 | 202 | 366 | 920 | 1,196 | 1,235 |
| Atlantic provinces | 8 | 53 | 109 | 83 | 96 | 86 |
| **Foundations** | **3,976** | **4,639** | **4,802** | **4,759** | **5,693** | **7,021** |
| Western provinces | 1,095 | 1,567 | 1,738 | 1,016 | 1,777 | 2,588 |
| Ontario | 1,753 | 1,764 | 1,988 | 2,368 | 2,820 | 3,294 |
| Quebec | 1,077 | 1,262 | 979 | 1,293 | 928 | 894 |
| Atlantic provinces | 51 | 46 | 97 | 82 | 168 | 254 |
| **All Sources** | **26,437** | **30,622** | **36,551** | **47,613** | **61,480** | **80,729** |
| Western provinces | 7,728 | 9,212 | 11,414 | 13,060 | 15,983 | 21,596 |
| Ontario | 9,309 | 10,830 | 12,616 | 19,634 | 26,174 | 34,246 |
| Quebec | 8,416 | 9,211 | 10,733 | 12,845 | 16,691 | 21,125 |
| Atlantic provinces | 984 | 1,369 | 1,788 | 2,074 | 2,632 | 3,762 |

SOURCE: DBS, No. 81-212.

**Table 3:3—Total Sponsored, Assisted and Contracted Research, by Size of Institution, for 47 Universities, 1965-66[a]**

NOTE: The figures in this table were collected by the Canadian Association of University Business Officers and have minor differences from those collected by DBS, shown in Tables 3:1 and 3:2.

| Item | | 16 with Total Income under $1,700,000 | 15 with Total Income $1,700,000 to $6,500,000 | 16 with Total Income over $6,500,000 |
|---|---|---|---|---|
| Total research income | $ | 289,000 | 1,964,000 | 58,808,000 |
| Largest research income | $ | 206,000 | 475,000 | 10,894,000 |
| Total of five largest research incomes | $ | — | — | 35,082,000 |
| Total of 10 largest research incomes | $ | — | — | 50,102,000 |
| Research incomes over $10,000,000 | No. | — | — | 1 |
| Research incomes over $5,000,000 | " | — | — | 5 |
| Research incomes over $1,000,000 | " | — | — | 14 |
| Research incomes less than $1,000,000 | " | 16 | 15 | 2 |
| Research incomes less than $100,000 | " | 15 | 6 | — |
| Research incomes zero | " | 12 | 3 | — |

[a]Total for all universities was $60,772,000. Five universities received over 50 per cent of total funds: 10 universities received 82 per cent of total funds; 33 universities received less than $1 million; 21 received less than $100,000; 15 (one third of all universities) received no research income.

**Table 3:4—Federal Expenditures for University Research in Science, Engineering and Medicine, 1961-62 to 1965-66**

| Year | Total 1 | Science-Engineering, Medicine 2 | Balance 3 |
|---|---|---|---|
| | $'000 | $'000 | $'000 |
| 1961–62 | 16,737 | 14,486 | 2,251 |
| 1962–63 | 18,640 | 16,866 | 1,774 |
| 1963–64 | 22,714 | 19,261 | 3,453 |
| 1964–65 | 27,277 | 25,783 | 1,494 |
| 1965–66 | 36,630 | 34,791 | 1,839 |

SOURCE: Col. 1, DBS; Col. 2, NRC Forecast, 1966, Append. E. Table 1; Col. 3 is Col. 1 less Col. 2.

**Table 3:5—Allocation of Assisted Research Funds, by Sector, for Six Universities, 1966-67**

NOTE: The allocations are based on data obtained by the Study Group from McGill University, University of British Columbia, University of Manitoba, University of Western Ontario, Lakehead University and Trent University. For purposes of the allocation, university departments are divided into sectors as in Table 3:6.

| Sector | Total Amount | Per Cent |
|---|---|---|
| | $'000 | |
| Natural sciences | 9,576 | 37.2 |
| Engineering | 2,909 | 11.3 |
| Health sciences | 11,304 | 44.0 |
| Social sciences | 1,666 | 6.5 |
| Humanities | 239 | 0.9 |
| Arts | 15 | 0.06 |
| **Totals** | **25,709**[a] | **100.0** |

[a]Does not include $3,103,000, which was difficult to allocate into sectors. This unallocated amount was made up of one big item (the McGill Space Sciences Center—the HARP Project—whose funds totalled $2,571,000 in 1966-67 and which might reasonably be attributed to engineering and the natural sciences) and several small miscellaneous items.

**Table 3:6—Allocation of Research Funds in the University of British Columbia, 1966-67 and 1967-68**

| Sector | 1966-67 | 1967-68 |
|---|---|---|
| | $'000 | $'000 |
| **Natural Sciences** | **3,032** | **3,932** |
| Chemistry | 764 | 840 |
| Physics | 667 | 827 |
| Zoology | 396 | 488 |
| Agriculture | 203 | 335 |
| Microbiology | 114 | 260 |
| Botany | 188 | 234 |
| Forestry | 128 | 195 |
| Geophysics | 141 | 151 |
| Mathematics | 83 | 141 |
| Geology | 55 | 139 |
| Miscellaneous | 293 | 322 |
| **Engineering** | **1,225** | **1,589** |
| Metallurgy | 470 | 619 |
| Electrical engineering | 291 | 305 |
| Computer sciences | 139 | 200 |
| Civil engineering | 73 | 155 |
| Mechanical engineering | 90 | 142 |
| Mineral engineering | 89 | 84 |
| Chemical engineering | 61 | 75 |
| Architecture | 15 | 5 |
| Miscellaneous | 2 | 4 |

**Table 3:6—Allocation of Research Funds in the University of British Columbia, 1966-67 and 1967-68 (continued)**

| Sector | 1966-67 | 1967-68 |
|---|---|---|
| | $'000 | $'000 |
| **Health** | **2,643** | **3,002** |
| Medicine | 438 | 395 |
| Biochemistry | 361 | 353 |
| Pediatrics | 230 | 340 |
| Pharmacology | 208 | 260 |
| Psychiatry | 333 | 246 |
| Pathology | 118 | 224 |
| Cancer research | 205 | 217 |
| Physiology | 131 | 164 |
| Surgery | 143 | 140 |
| Health care | 31 | 130 |
| Ophthalmology | 113 | 109 |
| Anatomy | 117 | 106 |
| Dentistry | 30 | 79 |
| Obstetrics | 46 | 78 |
| Pharmacy | 37 | 54 |
| Rehabilitative medicine | 25 | 24 |
| Medical education | 16 | 22 |
| Miscellaneous | 61 | 61 |
| **Social Sciences** | **359** | **434** |
| Psychology | 45 | 129 |
| Anthropology | 91 | 84 |
| Economics | 24 | 66 |
| Geography | 46 | 37 |
| Education | 39 | 33 |
| Home economics | — | 32 |
| Political science | 30 | 18 |
| Social work | — | 14 |
| Commerce | 12 | 13 |
| Librarianship | 10 | 3 |
| Law | 3 | 4 |
| Miscellaneous | 59 | 1 |
| **Humanities** | **95** | **110** |
| History | 18 | 29 |
| English | 25 | 27 |
| Slavonics | 2 | 13 |
| Hispanic, Italian | 2 | 12 |
| Philosophy | 3 | 9 |
| German | 1 | 5 |
| French | 14 | 3 |
| Classics | 15 | 2 |
| Religious studies | 6 | 1 |
| Asian studies | 9 | 9 |
| **Arts** | **12** | **11** |
| Music | 3 | 6 |
| Fine arts | 9 | 4 |
| Theatre | — | 1 |

**Table 3:6—Allocation of Research Funds in the University of British Columbia, 1966-67 and 1967-68 (concluded)**

SUMMARY

| Sector | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Total amount | Per Cent[a] | Total amount | Per Cent |
| | $'000 | | $'000 | |
| Natural Sciences | 3,032 | 41.1 (42.5) | 3,932 | 43.3 |
| Engineering | 1,225 | 16.6 (13.8) | 1,587 | 17.5 |
| Health | 2,653 | 36.0 (39.5) | 3,006 | 33.1 |
| Social Sciences | 359 | 4.9 (4.1) | 434 | 4.8 |
| Humanities | 95 | 1.3 (0.02) | 110 | 1.2 |
| Arts | 12 | 0.16 (0.0) | 11 | 0.12 |
| **Totals** | **7,376** | **100.0** | **9,082** | **100.0** |

[a]The percentages in brackets refer to the assisted research funds administered by the university—the same data for which the aggregates of six universities were given in Table 3:5. The difference between the bracketed and unbracketed percentages, therefore, gives an indication of the lack of completeness of the data of Table 3:5.

**Table 3:7—Allocations from General Purpose Revenues for Direct Support of Faculty Research in Canadian Universities and Colleges, 1966-67**

(58 institutions responding)

| Category | Science-Engineering | Health Sciences | Social Sciences | Humanities | Total |
|---|---|---|---|---|---|
| Unidentified Institutions—[a] | $'000 | $'000 | $'000 | $'000 | $'000 |
| A | 221.5 | 22.0 | 144.25 | 32.25 | 420 |
| B | 256 | 75 | 50 | 18 | 399 |
| C | 211.5 | 12.5 | 61 | 61 | 346 |
| D | 162.35 | 15 | 15.2 | 25 | 217.55 |
| E | 164.87 | 17 | — | 15 | 196.87 |
| F | 53.0 | 23.5 | 60.5 | 43 | 180 |
| G | — | — | 44.9 | 104.3 | 149.2 |
| H | 80 | — | 16 | 16 | 112 |
| I | 93.9 | — | 8.9 | — | 102.8 |
| J | 37.0 | 8 | 27.5 | 27.5 | 100 |
| Totals, 58 Universities | 1,579.13 | 173.00 | 650.98 | 520.30 | 3,045.74[b] |
| Per cent of Total Allocated | 54.0 | 5.9 | 22.3 | 17.8 | 100.0 |

[a]Institutions designated as A to J are those allocating $100,000 or more.

[b]Some universities gave total figures with no breakdown by sector. One large university (University of Montreal) was unable to provide data.

**Table 3:8—Approximate Provincial Contributions to Research in Canadian Universities for the Year 1966-67, compared to the Total Ordinary Expenditures and the Assisted Research Income of the Universities**

| Item | Amount |
|---|---|
| | $'000,000 |
| **Provincial Contributions to Research** | **181** |
| 1. Assisted research funds from provincial governments | 12 |
| 2. Direct research expenditures from the universities general revenue | 3 |
| 3. Research component of library acquisitions[a] | 10 |
| 4. Research component of computing centres | 2 |
| 5. Staff salaries allocated to research | 59 |
| 6. Indirect Costs of Research— | |
| In support of assisted research expenditures | 28 |
| In support of items 2, 3 and 4 | 6 |
| In support of staff salaries, item 5 | 21 |
| 7. Support of graduate instruction | 34 |
| 8. Graduate student aid | 5 |
| **Total Ordinary Expenditures (see Table 3:22)** | **481** |
| **Assisted Research Funds from Non-provincial Sources** | **84** |
| 1. From federal sources (including graduate student aid) | 67 |
| 2. From foundations, etc. | 17 |

[a]Library operating costs are treated as part of the indirect costs of item 6. See Chapter 6 for a detailed description of indirect costs.

**Table 3:9—Expenditures for 55 Canadian Universities and Colleges, Financial Years Ended in 1967**

| Item | Amount | Per Cent |
|---|---|---|
| | $'000 | |
| 1. Academic (except library) | 270,138 | 56.2 |
| 2. Library— | | |
| Books and periodicals | 14,000 | 2.9 |
| Other library expenditures | 20,571 | 4.3 |
| 3. Assisted research[a] | 79,622[b] | 16.5 |
| 4. Administration | 25,638 | 5.3 |
| 5. Alumni affairs, public relations, placement service, etc. | 5,760 | 1.2 |
| 6. Plant maintenance | 48,532 | 10.1 |
| 7. Scholarships, bursaries, prizes, etc. | 7,924 | 1.7 |
| 8. Miscellaneous | 5,762 | 1.2 |
| 9. Net deficit on ancillary enterprises | 2,882 | 0.6 |
| **Total Ordinary Expenditures** | **480,829** | **100.0** |

[a]An income item (Table 3:1) also treated as an expenditure; the university receives the assisted research funds and disburses them for the purposes intended by the grants.

[b]This figure recorded by CAUBO differs by $1.1 million from that recorded by DBS in Table 3:1.

SOURCE: The figures are taken from the reports of the Canadian Association of University Business Offices (CAUBO). The same data will also appear at a later date in DBS, No. 81-212.

**Table 3:10—Percentage Allocation of the Salaries of Staff of Canadian Universities to the Various Programs of the Universities**

| Faculty | Undergraduate Instruction | Research and Graduate Training | | General Reading and Study |
|---|---|---|---|---|
| | | Graduate Instruction | Graduate Supervision and Research | |
| | % | % | % | % |
| Arts | 47 | 6 | 24 | 6 |
| Science | 41 | 7 | 36 | 4 |
| Engineering | 40 | 9 | 28 | 4 |
| Agriculture | 41 | 3 | 37 | 3 |
| Education | 54 | 1 | 17 | 6 |
| Medicine | 24 | 4 | 42 | 4 |
| **Totals** | **42** | **6** | **29** | **5** |

| | Administration[a] | Non-instruction | Professional Organization | Community Service |
|---|---|---|---|---|
| | % | % | % | % |
| Arts | 13 | 1 | 2 | 1 |
| Science | 9 | 1 | 1 | 1 |
| Engineering | 15 | 1 | 1 | 2 |
| Agriculture | 10 | 1 | 2 | 3 |
| Education | 15 | 3 | 2 | 2 |
| Medicine | 19 | 1 | 3 | 3 |
| **Totals** | **13** | **1** | **2** | **2** |

[a]Includes departmental administration, faculty administration and general university administration.
SOURCE: Taken from preliminary results of the AUCC Cost Studies of a number of universities.

**Table 3:11—Number of Full-Time Faculty in 68 Canadian Universities and Colleges, by Province, 1965-66 and 1967-68**

| Province | 1965–66 | 1967–68 |
|---|---|---|
| | No. | No. |
| Newfoundland | 170 | 239 |
| Prince Edward Island | 33 | 98 |
| Nova Scotia | 583 | 805 |
| New Brunswick | 424 | 544 |
| Quebec | 2,982 | 3,496 |
| Ontario | 4,369 | 6,402 |
| Manitoba | 660 | 891 |
| Saskatchewan | 622 | 836 |
| Alberta | 760 | 1,374 |
| British Columbia | 1,482 | 1,844 |
| **Totals** | **12,085** | **16,529** |

SOURCE: DBS Special Survey, April, 1968.

**Table 3:12—Numbers of Full-Time University Faculty in Canadian Universities and Colleges, by Field, 1958-59 to 1967-68**

| Faculty | 1958–59 | 1960–61 | 1962–63 | 1963–64 | 1965–66 | 1967–68 |
|---|---|---|---|---|---|---|
| | No. | No. | No. | No. | No. | No. |
| Science-engineering | 2,166 | 2,578 | 3,081 | 3,454 | 4,304 | 5,393 |
| Health sciences | 474 | 572 | 683 | 752 | 972 | 1,619 |
| Humanities | 1,245 | 1,484 | 1,853 | 2,182 | 2,984 | 4,028 |
| Social sciences | 1,269 | 1,623 | 2,073 | 2,494 | 3,502 | 5,152 |
| Faculty administration | 171 | 194 | 201 | 242 | 323 | 336 |
| **Totals** | **5,325** | **6,451** | **7,891** | **9,124** | **12,085** | **16,529** |

SOURCES: 1958-59 to 1963-64—NRC Office of Economic Studies, Publication No. 9174, August, 1966; 1965-66 to 1967-68—DBS Special Survey, April, 1968.

**Table 3:13—Ratio of Undergraduate Students to Full-Time University Teachers in Canadian Universities and Colleges, 1958-59 and 1963-64**

| Field | Students | | Ratio of Students to Teachers | |
|---|---|---|---|---|
| | 1958–59 | 1963–64 | 1958–59 | 1963–64 |
| | No. | No. | No. | No. |
| Pure sciences | 7,521 | 18,668 | 5.6 | 8.4 |
| Applied biological sciences | 4,898 | 6,442 | 13.6 | 13.6 |
| Applied physical sciences | 15,450 | 15,616 | 26.5 | 16.7 |
| Humanities | 35,718 | 64,966 | 28.8 | 29.3 |
| Social sciences | 17,661 | 32,016 | 13.9 | 12.8 |
| Medicine | 4,370 | 4,443 | 17.1 | 11.3 |
| Health studies | 1,769 | 3,543 | 17.7 | 21.1 |
| **All Fields** | **87,387** | **145,694** | **16.9** | **16.4** |

SOURCE: NRC Office of Economic Studies, Publication No. 9174, 1966.

**Table 3:14—Ratio of Full-Time Enrolment to Full-Time Faculty in Canadian Universities and Colleges, Academic Years 1958-59 to 1975-76**

| Year | Enrolment | Faculty | Ratio |
|---|---|---|---|
| | Actuals[a] | | |
| 1958–59 | 95,000 | 5,325 | 18.0 |
| 1960–61 | 114,000 | 6,451 | 17.5 |
| 1961–62 | 141,000 | 7,891 | 17.8 |
| 1963–64 | 158,000 | 9,124 | 17.4 |
| 1965–66 | 206,000 | 12,085 | 17.1 |
| 1967–68 | 268,000 | 16,529 | 16.2 |
| | Projections[b] | | |
| 1968–69 | 305,000 | 19,062 | 16.0 |
| 1969–70 | 345,000 | 21,562 | 16.0 |
| 1970–71 | 383,000 | 23,937 | 16.0 |
| 1971–72 | 420.000 | 26,250 | 16.0 |
| 1972–73 | 455,000 | 28,437 | 16.0 |
| 1973–74 | 487,000 | 30,437 | 16.0 |
| 1974–75 | 517,000 | 32,312 | 16.0 |
| 1975–76 | 540,000 | 33,750 | 16.0 |

[a]Actual enrolments from DBS Education Division; for actual full-time faculty, see Tables 3:11 and 3:12.

[b]Projection of enrolment from Illing and Zsigmond, *Enrolment in Schools and Universities, 1951–52 to 1975–76* Economic Council of Canada, 1967; faculty projections are based on a constant student-faculty ratio of 16.0 to 1.0. Since the student and faculty figures are from different sources, the ratios may be overestimated absolutely, but they reflect a time series change.

**Table 3:15—Projections of Needed Faculty Staff in Canadian Universities and Colleges because of Enrolment Expansion to 1975-76**
(without turnover)

| Year | Enrolment (full-time equivalent basis) | | | Faculty (full-time equivalent basis) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Total | | Undergraduate | | Graduate[a] | |
| | Total | Under-graduate | Graduate | Number | Student/ Faculty Ratio | Number | Student/ Faculty Ratio | Number | Student/ Faculty Ratio |
| | '000 | '000 | '000 | '000 | | '000 | | '000 | |
| 1963–64 | 172.4 | 159.7 | 12.7 | 14.6 | 11.8/1 | 11.4 | 14.0/1 | 3.2 | 4.0/1 |
| 1964–65 | 194.2 | 178.6 | 15.6 | 15.6 | 12.4/1 | 11.7 | 15.3/1 | 3.9 | 4.0/1 |
| 1965–66 | 224.4 | 205.3 | 19.1 | 18.0 | 12.5/1 | 13.2 | 15.6/1 | 4.8 | 4.0/1 |
| 1966–67 | 255.0 | 231.9 | 23.1 | 20.4 | 12.5/1 | 14.8 | 15.7/1 | 5.6 | 4.0/1 |
| 1967–68 | 291.9 | 264.8 | 27.1 | 23.3 | 12.5/1 | 16.5 | 16.0/1 | 6.8 | 4.0/1 |
| 1968–69 | 332.3 | 300.6 | 31.7 | 26.0 | 12.7/1 | 18.0 | 16.7/1 | 8.0 | 4.0/1 |
| 1969–70 | 374.0 | 337.5 | 36.5 | 30.0 | 12.5/1 | 19.5 | 17.3/1 | 10.5 | 3.5/1 |
| 1970–71 | 417.5 | 375.6 | 41.9 | 33.4 | 12.5/1 | 21.4 | 17.6/1 | 12.0 | 3.5/1 |
| 1975–76 | 583.4 | 517.0 | 66.4 | 47.9 | 12.2/1 | 25.8 | 20.0/1 | 22.1 | 3.0/1 |

[a]Includes research activities.

SOURCE: NRC Office of Economic Studies, *Graduate Students and Faculty Resources at Canadian Universities and Colleges*, 1967.

**Table 3:16—Total New Academic Staff[a] Needed in Graduate and Undergraduate Education in Canadian Universities and Colleges to 1975-76**

NOTE: Needed new academic staff ranges from 40,000 to 53,000.

| Year | Added Enrolment | | | Turnover | | |
|---|---|---|---|---|---|---|
| | Total | Under-graduate | Graduate[b] | 4 Per Cent | 6 Per Cent | 8 Per Cent |
| | '000 | '000 | '000 | '000 | '000 | '000 |
| 1967-68 | 2.9 | 1.7 | 1.2 | 0.9 | 1.4 | 1.8 |
| 1968-69 | 2.7 | 1.5 | 1.2 | 1.0 | 1.6 | 2.0 |
| 1969-70 | 4.0 | 1.5 | 2.5 | 1.2 | 1.8 | 2.4 |
| 1970-71 | 3.4 | 1.9 | 1.5 | 1.3 | 2.0 | 2.6 |
| 1971-72 to 1975-76 | 14.5 | 4.4 | 10.1 | 8.6 | 12.7 | 17.2 |
| **Totals** | **27.5** | **11.0** | **16.5** | **13.0** | **19.5** | **26.0** |

[a]On a full-time equivalent basis.
[b]Includes research activities.

SOURCE: NRC Office of Economic Studies, *Graduate Students and Faculty Resources at Canadian Universities and Colleges*, 1967.

**Table 3:17—Estimated Supply of New Faculty in Canadian Universities and Colleges and Ph.D's Awarded by these Institutions, 1967–68 to 1975–76**

| Year | Ph.D's Awarded by Canadian Universities | Employed in Canadian Universities and Colleges as Faculty | | Ph.D's from Other Countries and Sources[a] Employed by Universities and Colleges | Total Ph.D's Employed 3 + 4 | Per Cent of New Faculty with Doctorate | Supply of New Faculty |
|---|---|---|---|---|---|---|---|
| | | Feedback Factor[b] | No. | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | No. | % | | No. | No. | | No. |
| 1967–68 | 1,245 | 50 | 623 | 175 | 798 | 25 | 3,192 |
| 1968–69 | 1.465 | 50 | 733 | 200 | 933 | 27 | 3,456 |
| 1969–70 | 1,695 | 52 | 881 | 200 | 1,001 | 27 | 4,004 |
| 1970–71 | 1,955 | 55 | 1,075 | 200 | 1,275 | 27 | 4,722 |
| 1971–72 | 2,280 | 55 | 1,254 | 200 | 1,454 | 30 | 4,847 |
| 1972–73 | 2,530 | 55 | 1,392 | 200 | 1,592 | 30 | 5,307 |
| 1973–74 | 2,780 | 55 | 1,529 | 200 | 1,729 | 30 | 5,763 |
| 1974–75 | 3,000 | 55 | 1,650 | 200 | 1,850 | 30 | 6,167 |
| 1975–76 | 3,125 | 55 | 1,719 | 200 | 1,919 | 30 | 6,397 |
| **Totals** | **20,075** | **54** | **10,857** | **1,775** | **12,631** | **29** | **43,855** |

[a]Other sources include Ph.D's from industry and government.
[b]The feedback may be overestimated because it does not take into account the substantial enrolment of foreign doctoral students.
SOURCE: NRC Office of Economic Studies, *Graduate Students and Faculty Resources at Canadian Universities and Colleges*, 1967.

**Table 3:18—Projections of Needed Science and Engineering Faculty Staff in Canadian Universities and Colleges because of Enrolment Expansion to 1975-76**
(without turnover)

| Year | Enrolment (full-time equivalent basis) | | | Faculty (full-time equivalent basis) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Total | | Undergraduate | | Graduate[a] | |
| | Total | Under-graduate | Graduate | Number | Student/ Faculty Ratio | Number | Student/ Faculty Ratio | Number | Student/ Faculty Ratio |
| | '000 | '000 | '000 | '000 | | '000 | | '000 | |
| 1963–64 | 61.2 | 55.1 | 6.1 | 5.4 | 11.3/1 | 3.9 | 14.0/1 | 1.5 | 4.0/1 |
| 1964–65 | 68.8 | 61.6 | 7.2 | 5.8 | 11.9/1 | 4.0 | 15.3/1 | 1.8 | 4.0/1 |
| 1965–66 | 79.5 | 70.8 | 8.7 | 6.7 | 11.9/1 | 4.5 | 15.6/1 | 2.2 | 4.0/1 |
| 1966–67 | 90.0 | 80.0 | 10.0 | 7.6 | 11.9/1 | 5.1 | 15.7/1 | 2.5 | 4.0/1 |
| 1967–68 | 102.9 | 91.4 | 11.5 | 8.6 | 12.0/1 | 5.7 | 16.0/1 | 2.9 | 4.0/1 |
| 1968–69 | 117.0 | 103.7 | 13.3 | 9.5 | 12.3/1 | 6.2 | 16.7/1 | 3.3 | 4.0/1 |
| 1969–70 | 131.5 | 116.4 | 15.1 | 11.0 | 11.9/1 | 6.7 | 17.3/1 | 4.3 | 3.5/1 |
| 1970–71 | 146.4 | 129.6 | 16.8 | 12.2 | 12.0/1 | 7.4 | 17.6/1 | 4.8 | 3.5/1 |
| 1975–76 | 201.4 | 178.4 | 23.0 | 16.6 | 12.1/1 | 8.9 | 20.0/1 | 7.7 | 3.0/1 |

[a]Includes research activities.

SOURCE: NRC Office of Economic Studies, *Graduate Students and Faculty Resources at Canadian Universities and Colleges*, 1967.

**Table 3:19—Total New Science and Engineering Academic Staff[a] Needed in Graduate and Undergraduate Education in Canadian Colleges and Universities to 1975-76**

NOTE: Needed new academic staff ranges from 13,000 to 18,000.

| Year | For Added Enrolment | | | For Turnover | | |
|---|---|---|---|---|---|---|
| | Total | Undergraduate | Graduate[b] | 4 Per Cent | 6 Per Cent | 8 Per Cent |
| | '000 | '000 | '000 | '000 | '000 | '000 |
| 1967-68 | 1.0 | 0.6 | 0.4 | 0.3 | 0.5 | 0.7 |
| 1968-69 | 0.9 | 0.5 | 0.4 | 0.4 | 0.6 | 0.8 |
| 1969-70 | 1.5 | 0.5 | 1.0 | 0.4 | 0.7 | 0.9 |
| 1970-71 | 1.2 | 0.7 | 0.5 | 0.5 | 0.7 | 0.9 |
| 1971-72 to 1975-76 | 4.4 | 1.5 | 2.9 | 3.0 | 4.5 | 6.0 |
| **Totals** | **9.0** | **3.8** | **5.2** | **4.6** | **7.0** | **9.3** |

[a]On a full-time equivalent basis.
[b]Includes research activities.

SOURCE: NRC Office of Economic Studies, *Graduate Students and Faculty Resources at Canadian Universities and Colleges*, 1967.

**Table 3:20—Estimated Supply of New Science and Engineering Faculties in Canadian Universities and Colleges and Ph.D's Awarded by these Institutions 1967–68 to 1975–76**

| Year | Ph.D's Awarded by Canadian Universities | Employed in Canadian Universities and Colleges as Faculty | | Ph.D's from Other Countries and Sources[a] Employed by Universities and Colleges | Total Ph.D's Employed 3 + 4 | Per Cent of New Faculty having a Ph.D | Supply of New Faculty |
|---|---|---|---|---|---|---|---|
| | | Feedback Factor | No. | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | No. | % | | No. | No. | | No. |
| 1967–68 | 872 | 48 | 419 | 131 | 550 | 60 | 917 |
| 1968–69 | 1,024 | 48 | 492 | 150 | 642 | 60 | 1,070 |
| 1969–70 | 1,187 | 50 | 594 | 150 | 744 | 60 | 1,240 |
| 1970–71 | 1,329 | 50 | 665 | 150 | 815 | 60 | 1,358 |
| 1971–72 | 1,550 | 50 | 775 | 150 | 925 | 60 | 1,542 |
| 1972–73 | 1,695 | 50 | 848 | 150 | 998 | 60 | 1,663 |
| 1973–74 | 1,835 | 50 | 918 | 150 | 1,068 | 60 | 1,780 |
| 1974–75 | 1,980 | 50 | 990 | 150 | 1,140 | 60 | 1,900 |
| 1975–76 | 2,063 | 50 | 1,032 | 150 | 1,182 | 60 | 1,970 |
| **Totals** | **13,535** | **50** | **6,733** | **1,181** | **8,064** | **60** | **13,440** |

[a]Other sources include Ph.D's from industry and government.

SOURCE: NRC Office of Economic Studies, *Graduate Students and Faculty Resources at Canadian Universities and Colleges*, 1967.

**Table 3:21—Projections of Needed "Social Sciences-Humanities" Faculty Staff[a] in Canadian Universities and Colleges because of Enrolment Expansion to 1975-76**
(without turnover)

NOTE: "Social Sciences-Humanities" covers all disciplines not included in sciences, engineering and health.

| Year | Enrolment (full-time equivalent basis) | | | Faculty (full-time equivalent basis) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Total | | Undergraduate | | Graduate[b] | |
| | Total | Under-graduate | Graduate | Number | Student/ Faculty Ratio | Number | Student/ Faculty Ratio | Number | Student/ Faculty Ratio |
| | '000 | '000 | '000 | '000 | | '000 | | '000 | |
| 1963–64 | 111.2 | 104.6 | 6.6 | 9.2 | 12.1/1 | 7.5 | 14.0/1 | 1.7 | 4.0/1 |
| 1964–65 | 125.4 | 117.0 | 8.4 | 9.8 | 12.8/1 | 7.7 | 15.3/1 | 2.1 | 4.0/1 |
| 1965–66 | 144.9 | 134.5 | 10.4 | 11.3 | 12.8/1 | 8.7 | 15.6/1 | 2.6 | 4.0/1 |
| 1966–67 | 165.0 | 151.9 | 13.1 | 12.8 | 12.8/1 | 9.7 | 15.7/1 | 3.1 | 4.0/1 |
| 1967–68 | 189.0 | 173.4 | 15.6 | 14.7 | 12.8/1 | 10.8 | 16.0/1 | 3.9 | 4.0/1 |
| 1968–69 | 215.3 | 196.9 | 18.4 | 16.5 | 13.0/1 | 11.8 | 16.7/1 | 4.7 | 4.0/1 |
| 1969–70 | 242.5 | 221.1 | 21.4 | 19.0 | 12.8/1 | 12.8 | 17.3/1 | 6.2 | 3.5/1 |
| 1970–71 | 271.1 | 246.0 | 25.1 | 21.2 | 12.8/1 | 14.0 | 17.6/1 | 7.2 | 3.5/1 |
| 1975–76 | 382.0 | 338.6 | 43.4 | 31.3 | 12.2/1 | 16.9 | 20.0/1 | 14.4 | 3.0/1 |

[a]Includes social sciences and the humanities.
[b]Includes research activities.

SOURCE: NRC Office of Economic Studies, *Graduate Students and Faculty Resources at Canadian Universities and Colleges*, 1967.

**Table 3:22—Total New "Social Sciences-Humanities" Academic Staff[a] Needed in Graduate and Undergraduate Education in Canadian Universities and Colleges to 1975-76**

NOTE: "Social Sciences-Humanities" covers all disciplines not included in sciences, engineering and health. Needed new academic staff ranges from 27,000 to 35,000.

| Year | For Added Enrolment | | | For Turnover | | |
|---|---|---|---|---|---|---|
| | Total | Under-graduate | Graduate[b] | 4 Per Cent | 6 Per Cent | 8 Per Cent |
| | '000 | '000 | '000 | '000 | '000 | '000 |
| 1967-68 | 1.9 | 1.1 | 0.8 | 0.6 | 0.9 | 1.1 |
| 1968-69 | 1.8 | 1.0 | 0.8 | 0.6 | 1.0 | 1.2 |
| 1969-70 | 2.5 | 1.0 | 1.5 | 0.8 | 1.1 | 1.5 |
| 1970-71 | 2.2 | 1.2 | 1.0 | 0.8 | 1.3 | 1.7 |
| 1971-72 to 1975-76 | 10.1 | 2.9 | 7.2 | 5.6 | 8.2 | 11.2 |
| **Totals** | **18.5** | **7.2** | **11.3** | **8.4** | **12.5** | **16.7** |

[a]On a full-time equivalent basis.
[b]Includes research activities.

SOURCE: NRC Office of Economic Studies, *Graduate Students and Faculty Resources at Canadian Universities and Colleges*, 1967.

**Table 3:23—Estimated Supply of New "Social Sciences-Humanities" Faculty[a] in Canadian Universities and Colleges and Ph.D's Awarded by these Institutions, 1967-68 to 1975-76**

NOTE: "Social Sciences-Humanities" covers all disciplines not included in sciences, engineering and health.

| Year | Ph.D's Awarded by Canadian Universities[b] | Employed in Canadian Universities and Colleges as Faculty | | Ph.D's from Other Countries and Sources[c] Employed by Universities and Colleges | Total Ph.D's Employed 3 + 4 | Per Cent of New Faculty having a Ph.D. | Supply of New Faculty |
|---|---|---|---|---|---|---|---|
| | | Feedback Factor | No. | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | No. | % | | No. | No. | | No. |
| 1967–68 | 373 | 55 | 204 | 44 | 248 | 11 | 2,275 |
| 1968–69 | 441 | 55 | 241 | 50 | 291 | 12 | 2,386 |
| 1969–70 | 508 | 56 | 287 | 50 | 337 | 12 | 2,764 |
| 1970–71 | 626 | 65 | 410 | 50 | 460 | 14 | 3,364 |
| 1971–72 | 730 | 65 | 479 | 50 | 529 | 16 | 3,305 |
| 1972–73 | 835 | 65 | 544 | 50 | 594 | 16 | 3,644 |
| 1973–74 | 945 | 65 | 611 | 50 | 661 | 17 | 3,983 |
| 1974–75 | 1,020 | 65 | 660 | 50 | 710 | 17 | 4,267 |
| 1975–76 | 1,062 | 65 | 687 | 50 | 737 | 17 | 4,427 |
| **Totals** | **6,540** | **63** | **4,123** | **444** | **4,567** | **15** | **30,415** |

[a]Includes social sciencse and humanities; excludes natural sciences and engineering.
[b]Ph.D's in the social sciences and humanities.
[c]Other sources include Ph.D's from industry and government.

SOURCE: NRC Office of Economic Studies, *Graduate Students and Faculty Resources at Canadian Universities and Colleges*, 1967.

## Chapter 4

# FEDERAL INVOLVEMENT IN UNIVERSITY RESEARCH

In this Chapter, attention is focused specifically upon the evolving role of the Federal Government in university research. This role has two facets, which are treated in turn. The first, already sketched in Chapters 2 and 3 and presently to be examined in more detail, is that of federal support to university research as such. The second, critical to an understanding of the university research environment, is that of general federal support for universities through fiscal arrangements with the provinces.

## UNIVERSITY RESEARCH SUPPORT

### Growth of Support: Sciences and Engineering

Federal support for university research in the natural sciences and engineering antecedes World War I. One estimate places the level of support in the triennium 1912-15 at an annual rate of $90,000, mostly in agriculture and mining.[1]

The watershed in the evolution of federal support for university research came with the creation of the National Research Council in 1916. Although NRC was conceived in wartime and its governing statute has always had more to say about research for industry and the exploitation of natural resources than about universities, the Council rapidly developed a university research support program. In 1917-18, the Council expended in universities a modest $13,000, which grew to $154,000 by 1927-28 and, despite the ravages of the Great Depression, reached $214,000 in 1937-38. Ten years later, after a notable record of scientific achievements in World War II, NRC not only expended $957,000 in universities, but had spun off two mission-oriented agencies, Atomic Energy of Canada Limited and the Defence Research Board, each of which assumed in turn an important role in university research support.

Table 4:1 summarizes the growth in federal contracts and grants for scientific research in Canadian educational institutions and non-profit organizations during the ten years from 1958-59 through 1967-68. If teaching hospitals are included with universities, virtually all of the dollar amounts shown in the table were expended in the latter institutions. The figures testify to a decade of remarkable, indeed explosive growth. At $71 million in

[1] Mel Thistle, *The Inner Ring* (Toronto: University of Toronto Press, 1966), p. 5.

1967-68, research support was almost seven times its 1958-59 level. Defence Research Board outlays rose from $1.4 million to $3.7 million, and those of the Atomic Energy Control Board from $400,000 to $2.5 million. The Department of National Health and Welfare expended $4.4 million, up from $2.3 million. Perhaps most remarkable was the growth in research support by "other" mission-oriented agencies of government. Here the very modest sum of $100,000 in 1958-59 multiplied to $3.9 million in 1967-68.

But above all, the story of university research support in the past decade is the story of the NRC and its "virtually autonomous" creature of the 1960s, the Medical Research Council. In 1958-59, NRC grants to universities for research in science and engineering, including the medical sciences, totalled $6.1 million. By 1967-68, NRC expenditures of $37.9 million, to which can be added the $18.5 million spent by MRC, revealed a quantum jump of almost ten. Council grants for research in the natural, physical and engineering sciences, which had accounted for 59 per cent of the total from all sources at the beginning of the decade, were 80 per cent of the total at its end. And as we shall have occasion to stress shortly, grants constitute only a portion of Council activity on behalf of university research support.

**Growth of Support: Social Sciences and Humanities**

Government support for university research in the social sciences, and particularly the humanities, was much later in developing. Where the social sciences are concerned, probably the first really visible program of government research was generated by the great Rowell-Sirois Commission on Dominion-Provincial Relations. During its existence in the years 1937-40, this body, the first of the modern research-oriented commissions, sponsored studies by historians, economists, political scientists and lawyers that remain landmarks in their disciplines.

Royal commissions and related bodies, such as task forces and "study groups", have been a most important source of government research support in the past decade. Among the best known have been the Gordon Commission on Canada's Economic Prospects, the Porter Commission on Banking and Finance, the Carter Commission on Taxation and the Dunton-Laurendeau Commission on Bilingualism and Biculturalism. In Table 4:2 are recorded the expenditures of selected non-judicial royal commissions and task forces over the three-year period 1965-68. The resulting total, which hovers around $3 million annually, by no means reflects support made available for social science research in universities. In our opinion, royal commissions can be most appropriately viewed as temporary intramural government "laboratories" for the social sciences. These laboratories directly employ large numbers of university personnel as commissioners, staff or consultants. To be sure, an indeterminate amount of support may be made available to finance research conducted on university premises. Thus, for example, Professor Albert Faucher estimated that of the 25-odd social

science research projects being conducted in 1965 at the universities of Laval and Montreal, eight to ten were supported by the Royal Commission on Bilingualism and Biculturalism.[2] But while royal commissions may indeed support research in universities, we nonetheless believe that our view of them as temporary intramural laboratories of government is the correct one.

The extensive use of royal commissions by government has recently come under questioning in both official and academic circles. In the fall of 1968, the Throne Speech made mention of a possible research institute which would in effect constitute a permanent intramural laboratory for social science research. Later in this report, we press the need for a comprehensive study of all government intramural laboratories. For the essentially descriptive purposes of this Chapter, it is sufficient to assert that royal commissions have a major role in the history of social science research in Canada, whether in government or in universities.

Not least because royal commissions do not figure in it, the history of government support for the humanities virtually dates from the creation of the Canada Council in 1957. Brought into being six years after its creation had been recommended by the Massey Commission on National Development in the Arts, Letters and Sciences, the mandate of the Canada Council spans the humanities, the social sciences and the performing arts. The Council was given an endowment of $50 million from which to extend support to the arts and provide research grants and scholarships in the humanities and social sciences.[3] Over the first decade of the Council's existence, this fund yielded an annual income that gradually rose from $2.4 million in 1957-58 to $3.4 million in 1966-67. On the eve of 1965, when the endowment income was supplemented for the first time by a parliamentary appropriation, the Council spent $1.3 million on research support in the humanities and social sciences. Thereafter, through annual doubling and redoubling in the appropriation, Council support for these disciplines reached almost $12 million in 1967-68.

The apportionment of Council support between the humanities and social sciences is of interest, and is outlined in Table 4:3 for the recent years of most rapid growth, 1965-68. This table is restricted to research grants only; it excludes library grants, sabbatical and predoctoral fellowships, and all other forms of support. As between the humanities and the social sciences, what little variation appears in proportional rates of increased support favours the humanities. Thus in 1966-67, the dollar value of grants awarded for humanities research was 294 per cent of the 1965-66 level, and in 1967-68, 248 per cent of the 1966-67 level. For the social sciences, the

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[2] Timlin and Faucher, *op. cit.*, p. 13.

[3] The Council was given a second endowment fund of $50 million to support capital projects in universities.

comparable figures are 238 per cent for 1966-67 and 214 per cent for 1967-68.

Although support for the humanities is growing at a slightly faster rate than that for the social sciences, the fact remains that the dollar value of research grants to the latter disciplines greatly exceeds that to the former. In 1967-68 the ratio of social science to humanities awards was almost exactly three to one. The reasons for this phenomenon appear to be the following. First, part of the discrepancy can be explained simply by the fact that Canada Council counts history as a social science. Were history, which received almost $250,000 in research grants during 1967-68 included with humanities, the ratio of social science to humanities support for that year would have dropped to slightly less than two to one. Secondly, noting that awards as a percentage of grant requests are virtually the same in the two sets of disciplines, it is abundantly apparent that the favourable awards ratio enjoyed by the social sciences is matched almost exactly by the larger aggregate dollar value of the requests generated in this field. Thirdly, the dollar value of both the *average* request and the *average* award is greater in the social sciences than in the humanities. For 1967-68, the average grant awarded in the social sciences was $3,381 and in the humanities $2,161. Finally, bearing in mind the rather similar number of Canadian university staff in the humanities and the social sciences (see Chapter 3, Table 3:9), the fact is that scholars in the humanities are generating fewer requests than their social science counterparts.

This leads us to speculate on the extent to which the long starvation of the humanities in Canada inhibits demand for research funds. Various impressions accumulated by us in the course of our hearings strongly support this possibility. With even less of a tradition of government support than obtains in the social sciences, humanists are lagging in the articulation of their needs. Like all lags, however, this is a temporary phenomenon whose gradual demise is to be expected in relatively short order, with corresponding pressure for additional funds.

To round out this sketch of the evolution of government support for humanities and social sciences, it is necessary to refer to the role of mission-oriented agencies other than royal commissions. Among the first of the established operating agencies to fund research in the social sciences was the Department of Labour, which launched a university research program in labour economics and labour relations in 1951. Then, using authority contained in the National Housing Act of 1954, the Central Mortgage and Housing Corporation initiated a university program of its own. For the remainder, however, mission-oriented outlays for university research are a product of the mid-1960s. The present extent of these expenditures will be dealt with below. Although they are significant, the fact is that present government support for research in the humanities and social sciences, as in the natural sciences and engineering, is council-dominated.

**Existing Support Programs: The Councils**

Table 4:4 outlines the dollar magnitude of the research support programs of all three councils in 1966-67 and 1967-68. Although the amounts shown are not expended entirely in Canadian universities—fellowships, for example, may be held abroad—they indicate accurately the sum-total of council programs that can be said to affect university research.

Beginning at the top of the table, research grants to university staff represent the amounts expended by each council for research conducted on university premises by investigators holding staff appointments. The research grant programs of all three councils are broadly similar in the sense that they are designed to finance researchers on the basis of the combined merits of the qualifications of the individual and the content of the project. As to the key differences among the programs of the three councils, it would be fair to say by way of generalization that the National Research Council places the greatest emphasis on the merits of the individual, the Canada Council on the excellence of the project and the Medical Research Council on the support of larger projects and team research. The councils differ in their grant selection procedures. The Canada Council is advised by a single academic panel which judges the merit of projects after these have been submitted to two or more outside referees. The Medical Research Council, for its part, also uses outside referees but is advised by a number of grant committees (15 in 1967-68) organized by discipline. The National Research Council relies almost entirely on 16 grant selection committees, again organized by discipline. As a final point of difference, it will be noted from the table that, whereas the research grants of the Medical Research Council were 75 per cent of its total university support in 1967-68 and those of the National Research Council 66 per cent, the Canada Council percentage was under 20. This reflects the relative recency of the Canada Council program, which effectively dates from 1965, the first year in which this Council became the subject of a parliamentary appropriation.

Of the three research councils, the Canada Council and the National Research Council encompass the greatest number of academic disciplines. Accordingly, we present in Table 4:5 a breakdown for 1967-68 of Canada Council grants by discipline, and in Table 4:6 a similar breakdown of NRC grants. Following NRC procedure, Table 4:6 distinguishes between grants for operating costs and grants for "major" equipment, i.e., equipment costing between $5,000 and $150,000.

Returning to Table 4:4, the second major item, "Other Research Grants", covers a variety of programs. Under the heading "general" grants, the Medical Research Council pays to the dean of each Canadian medical school a lump-sum subsidy of $24,000. NRC, for its part, makes to each Canadian university president a grant equal to 7½ per cent of the value of the operating grants held in the university. The next heading, "Grants for major installations, institutes and development", is dominated by NRC. This Coun-

cil finances such major university installations as a nuclear accelerator and five research institutes, four of which are university affiliated.[4] NRC also makes negotiated development grants, designed to help universities build on the strength they already possess in designated disciplines. The Medical Research Council, meantime, introduced negotiated development grants in 1967-68, which are intended to assist universities to develop their academic capacity in new fields of endeavour. Finally, grants for computer facilities and for library collections are the exclusive province of NRC and the Canada Council, respectively.

The third major item in Table 4:4, "Staff awards", covers programs whose emphasis varies from council to council. Canada Council expenditures are for leave fellowships, while those of the Medical Research Council are largely for the salaries of resident research staff (associates and scholars) in Canadian medical schools. NRC, whose staff awards program is the smallest of the three councils, subsidizes research leaves for staff either on their own campus or elsewhere.

The fourth item in Table 4:4, "Fellowships", distinguishes between postdoctoral and doctoral awards. The former, a traditional form of award in the natural sciences, is dominated by NRC, but it is to be noted that the Canada Council initiated a postdoctoral program in 1967-68. All three councils spend appreciable funds for doctoral fellowships but the Canada Council clearly stands out. The $6.5 million expended by this Council in 1967-68 not only leads all councils but accounts for approximately three fifths of total Canada Council outlays. However, the Canada Council lead in doctoral fellowships is not exclusively attributable to a present emphasis, in the humanities and social sciences, on scholars in training. The fact is that NRC and the Medical Research Council support numerous doctoral candidates through means other than fellowships, mainly as support staff on projects funded by research grants. The use of students as support staff is much less common in the humanities and social sciences.

The final heading in Table 4:4 ,"Supporting activities", covers council expenditure on items that constitute an indispensable adjunct to science and scholarship in Canada. In particular, all three councils fund to varying degrees the publication of journals and monographs, the expenses of learned societies, affiliations with international bodies, and travel to scholarly meetings at home and abroad. Nor can the supporting activities of the councils be measured simply in dollar terms. The assistance they render in kind ranges from advice on the design of research projects to patent services. With respect to the latter, NRC has agreements with a number of universities whereby they receive the services of NRC's subsidiary, Canadian Patent and Development, Ltd. Through this body, NRC has not only provided patent

[4] The five research institutes (with their university affiliation in parentheses) are: The Institute of Oceanography (Dalhousie), the Institute of Parasitology (McGill), the Great Lakes Institute (Toronto), the Institute of Oceanography (British Columbia), and the Arctic Institute of North America.

services to universities but has been able to assist in the formulation of university patent policies. Because these policies are at present of interest to a number of universities, we reproduce in Appendix 3 the McGill statement of patent policy.

**Existing Support Programs: Mission-Oriented Agencies**

In Table 4:7, the scene shifts from the support programs of councils to those of mission-oriented agencies. As the table indicates, we have been able to trace no fewer than 41 operating agencies that support university research in one form or another. Of these, 12 support research only in the social sciences-humanities sector, and seven are restricted to the sciences-engineering sector. The remaining 22 fund work in both. In 1967-68, total mission-oriented expenditures in the sciences-engineering sector were $15.6 million for research grants, contracts and related forms of support, and $828,000 for scholarships. The comparable figures in the social sciences-humanities sector were $3.1 million and $1.0 million, respectively. These aggregates mask a wide variety of support programs, ranging from straight-forward research contracts to sustaining grants for research institutes. We shall have occasion to refer to a number of these programs in subsequent sections of this report. Rather than describe them in full in any given part of the text, we have provided in Appendix 1 a detailed account of the support extended by each mission-oriented agency of government.

The variety of forms under which mission-oriented agencies extend financial support to university research is matched by the variety of activities through which these agencies indirectly contribute to the university environment. Table 4:8 offers a detailed tabulation of these activities, which include government intramural laboratories sited on university campuses, the accommodation in intramural laboratories of postdoctoral fellows, the direct employment of university staff and students, teaching by government employees, and agency advisory committees made up in whole or in part of university personnel. Not indicated in the table but of immense practical importance is research support in kind, which ranges from library and archive services for humanists to ship-time for oceanographers. Although the dollar support extended to university research by mission-oriented agencies is only a fraction of that supplied by the Councils, the role of these agencies is of major consequence.

**Federal Contribution to University Research**

To round out our description of federal support programs for university research, we summarize in Table 4:9 the total assistance made available in dollar terms. As the table clearly indicates, both the councils and mission-oriented agencies have contributed to the contemporary setting of rapidly expanding research outlays. By 1967-68, federal expenditure on university research support had approached $100 million, with $82.4 million devoted to the sciences and engineering and $15.3 million to the humanities and social sciences.

## GENERAL UNIVERSITY SUPPORT

Through the support programs just described, the Federal Government has had a direct and major impact on university research. Since the early 1950s, the Federal Government has also played an indirect role in the development of university research by providing, either through grants or fiscal transfers, across-the-board support for Canadian universities. This general support has enhanced the capacity of universities to discharge all their functions, including research, and, as such, forms an essential part of the picture of federal involvement which we attempt to sketch in this Chapter.

### Per Capita Grants: 1951-67

While federal grants to universities are normally traced to a recommendation made in 1951 by the Massey Commission, they had been discussed, and cautiously endorsed, by the Rowell-Sirois Commission in 1940. In its Report, the latter stated:

> It is conceivable that even the provinces might welcome a small Dominion grant to their universities made contingent on the maintenance over a period of some years of the provincial grants to the same institutions and on the preservation of high academic standards. If this is the case, a relatively small Dominion annual grant divided among the provinces in rough proportion to their population for the benefit of institutions which receive help from the state might play a peculiarly useful part in our national life.[5]

However, the Rowell-Sirois Commission refrained from making a formal recommendation on this subject.

By 1951, when the Massey Report was published, any inhibitions with respect to federal university grants had been dispelled by what this Commission deemed "a financial crisis so grave" as to threaten the "future usefulness" of Canadian universities.[6] The Massey Commission accordingly recommended that the Federal Government make annual contributions to support the work of the universities on the basis of the population of each of the provinces of Canada; that these contributions be distributed to each university proportionately to the student enrolment; and that all members of the National Conference of Canadian Universities[7] be eligible for the grants. The Commission's formal recommendation refrained from stipulating the level of the federal grant, but a hypothetical example contained in its Report posited an amount of 50 cents per head of population.[8]

The Federal Government promptly accepted the grant recommendation, and also the level of aid envisaged in the Massey Report's example. From

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[5] Royal Commission on Dominion-Provincial Relations, *Report* (Ottawa: King's Printer, 1940), Book II, p. 52.

[6] Royal Commission on National Development in the Arts, Letters and Sciences, *Report* (Ottawa: King's Printer, 1951), p. 141.

[7] The National Conference of Canadian Universities was renamed the Association of Universities and Colleges of Canada in 1965.

[8] *Ibid.*, p. 355.

1951-52, Canadian universities became eligible for annual grants based on 50 cents per capita of the population of each province, and allocated among the universities within a given province in accordance with student enrolment. Federal expenditure for these grants, made through the year 1966-67, is shown in Table 4:10.

During the years over which its per capita grants were in effect, the Federal Government proved sensitive to growing university needs. The per capita amount of the grants was boosted to $1.00 in 1956-57, to $1.50 in 1958-59, again to $2.00 in 1962-63 and finally, in the wake of the Bladen Report on financing higher education, to $5.00 in 1966-67. The effect of each successive raise is readily apparent from the data shown in Table 4:10.

For the purposes of this study, it is not necessary to discuss the adequacy, allocation or equity of the federal per capita grants. But no factual account of the grants is complete without reference to the constitutional and fiscal controversy they provoked between the Federal Government and the government of the Province of Quebec. In the first year of the program, the then Premier of Quebec, the Hon. Maurice Duplessis, acceded to the grants provided that they be paid to the universities of his province after consultation with the provincial treasurer. Then when the Federal Government proceeded to make its second annual payment to the universities, that for 1952-53, Mr. Duplessis in effect ordered the Quebec universities to refuse the money. One by-product of the imbroglio that ensued was the return in 1954 of the Province of Quebec to the field of personal income taxation, a move partially accommodated by an extension of the federal tax credit available to residents of the province. Again, in 1956, the Federal Government attempted to resolve the situation by ceasing to pay the grants directly to universities, transmitting them instead to the National Conference of Canadian Universities for distribution. But the Quebec provincial government remained adamant. So as to prevent further financial losses to Quebec universities from accumulating in wait of an eventual solution, the Federal Government from 1956-57 paid to the National Conference of Canadian Universities the grants that would otherwise have accrued to these institutions, to be held in trust until claimed.

Presently, dire fiscal necessity broke the federal-provincial impasse. In 1957-58, one and, in 1958-59, two Quebec universities disregarded provincial directives and accepted the federal grants. The advent of a new Premier of Quebec, the Hon. Paul Sauvé, made possible new federal-provincial attempts to resolve the situation and, pending the outcome of negotiations, all Quebec universities accepted the per capita grants in 1959-60.

The final *dénouement* was as follows. Beginning in 1960-61, the Federal Government terminated per capita grants on behalf of Quebec universities. In lieu thereof, the Government increased its corporation income tax abatement

for Quebec under the existing Tax-Sharing Arrangements (and subsequently under the Fiscal Arrangements of 1962-67) from nine per cent to 10 per cent. Should the cost in any given year of the university grants which the Federal Government would otherwise have made exceed or fall short of the value of the tax abatement, a corresponding adjustment would be made in the general grants accruing to Quebec. Thus the question of federal university financing in Quebec was resolved through the mechanism of the federal-provincial tax-sharing arrangements with appropriate adjustments. And henceforth, the Province of Quebec would assume the entire burden of general university finance.

The data presented in Table 4:10 record the net value of the additional corporation income tax abatement made available to Quebec. The gross value of the abatement and the requisite adjustments are shown in Table 4:11.

**Fiscal Arrangements: 1967 to the Present**

Neither the per capita grants recommended by the Massey Commission nor the subsequent increases made by the Federal Government proved a match for the remarkable growth in university needs occasioned by the undergraduate and graduate enrolment of the postwar baby boom. In 1965, the report of a commission appointed by the Association of Universities and Colleges of Canada (Bladen Report) made a number of recommendations to the Federal Government. In addition to enhanced federal contributions for research and for training in the health professions, the Bladen Commission called for two major changes affecting federal participation in general university financing. First, the federal per capita grants should be raised to $5 immediately, and increased by $1 a year thereafter until such time as federal-provincial meetings might indicate a different scale of financing. Secondly, in response to the pressing need for capital facilities, the Federal Government should establish a Capital Grants Fund into which would be paid each year $5 per head of the Canadian population.[9]

The Federal Government implemented the first recommendation in 1966-67 through the $5 per capita grant discussed earlier. For that year only, the Province of Quebec agreed to accept a per capita grant of $3, recovering the remaining $2 through the established fiscal adjustment. Further developments awaited the outcome of federal-provincial conferences held in September and October 1966. The main purpose of these conferences was to discuss a new quinquennial fiscal arrangement between the Federal Government and the provinces to replace the old one in effect since 1962.

As it affected universities, the main result of the federal-provincial negotiations was the termination of federal per capita grants. No longer would the Federal Government involve itself directly in general university

[9] *Financing Higher Education in Canada,* Association of Universities and Colleges of Canada, 1965, p. 68.

finance. Federal recognition of university needs would henceforth take place as an integral part of the fiscal arrangements with the provinces. The provisions relating to these needs were accordingly written into the Federal-Provincial Fiscal Arrangements Act, 1967, along with those covering general equalization, stabilization, succession duties and other matters. Furthermore, inasmuch as the fiscal arrangements took cognizance of university needs, they did so in the context of overall post-secondary education.[10]

In their treatment of post-secondary education, the new arrangements borrow an important operating principle from the special agreement on per capita grants in effect with Quebec between 1960 and 1967. The basic starting point is a tax abatement—four points on the personal income tax and one point of corporation income tax—extended to all provinces.[11] The yield from these points, after being equalized in accordance with the general equalization formula provided by the fiscal arrangements, is then adjusted to yield to each province the greater of (1) $15 per capita on the provincial population, or (2) 50 per cent of the recognized operating costs of post-secondary education within the province. As part and parcel of the fiscal arrangements, the above adjustment makes it possible for the Federal Government to recognize the need of the provinces with high post-secondary operating expenditures, while providing a floor ($15 per capita) for those whose post-secondary outlays have been lower.

From a provincial viewpoint, a particularly attractive feature of the adjustment is that it entails federal partnership (50 per cent) in grappling with the annually rising costs of post-secondary education, costs whose growth elasticity has proven to be even greater than that of the yield in the personal income tax. That the Federal Government wishes to take full account of this growth is further confirmed by the fact that the $15 per capita floor provision is to be increased annually in proportion to the rate at which national post-secondary operating expenditures have grown over the preceding year. Also, the Federal Government attempts to encourage provincial spending on post-secondary education by stipulating that, once the 50 per cent option proves to be the more attractive, a province cannot revert to the per capita option.

From the beginning, the Federal Government has made it plain that, while the portion of the fiscal arrangements recognizing post-secondary education uses operating costs as a base of calculation, it is meant to accommodate both current and capital needs. In proposing the arrangements, the then Prime Minister of Canada, the Rt. Hon. Lester B. Pearson, stated that "The fiscal transfer would be calculated in relation to operating costs in determining the amount, but would be regarded as being on account of both the

[10] Broad coverage of post-secondary education was occasioned in part by the termination of existing assistance to technical and vocational training, in part by the influence of the Economic Council's second annual report which stresses the value of manpower training.

[11] For Quebec the additional point of corporation income tax was in lieu of the point given as part of the per capita grants agreement, which was now terminated.

operating and the capital needs of these (i.e., post-secondary) educational bodies."[12]

A dollar estimate of the fiscal transfers is provided in Table 4:12 showing recent calculations involved in making the payments for 1967-68.[13] After calculating for each province 50 per cent of its post-secondary operating expenditures (columns 1 and 3), and the value of $15 per capita on the provincial population (column 4), the higher of the two amounts is entered (column 5). It will be noted that only in three provinces—Newfoundland, Prince Edward Island and New Brunswick—did $15 per capita exceed half of operating expenditures in the year shown. Once the more favourable of the two options has been entered, there remains the task of recording the value of the tax abatement points (column 6), together with the general equalization payment, if any (column 7). The sum of these two amounts (column 8) is then subtracted from the more favourable of the two options (column 5) to yield the additional adjustment called for under the arrangements (column 9). This 1967-68 estimate of the total cost of the arrangements to the federal treasury (made up of $227.6 million in income tax abatements, $21.0 million in equalization payments and $151.9 million in additional adjustment payments) was $400.5 million.

In determining final payments for any year, the calculation of eligible post-secondary operating expenditures is of critical importance. Post-secondary education is defined simply as that for which junior matriculation is a prerequisite.[14] By federal regulation, the following classes of operating expenditures are recognized: academic, library, administrative, plant and miscellaneous.[15] In arriving at the gross recognized expenditures, the following items are excluded: student financial aid; any capital, debt or depreciation charge save for the purchase of library books, periodicals and related items;[16] alterations and ancillary enterprises;[17] overhead expenditures of provincial government departments; and all rental charges, with a noteworthy exception. Rental charges for computer and data-processing systems and for photocopying equipment are allowed. Where this equipment has been purchased, a yearly imputed rental of a maximum of 20 per cent of the purchase cost can be included in gross recognized expenditures.

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[12] *Statement by the Prime Minister for the Federal-Provincial Meeting, October 24, 1966.* Ottawa, mimeographed, p. 12.

[13] Actual expenditure figures will not be known until the provinces have made their final returns in the spring of 1969.

[14] Accordingly, the arrangements recognize the operating costs of Grade 13 in New Brunswick, Ontario and British Columbia, and those of Grade 12 in Newfoundland, Nova Scotia, Quebec, Manitoba, Saskatchewan and Alberta.

[15] The items of expenditure allowed in each class are given in Appendix 4.

[16] The full list of library expenditures excluded from capital costs, and therefore recoverable under the fiscal arrangements, is as follows: books, periodicals, films, magnetic tapes, video tapes, film strips, records, slides and other similar audio-visual aids.

[17] The regulations list the following as examples of "ancillary enterprises": residences, student unions, cafeterias, dining halls, book stores, university presses, intercollegiate athletics, teaching hospitals and health services.

Once gross expenditures have been arrived at, two major deductions are made. These are (1) income for assisted, sponsored or contract research, whether from federal or other sources; (2) any federal payments in respect of post-secondary education received either by the province or by its educational institutions. The principal effect of the second deduction is to remove hospital schools of nursing, whose costs are recognized under the Hospital Insurance and Diagnostic Services Act, from coverage under the post-secondary arrangements.

The above deductions yield an operating cost figure to which, save for the portion of cost attributable to the senior matriculation school year, is added the amount of 8.5 per cent for furniture, equipment, and building repair, renewal, renovation or alteration. This percentage figure is used because to draw an accounting distinction between the current and capital component of such outlays would be overly arbitrary. The resulting total comprises the recognized net ordinary expenditures for post-secondary education on the basis of which the federal-provincial transfers are calculated.[18]

The proportion of post-secondary expenditures attributable to institutions other than universities is of interest. On a national basis, these institutions accounted for approximately one quarter of recognized post-secondary operating costs in 1967-68.

**Conclusion**

In this section, we have attempted to describe as completely as possible the portion of the existing fiscal arrangements that relates to post-secondary education. Our purpose has been twofold. First, general acquaintance with the arrangements is a key to understanding the environment in which Canadian universities endeavour to meet their responsibilities. Secondly, a working knowledge of the functioning of these arrangements has proved essential to our task of formulating recommendations in keeping with our terms of reference. The reader can expect frequent allusions to the fiscal arrangements in the chapters that follow. To ease his task in grasping future references to these arrangements, we shall close by summarizing in point form those features of the arrangements that have proved most important to our task.

1. Post-secondary education is an integral part of the general federal-provincial fiscal arrangements that are to remain in effect until 1972.
2. As defined for the purposes of these arrangements, post-secondary education, includes, along with universities, virtually all educational institutions offering courses of study beyond junior matriculation.
3. While only operating costs are used as a basis of calculation, the post-secondary formula applied by the fiscal arrangements is

[18] To illustrate the foregoing, a copy of the form used in arriving at net operating expenditures for each province is reproduced in Appendix 5.

deemed by the Federal Government to compensate the provinces for both current and capital outlays.

4. The operating costs recognized by the Federal Government for the purpose of the arrangements include the purchase of library books, periodicals and related items.
5. Recognized operating costs also include rental charges or imputed rental for computer and data-processing systems and photocopying equipment.
6. Recognized operating costs exclude expenditures for student aid.
7. All income for assisted, sponsored or contract research, whether from federal or other sources, is deducted from recognized post-secondary operating costs.

**Table 4:1—Federal Government Contracts and Grants for Scientific Research in Canadian Educational Institutions and Non-profit Organizations, 1958-59 to 1967-68**

(millions of dollars)

| Department or Agency | 1958–59 | 1959–60 | 1960–61 | 1961–62 | 1962–63 |
|---|---|---|---|---|---|
| Atomic Energy Control Board | 0.4 | 0.7 | 0.7 | 0.7 | 0.8 |
| Defence Research Board | 1.4 | 1.5 | 1.7 | 1.7 | 1.9 |
| Medical Research Council | — | — | — | — | 3.6 |
| National Health and Welfare Department | 2.3 | 2.9 | 3.0 | 3.2 | 3.4 |
| National Research Council | 6.1 | 8.3 | 9.5 | 11.2 | 8.4 |
| Other | 0.1 | 0.1 | 0.4 | 0.6 | 0.5 |
| **Totals** | **10.3** | **13.5** | **15.3** | **17.4** | **18.6** |
| | 1963–64 | 1964–65 | 1965–66 | 1966–67 | 1967–68[a] |
| Atomic Energy Control Board | 0.9 | 1.3 | 1.6 | 2.0 | 2.5 |
| Defence Research Board | 1.9 | 2.3 | 2.3 | 2.9 | 3.7 |
| Medical Research Council | 4.5 | 6.2 | 11.5 | 11.2 | 18.5 |
| National Health and Welfare Department | 4.0 | 4.2 | 4.3 | 4.4 | 4.4 |
| National Research Council | 10.3 | 14.6 | 18.1 | 29.1 | 37.9 |
| Other | 0.6 | 1.2 | 3.5 | 3.6 | 3.9 |
| **Totals** | **22.2** | **29.8** | **41.5** | **53.2** | **71.0** |

[a]Estimated.

**Table 4:2—Selected Royal Commission and Task Force Expenditures, 1965-66 to 1967-68**

| Commission or Task Force | 1965–66 | 1966–67 | 1967–68 |
|---|---|---|---|
| | $'000 | $'000 | $'000 |
| Royal Commission on Banking and Finance | 15 | — | — |
| Royal Commission on Bilingualism and Biculturalism | 2,298 | 1,601 | 1,050 |
| Royal Commission on Health Services | 144 | 96 | 16 |
| Royal Commission on Pilotage | 148 | 206 | 140 |
| Royal Commission on Taxation | 569 | 765 | 118 |
| Royal Commission on Farm Machinery | — | 80 | 473 |
| Royal Commission on the Status of Women | — | 9 | 519 |
| Task Force on Labour Relations | — | — | 676 |
| Task Force on the Structure of Canadian Industry | — | — | 331 |
| **Totals** | **3,174** | **2,757** | **3,323** |

**Table 4:3—Canada Council Research Grants in the Humanities and Social Sciences: Requests and Awards, 1965-66 to 1967-68**

| Item | Requests | Awards | Per Cent |
|---|---|---|---|
| | 1965–66 | | |
| | $'000 | $'000 | |
| Humanities | 91.6 | 71.0 | 77.6 |
| Social Sciences | 439.3 | 341.8 | 77.8 |
| **Totals** | **530.9** | **412.8** | **77.7** |
| | 1966–67 | | |
| | $'000 | $'000 | |
| Humanities | 293.9 | 209.2 | 71.1 |
| Social Sciences | 1,082.4 | 773.9 | 71.6 |
| **Totals** | **1,376.3** | **983.1** | **71.6** |
| | 1967–68 | | |
| | $'000 | $'000 | |
| Humanities | 624.7 | 518.6 | 83.0 |
| Social Sciences | 2,141.8 | 1,583.3 | 74.0 |
| **Totals** | **2,766.5** | **2,101.9** | **76.0** |

**Table 4:4—Council Support of University Research, 1966-67 and 1967-68**

| Item | Canada Council | | Medical Research Council | | National Research Council | |
|---|---|---|---|---|---|---|
| | 1966–67 | 1967–68 | 1966–67 | 1967–68 | 1966–67 | 1967–68 |
| | $'000 | $'000 | $'000 | $'000 | $'000 | $'000 |
| Research grants to university staff | 983 | 2,102 | 9,088 | 15,602 | 23,267 | 29,498 |
| Other Research Grants— | | | | | | |
| General | — | — | 336 | 336 | 966 | 1,687 |
| Grants for major installations, institutes and development | — | — | 12 | 170 | 2,414 | 3,720 |
| Grants for computer facilities | — | — | — | — | 1,300 | 2,373 |
| Library grants | 500 | 1,003 | — | — | — | — |
| Staff awards (leave fellowships, associateships and scholarships) | 617 | 877 | 1,704 | 2,176 | 410 | 491 |
| Fellowships— | | | | | | |
| Postdoctoral | — | 159 | — | — | 987 | 859 |
| Doctoral[a] | 2,931 | 6,477 | 991 | 1,779 | 4,054 | 5,415 |
| Supporting activities | 491 | 590 | 219 | 437 | 768 | 1,357 |
| **Totals** | **5,522** | **11,208** | **15,350[b]** | **20,500** | **34,166** | **45,400** |

[a]MRC fellowships for students holding the M.D. degree are shown in this table as doctoral fellowships.
[b]Includes $3,000,000 provided in 1965–66 for projects in 1966–67.

**Table 4:5—Canada Council Research Grants, by Discipline, 1967-68**

| Discipline | Number | Amount |
|---|---|---|
| | | $ |
| Political science | 54 | 284,420 |
| History | 103 | 247,494 |
| Sociology | 60 | 218,264 |
| Psychology | 34 | 181,266 |
| English | 93 | 176,020 |
| Economics | 35 | 133,419 |
| Anthropology | 15 | 107,716 |
| Geography | 22 | 85,654 |
| Law | 12 | 85,400 |
| Linguistics | 11 | 81,061 |
| Other[a] | 26 | 76,378 |
| French | 42 | 72,846 |
| Philosophy | 31 | 68,519 |
| Art history | 14 | 61,062 |
| Mathematics | 2 | 50,400 |
| German | 17 | 38,946 |
| Classics | 10 | 18,059 |
| Asian | 3 | 17,160 |
| Architecture | 5 | 15,734 |
| Slavic (Russian) | 7 | 15,458 |
| Spanish | 8 | 14,977 |
| Industrial relations | 4 | 14,000 |
| Archaeology | 5 | 10,673 |
| Music | 6 | 10,375 |
| Italian | 4 | 9,402 |
| Demography | 2 | 7,150 |
| **Totals** | **625** | **2,101,853** |

[a]Includes social sciences (NEC), religion, interdisciplinary and international affairs.

**Table 4:6—National Research Council Research Grants, by Discipline, 1967-68**

| General Subject of Research | Operating Grants | | Major Equipment Grants | Total |
|---|---|---|---|---|
| | No. | $'000 | $'000 | $'000 |
| Biology | 861 | 5,905 | 926 | 6,831 |
| Chemistry | 564 | 4,676 | 1,302 | 5,978 |
| Physics | 327 | 2,417 | 768 | 3,185 |
| Engineering— | | | | |
| Chemical and metallurgical | 221 | 1,635 | 412 | 2,047 |
| Civil, electrical and mechanical | 500 | 3,555 | 867 | 4,422 |
| Earth sciences | 328 | 2,174 | 368 | 2,542 |
| Space and astronomy | 88 | 1,125 | 209 | 1,334 |
| Mathematics | 256 | 1,178 | — | 1,178 |
| Computer and information science | 48 | 302 | 80 | 382 |
| Psychology | 171 | 1,119 | 63 | 1,182 |
| Dental research | 51 | 396 | 21 | 417 |
| **Totals** | **3,415** | **24,482** | **5,016** | **29,498** |

## Table 4:7—Mission-Oriented Expenditures, 1966–67 and 1967–68

| Department or Agency | Sciences | | | | Humanities-Social Sciences | | | |
|---|---|---|---|---|---|---|---|---|
| | Grants, etc. | | Scholarships, etc. | | Grants, etc. | | Scholarships, etc. | |
| | 1966–67 | 1967–68 | 1966–67 | 1967–68 | 1966–67 | 1967–68 | 1966–67 | 1967–68 |
| | $'000 | $'000 | $'000 | $'000 | $'000 | $'000 | $'000 | $'000 |
| Agriculture | 415 | 570 | — | — | 41 | 61 | — | — |
| Air Canada | — | — | — | — | 38 | 4 | — | — |
| Atlantic Development Board | 3,500 | — | — | — | 65 | 84 | — | — |
| Atomic Energy Control Board | 2,000 | 2,500 | — | — | — | — | — | — |
| Atomic Energy of Canada Limited | 397 | 519 | — | — | — | — | — | — |
| Commercial Products | 80 | 130 | — | — | — | — | — | — |
| Bank of Canada | — | — | — | — | 23 | 29 | — | — |
| Central Mortgage and Housing Corporation | — | — | — | — | 141 | 519 | 169 | 258 |
| Canadian National Railways | — | — | — | — | 12 | 20 | — | — |
| Consumer and Corporate Affairs | — | — | — | — | 57 | 152 | — | — |
| Defence Research Board | 2,667 | 3,304 | — | — | 162 | 125 | — | — |
| Dominion Bureau of Statistics | — | — | — | — | 49 | 35 | — | — |
| Dominion Coal Board | 3 | 3 | — | — | — | — | — | — |
| Economic Council of Canada | — | — | — | — | 93 | 177 | — | — |
| Eldorado Nuclear Limited | 76 | 45 | 10 | — | — | — | — | — |
| Emergency Measures Organizations | — | — | — | — | 10 | 10 | 5 | 5 |
| Energy, Mines and Resources— | | | | | | | | |
| Astronomy | 10 | 25 | — | — | — | — | — | — |
| Contracts | 75 | 109 | — | — | — | — | — | — |
| Geology | 149 | 185 | — | — | — | — | — | — |
| Geography | 25 | 35 | — | — | — | — | — | — |
| Mining | 72 | 70 | — | — | — | — | — | — |
| Mineral Processing | 28 | 30 | — | — | — | — | — | — |
| Surveys and Mapping | 12 | 20 | — | — | — | — | — | — |
| Water Resources | 20 | 192 | — | — | 18 | 20 | — | — |

**Table 4:7—Mission-Oriented Expenditures, 1966–67 and 1967–68 (concluded)**

| Department or Agency | Sciences | | | | Humanities-Social Sciences | | | |
|---|---|---|---|---|---|---|---|---|
| | Grants, etc. | | Scholarships, etc. | | Grants, etc. | | Scholarships, etc. | |
| | 1966–67 | 1967–68 | 1966–67 | 1967–68 | 1966–67 | 1967–68 | 1966–67 | 1967–68 |
| | $'000 | $'000 | $'000 | $'000 | $'000 | $'000 | $'000 | $'000 |
| External Affairs[a] | — | — | 348 | 323 | 66 | 17 | 185 | 245 |
| External Aid[b] | — | — | 373 | 427 | — | — | 373 | 426 |
| Finance | — | — | — | — | 98 | 130 | — | — |
| Fisheries | 13 | 5 | — | — | 5 | 10 | — | — |
| Fisheries Research Board | 280 | 428 | — | — | — | — | — | — |
| Forestry and Rural Development— | | | | | | | | |
| Forestry | 96 | 335 | — | — | — | — | — | — |
| Rural Development | — | — | — | — | 154 | 176 | — | — |
| Indian Affairs and Northern Development— | | | | | | | | |
| National and Historic Parks[c] | 29 | 61 | — | 6 | 110 | 32 | — | — |
| Indian Affairs | — | — | — | — | 55 | 41 | — | — |
| Northern Co-ordination | 208 | 252 | — | — | — | — | — | — |
| Wildlife Service | 82 | 144 | 5 | 15 | — | — | — | — |
| Industry | 1,442 | 58 | — | — | 41 | 80 | — | — |
| Research Institutes | — | 84 | — | — | — | — | — | — |
| International Joint Commission | — | — | — | — | 3 | — | — | — |
| Labour | — | — | — | — | 113 | 97 | 12 | 12 |
| Manpower and Immigration | — | — | — | — | 33 | 110 | — | — |
| National Design Council | 5 | 21 | 2[d] | 6[d] | — | — | — | — |
| National Film Board | — | — | — | — | — | 28 | — | — |
| National Harbours Board | — | — | — | — | 5 | 3 | — | — |
| National Health and Welfare— | | | | | | | | |
| Fitness and Amateur Sport | 346 | 421 | 42 | 48 | — | — | 42 | 47 |
| Food and Drug Directorate | 14 | 25 | — | — | — | — | — | — |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Health Resources | 2,150 | 2,308 | — | — | — | — | — | — |
| Medical Services | 17 | 18 | — | — | — | — | — | — |
| Mental Retardation | — | 137 | — | — | — | — | — | — |
| Public Health[e] | 3,254 | 3,195 | — | — | 580 | 779 | — | — |
| Welfare | — | — | — | — | 27 | 131 | 62 | 56 |
| Natural Museums— | | | | | | | | |
| Human History | — | — | — | — | 46 | 36 | — | — |
| Natural History | 15 | 17 | — | — | — | — | — | — |
| Polymer Corporation | 78 | 54 | 4 | 3 | — | — | — | — |
| Public Works | — | 14 | — | — | — | — | — | — |
| Secretary of State | — | — | — | — | 5 | 9 | — | — |
| Solicitor General | — | — | — | — | 49 | 76 | — | — |
| Transport | 188 | 249 | — | — | 24 | 64 | — | — |
| Veterans Affairs | 67 | 68 | — | — | — | — | — | — |
| **Totals** | **17,804** | **15,631** | **784** | **828** | **2,123** | **3,055** | **848** | **1,049** |

## RECAPITULATION

| Year | Grants | Scholarships | Grand Total |
|---|---|---|---|
| | $'000 | $'000 | $'000 |
| 1966–67 | 19,927 | 1,632 | 21,559 |
| 1967–68 | 18,686 | 1,877 | 20,563 |

[a]Includes some funds for visiting professors.
[b]Arbitrary division between natural science and humanities and social science.
[c]Arbitrary division between sciences and social sciences.
[d]Awards to Ph.D candidates.
[e]Universities and university affiliated hospitals.

## Table 4:8—Involvement of Federal Government Departments and Agencies in Support of University Research, 1966-67 and 1967-68

NOTE: All expenditures are in thousands of dollars; areas of involvement are indicated by "x".

Column Designations:

*Grants for Research*

- A = Operating
- B = Equipment
- C = Development
- D = Installations and Capital

*Other Relations with Universities:*

- E = Contract Research
- F = Special Projects
- G = Employment of University Staff and Students
- H = Advisory Committees
- I = Scholarships and Fellowships
- J = Accommodation of Post-doctorate Fellows
- K = Supervision and Accommodation of Graduate Students
- L = Lectures by Departmental Staff
- M = Regional Laboratories on or Near Campuses

| Agency and Year | | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Agriculture | 1966–67 | 445 | | | x | 11 | | | x | | x | x | x | x |
| | 1967–68 | 622 | | | | 9 | | | | | | | | |
| Air Canada | 1966–67 | | | | | 38 | | | | | | | | |
| | 1967–68 | | | | | 4 | | | | | | | | |
| Atlantic Development Board | 1966–67 | | | | 3,500[a] | 65 | | | | | | | | |
| | 1967–78 | | | | | 84 | | | | | | | | |
| Atomic Energy Control Board | 1966–67 | 2,000 | x | x | x | | | | x | | | | | |
| | 1967–68 | 2,500 | | | | | | | | | | | | |
| Atomic Energy of Canada Limited | 1966–67 | | | | | 397 | x | x | x | | x | x | x | |
| | 1967–68 | | | | | 519 | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Commercial Products | 1966–67 | | | | | 80 | | x | | | | | | |
| | 1967–68 | | | | | 130 | | | | | | | | |
| Bank of Canada | 1966–67 | | | | | | | 23 | | | | | | |
| | 1967–68 | | | | | | | 29 | | | | | | |
| Central Mortgage and Housing Corporation | 1966–67 | | | | | 141 | | | | 169 | | | | |
| | 1967–68 | | | | | 519 | | | | 258 | | | | |
| Canadian National Railways | 1966–67 | | | | | 12 | | | | | | | | |
| | 1967–68 | | | | | 20 | | | | | | | | |
| Consumer and Corporate Affairs | 1966–67 | | | | | 57 | | | | | | | | |
| | 1967–68 | | | | | 152 | | | | | | | | |
| Defence Research Board | 1966–67 | 2,456 | x | x | x | 373 | x | x | x | | x | | x | x |
| | 1967–68 | 2,821 | | | | 608 | | | | | | | | |
| Dominion Bureau of Statistics | 1966–67 | | | | | 49 | | x | | | | | | |
| | 1967–68 | | | | | 35 | | | | | | | | |
| Dominion Coal Board | 1966–67 | 3 | | | | | | | | | | | | |
| | 1967–68 | 3 | | | | | | | | | | | | |
| Economic Council of Canada | 1966–67 | | | | | 93 | x | x | | | | | | |
| | 1967–68 | | | | | 177 | | | | | | | | |
| Eldorado Mining and Refining Ltd. | 1966–67 | | | | | 67 | | | | 10 | | | | |
| | 1967–68 | | | | | 45 | | | | | | | | |

**Table 4:8—Involvement of Federal Government Departments and Agencies in Support of University Research, 1966-67 and 1967-68 (continued)**

| Agency and Year | | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Emergency Measures Organization | 1966–67 | 10 | | | | | x | | x | 5 | | | | |
| | 1967–68 | 10 | | | | | | | | 5 | | | | |
| Energy, Mines and Resources | 1966–67 | | | | | 75 | | x | | | | | | x |
| | 1967–68 | | | | | 109 | | | | | | | | |
| Astronomy | 1966–67 | 10 | | | | | | x | | | x | | x | |
| | 1967–68 | 25 | | | | | | | | | | | | |
| Geology | 1966–67 | 149 | | | | | | | x | | x | | x | |
| | 1967–68 | 185 | | | | | | | | | | | | |
| Geography | 1966–67 | 25 | | | | | | | x | | | | | |
| | 1967–68 | 35 | | | | | | | | | | | | |
| Mining | 1966–67 | 72 | | | | | | | x | | x | | x | |
| | 1976–68 | 70 | | | | | | | | | | | | |
| Mineral Processing | 1966–67 | 28 | | | | | | | x | | x | | x | |
| | 1967–68 | 30 | | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Surveys and Mapping | 1966–67 | 12 | | | | | | | x | | x | | | |
| | 1967–68 | 20 | | | | | | | | | | | | |
| Water Resources | 1966–67 | 38 | | | | | | | x | | x | | x | x |
| | 1967–68 | 212 | | | | | | | | | | | | |
| External Affairs | 1966–67 | | | | | 66 | | | | 533[b] | | | | |
| | 1967–68 | | | | | 17 | | | | 568 | | | | |
| External Aid | 1966–67 | | | | | | | | | 746 | | | | |
| | 1967–68 | | | | | | | | | 853 | | | | |
| Finance | 1966–67 | | | | | 98 | | | | | | | | |
| | 1967–68 | | | | | 130 | | | | | | | | |
| Fisheries | 1966–67 | | | | | 18 | | x | | | | | | |
| | 1967–68 | | | | | 15 | | | | | | | | |
| Fisheries Research Board | 1966–67 | 148 | | 102 | x | 30 | | x | x | x | x | x | x | x |
| | 1967–68 | 250 | | 140 | | 38 | | | | | | | | |
| Forestry and Rural Development | | | | | | | | | | | | | | |
| Forestry | 1966–67 | 89 | | | | 7 | | x | x | | x | x | x | x |
| | 1967–68 | 175 | | 160 | | | | | | | | | | |
| Rural Development | 1966–67 | | | | | 154 | | x | | | | | | |
| | 1967–68 | | | | | 176 | | | | | | | | |

**Table 4:8—Involvement of Federal Government Departments and Agencies in Support of University Research, 1966-67 and 1967-68 (continued)**

| Agency and Year | | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Indian Affairs and Northern Development— | | | | | | | | | | | | | | |
| National and Historic Parks | 1966–67 | | | | | 139 | | x | | | | x | x | |
| | 1967–68 | | | | | 93 | | | | 6 | | | | |
| Indian Affairs Branch | 1966–67 | | | | | 55 | | | x | | | | | |
| | 1967–68 | | | | | 41 | | | | | | | | |
| Northern Co-ordination | 1966–67 | | | 150 | | 8 | 50 | | x | | | x | x | |
| | 1967–68 | | | 182 | | 2 | 68 | | | | | | | |
| Wildlife Service | 1966–67 | | | | | 82 | | x | x | 5 | | x | x | x |
| | 1967–68 | | | | | 144 | | | | 15 | | | | |
| Industry | 1966–67 | | | 1,442[a] | | 26 | 15 | | | | | | | |
| | 1967–68 | | | 58 | | 80 | 84 | | | | | | | |
| International Joint Commission | 1966–67 | | | | | 3 | | | | | | | | |
| | 1967–68 | | | | | | | | | | | | | |
| Labour | 1966–67 | 100 | | | | 13 | x | x | x | 12 | | | x | |
| | 1967–68 | 86 | | | | 11 | | | | 12 | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Manpower and Immigration | 1966–67 | 11 | | | | 22 | x | x | x | | | | x | |
| | 1967–68 | 41 | | | | 69 | | | | | | | | |
| National Design Council | 1966–67 | 5 | | | | | | | | 2 | | | | |
| | 1967–68 | 21 | | | | | | | | 6 | | | | |
| National Film Board | 1966–67 | | | | | | | | | | | | | |
| | 1967–68 | | | | | 28 | | | | | | | | |
| National Harbours Board | 1966–67 | 5 | | | | | | | | | | | | |
| | 1967–68 | | | | | 3 | | | | | | | | |
| National Health and Welfare— | | | | | | | | | | | | | | |
| Public Health | 1966–67 | 3,834 | | | | | x | | x | | | | | |
| | 1967–68 | 3,974 | | | | | | | | | | | | |
| Health Resources | 1966–67 | | | | 2,150 | | | | | | | | | |
| | 1967–68 | | | | 2,308 | | | | | | | | | |
| Mental Retardation | 1966–67 | — | | | | | | | | | | | | |
| | 1967–68 | 137 | | | | | | | | | | | | |
| Medical Services | 1966–67 | | | | | 17 | | | | | | | | |
| | 1967–68 | | | | | 18 | | | | | | | | |
| Food and Drug Directorate | 1966–67 | | | | | 14 | | | | | | | | |
| | 1967–68 | | | | | 25 | | | | | | | | |

**Table 4:8—Involvement of Federal Government Departments and Agencies in Support of University Research, 1966-67 and 1967-68 (concluded)**

| Agency and Year | | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Welfare | 1966–67 | 27 | | | | | | | | 62 | | | | |
| | 1967–68 | 131 | | | | | | | | 56 | | | | |
| Fitness and Amateur Sport | 1966–67 | 181 | 15 | 150 | | | | | | 84 | | | | |
| | 1967–68 | 245 | | 176 | | | x | | x | 95 | | | | |
| National Museums— | | | | | | | | | | | | | | |
| Human History | 1966–67 | | | | | 46 | | | | | | | | |
| | 1967–68 | | | | | 36 | x | x | x | | x | x | x | |
| Natural History | 1966–67 | | | | | 15 | | | | | | | | |
| | 1967–68 | | | | | 17 | x | | | | | | | |
| Polymer Corporation | 1966–67 | 18 | 60 | | | | | | | 4 | | | | |
| | 1967–68 | 19 | 35 | | | | | x | | 3 | | | | |
| Privy Council | 1966–67 | | | | | | | | | | | | | |
| | 1967–68 | | | | | x | x | x | | | | | | |
| Public Works | 1966–67 | | | | | | | | | | | | | |
| | 1967–68 | 14 | | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Secretary of State | 1966–67 | 5 | | | | | | | | | | | | |
| | 1967–68 | 9 | | | | | | | | | | | | |
| Solicitor General | 1966–67 | | | | | 49 | | | | | | | | |
| | 1967–68 | | | | | 76 | | | | | | | | |
| Transport— | | | | | | | | | | | | | | |
| Meteorology | 1966–67 | 125 | x | | | 63 | | | x | x | x | x | x | |
| | 1967–68 | 150 | | | | 99 | | | | | | | | |
| Transportation Economics | 1966–67 | 24 | | | | | | x | x | | | | | |
| | 1967–68 | 64 | | | | | | | | | | | | |
| Veterans Affairs | 1966–67 | | | | | | | 67 | | | | | | |
| | 1967–68 | | | | | | | 68 | | | | | | |
| **Totals** | **1966–67** | **9,820** | **75** | **1,844** | **5,650** | **2,383** | **65** | **90** | | **1,632** | | | | |
| | **1967–68** | **11,849** | **35** | **716** | **2,308** | **3,529** | **152** | **97** | | **1,877** | | | | |

**RECAPITULATION**

| | Grants | Scholarships | Grand Total |
|---|---|---|---|
| 1966–67[a] | 19,927 | 1,632 | 21,559 |
| 1967–68 | 18,686 | 1,877 | 20,563 |

[a] This total includes a large grant to McGill, the HARP project and grants of $3.5 million provided by Atlantic Development Board for research developments at the universities of Dalhousie and New Brunswick.

[b] Funding of cultural exchange.

**Table 4:9—Federal Expenditure for University Research Support Programs, 1966-67 and 1967-68**

(Reconciliation)

| Item | Sciences | | Humanities-Social Sciences | |
|---|---|---|---|---|
| | 1966–67 | 1967–68 | 1966–67 | 1967–68 |
| | $'000 | $'000 | $'000 | $'000 |
| Total Mission-Oriented Support | 18,588 | 16,459 | 2,971 | 4,104 |
| Total Council Support | 49,516 | 65,900 | 5,522 | 11,208 |
| **Totals, Government Support** | **68,104** | **82,359** | **8,493** | **15,312** |

**Table 4:10—Federal Disbursements and Abatements for University Per Capita Grants, 1951-52 to 1966-67**

| Year | Grant Disbursements | Value of Abatement (net) | Total |
|---|---|---|---|
| | $'000 | $'000 | $'000 |
| 1951–52 | 6,992 | — | 6,992 |
| 1952–53 | 5,116 | — | 5,116[a] |
| 1953–54 | 5,244 | — | 5,244 |
| 1954–55 | 5,390 | — | 5,390 |
| 1955–56 | 5,527 | — | 5,527 |
| 1956–57 | 16,049 | — | 16,049[b] |
| 1957–58 | 16,558 | — | 16,558 |
| 1958–59 | 25,523 | — | 25,523[c] |
| 1959–60 | 26,112 | — | 26,112 |
| 1960–61 | 19,049 | 7,659 | 26,708 |
| 1961–62 | 19,360 | 7,889 | 27,249 |
| 1962–63 | 26,332 | 10,732 | 37,062[d] |
| 1963–64 | 26,778 | 10,936 | 37,714 |
| 1964–65 | 27,264 | 11,124 | 38,388 |
| 1965–66 | 27,748 | 11,314 | 39,062 |
| 1966–67 | 87,053[e] | 11,562[f] | 98,615[g] |

[a]Reduced total reflects Quebec's refusal of the grants.

[b]Increase is attributable to new per capita level of $1 and to federal policy of allowing grants otherwise payable to Quebec universities to accumulate until paid.

[c]Per capita level increased to $1.50.

[d]Per capita level increased to $2.00.

[e]Includes $3 per capita for Quebec universities allowed by the provincial government for that year only.

[f]Net abatement still calculated at $2 per capita.

[g]Per capita level increased to $5.00.

SOURCE: Department of Finance.

**Table 4:11—Adjustment of Fiscal Transfer to Quebec, University Grants, 1960-61 to 1966-67**

| Year | Value of 1 per cent Corporation Income Tax Abatement | Value of Per Capita Grants Otherwise Payable | Additional Transfer (+) or Deduction (−) from Other Grants to Quebec |
|---|---|---|---|
| | $'000 | $'000 | $'000 |
| 1960–61 | 8,405 | 7,659 | − 746 |
| 1961–62 | 9,128 | 7,889 | − 1,240 |
| 1962–63 | 10,346 | 10,732 | + 386 |
| 1963–64 | 10,721 | 10,936 | + 215 |
| 1964–65 | 10,557 | 11,124 | + 567 |
| 1965–66 | 12,342 | 11,314 | − 1,028 |
| 1966–67 | 13,274 | 11,562 | − 1,713 |

SOURCE: Department of Finance.

**Table 4:12—Estimated Post-Secondary Education Adjustment Payments, by Province, 1967–68**

| Province | Estimated Eligible Post-Secondary Operating Expenditures[a] | Estimated Population Apr. 1, 1967 | 50% Eligible Operating Expenditures | $15 Per capita | Greater of 3 and 4 | Estimated Value of Income Tax Abatement[b] | Estimated Value of Equalization Payments[b] | Estimated Total of Basic Fiscal Transfer[b] | Estimated Value of Adjustment Payments 5–8 |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | $'000 | No. | $'000 | $'000 | $'000 | $'000 | $'000 | $'000 | $'000 |
| Nfld. | 6,742 | 500 | 3,371 | 7,500 | 7,500 | 2,346 | 3,242 | 5,588 | 1,912 |
| P.E.I. | 2,123 | 109 | 1,062 | 1,635 | 1,635 | 429 | — | 429 | 1,206 |
| N.S. | 31,397 | 756 | 15,699 | 11,340 | 15,669 | 4,604 | 3,861 | 8,465 | 7,204 |
| N.B. | 16,234 | 619 | 8,117 | 9,285 | 9,285 | 3,347 | 3,585 | 6,932 | 2,353 |
| Que. | 212,800 | 5,854 | 106,400 | 87,810 | 106,400 | 57,273 | 8,430 | 65,703 | 40,697 |
| Ont. | 304,414 | 7,115 | 152,207 | 106,725 | 152,207 | 102,308 | — | 102,308 | 49,899 |
| Man. | 35,826 | 961 | 17,913 | 14,415 | 17,913 | 8,859 | 1,912 | 10,771 | 7,142 |
| Sask. | 36,540 | 955 | 18,270 | 14,325 | 18,270 | 7,487 | — | 7,487 | 10,783 |
| Alta. | 75,604 | 1,483 | 37,802 | 22,245 | 37,802 | 14,643 | — | 14,643 | 23,159 |
| B.C. | 67,803 | 1,938 | 33,902 | 29,070 | 33,902 | 26,317 | — | 26,317 | 7,585 |
| **Totals** | **789,483** | **20,290** | **394,743** | **304,350** | **400,583** | **227,613** | **21,030** | **248,643** | **151,940** |

[a]Final provincial returns will not be available until the Spring of 1969; these figures are based on provincial estimates made during 1968 and hence differ from earlier figures.
[b]Final value of income tax abatement and equalization payments to be calculated in March 1969.

SOURCE: Education Support Branch, Department of Secretary of State.

## Chapter 5

# FEDERAL SUPPORT OF RESEARCH: THE COUNCILS

### Government Support of University Research

As shown in Chapter 4, the Federal Government has a wide and growing variety of relations with universities in the area of research support. In this Chapter, we begin to move from the realm of description to that of prescription by dealing with the organization and terms of reference of federal research councils. In order to offer what we hope will be useful criticisms and proposals, we must first attempt to sort out the many dimensions of federal research support according to some distinction sufficiently workable to enable us to apply criteria pertinent to government-university relations.

The quest for such a distinction has proven elusive not only to us, but to others as well. To choose an example, the time-honored distinction between basic and applied research, while useful for certain purposes, can be a quite unsatisfactory guide to the subject matter of government-university relations. Not only does it give rise to endless wrangling over evils whose existence is all too often solely in the eye of the beholder; it ignores the very real fact that what constitutes *applied* research in one field of endeavour may be *basic* in another. Most impressive testimony to the elusive quality of the distinction between basic and applied research can be found in the fact that the Act of Congress covering the National Science Foundation of the United States, the agency most directly concerned with university research in that country, has recently been amended to remove explicit references to "basic" or "fundamental" work.

A second major distinction familiar to students of government policy is that between sponsored and purchased research. From a conceptual point of view, research can be deemed to be sponsored when it is supported solely on its scientific merits, and purchased when it is procured to solve a practical problem. But in operational terms, research may at times be sponsored less on its intrinsic merits than because it contributes to a balanced scientific effort, and purchased less because it is directly problem-oriented than because it may contribute to a broadly designated area of knowledge.

Yet a third common distinction is between what is called grant-assisted research and contract research. Inasmuch as the validity of this distinction hinges on what is presumed to be a firm line of demarcation between two legal instruments—one called a "grant" (presumably used to sponsor

research) the other a "contract" (presumably entered upon to purchase research)—it is perhaps the most misleading of all. As we shall have occasion to point out in a later chapter, the evolution of these particular instruments in Canada has been such that what for all ostensible purposes are grants turn up under the guise of contracts, and vice-versa. We hasten to add that Canada does not offer the only setting in which grants and contracts are confounded; a similar, perhaps even accentuated, pattern obtains in the United States.

The quest for a workable distinction on which to hinge an analysis of government support of university research takes us finally to the two main reasons why this support is provided. First, as we took pains to point out in Chapter 1, research is supported for its own sake. Secondly, research is supported because it is a necessary tool for the achievement of such national goals as economic growth, industrial development, resource conservation and the like. These twin reasons for the support of research are recognized in all advanced nations, and have long been respected in Canada. In this country there are at present three agencies whose sole or primary role has been the support of research for its own sake—especially in the universities. These are the Canada Council, the National Research Council and the Medical Research Council. Since all three share in common the name "council", we have decided for the sake of convenience to use the term "the councils" when referring to these or to any other agencies that might be created for the express purpose of supporting research.[1]

In contrast to the councils, whose sole *raison d'être* is research, stand the agencies that support research in keeping with various kinds of missions, be these agriculture, welfare, housing or defence. We recognize and welcome the important role of such mission-oriented agencies in research support. But in keeping with the twin reasons that account for the government support of research, there follow certain practical consequences as to the respective place of councils and mission-oriented agencies. Since the councils have as their prime goal the support of research *per se,* theirs is the all-important responsibility of advancing research on a broad front in keeping with the balanced development of science and scholarship. This responsibility is most likely to be met by following a policy of supporting research projects on their intrinsic merits and on those of their proponents. Mission-oriented agencies, for their part, should respect the special role of the councils in their own support of research. It is by recognizing the responsibility of the councils for the general health of the nation's research that mission-oriented agencies can best ensure the quality of the resources which they themselves seek to command. Accordingly, a prime test for the research support extended by mission-oriented agencies should be whether the research is indeed relevant

[1] Since the Science Council is an advisory body on science policy and not a research sponsorship agency, it is not embraced by our term "the councils". Certain aspects of the advisory role of the Science Council are discussed later in this Chapter.

to the missions of these agencies. There would be little to be gained and much to be lost from a situation where research support by mission-oriented agencies, in the absence of such a test, did not respect the more encompassing responsibility of the councils for research in general.

**The Councils: Their Role and Number**

In a setting where the prime test for research funding by mission-oriented agencies is the relevance of the work to a mission, it can be expected that these agencies will support different disciplines selectively. Not least for this reason, we deem it of the utmost importance that the councils, whose primary task is to support research for its own sake, should encompass all fields and disciplines in which research can conceivably be supported. Only thus can the balanced development of research be assured.

That the councils, whatever their number, should encompass all fields of scientific or scholarly endeavour is in our opinion the foundation upon which federal organization for sponsored research should be built. In the course of our hearings, we were impressed by the number of complaints voiced by both researchers and university administrators that certain fields of scientific or scholarly endeavour are now either shortchanged or totally ignored. Thus, for example, schools of business administration complained that no council in Ottawa is prepared to consider proposals emanating from their faculties. Similar difficulties were reported by faculties of education. Faculties of law deplored the dearth of support for research in law and concurrently indicated the need for basic studies related to law reform. Among others, schools of architecture, departments of music, art and theatre, and schools of nursing expressed frustration in the absence of sources of federal support for their disciplines.

The Federal Government, through the councils that already exist, has made it abundantly plain that it regards the support of research for its own sake to be in the national interest. If research is indeed to be supported for its own sake, there is everything to be lost from a situation where federal organization for research support is such that the frontiers of knowledge in any legitimate discipline may fail to advance through lack of funding. As to what constitutes a "legitimate discipline", we are of the opinion that the appropriate test is whether or not the discipline in question is recognized at the university level. The organization of federal research councils should be such that no university faculty member, be he in a school of social work or a faculty of food sciences, in a school of nursing or a faculty of law, in a school of business or a faculty of education, is without a council to which he can turn for support on the scientific or scholarly merits of his proposal. Accordingly, *we recommend that:*

> **Federal research councils be organized in such a manner that, when taken together, their terms of reference will encompass all disciplines recognized by Canadian universities.**

That the councils should encompass all disciplines recognized by Canadian universities leads naturally to a consideration of what their number should be. At one extreme, it has been suggested that a single council would be most appropriate. As we understand it, the case for a single council consists of the following propositions. First, a single council charged with responsibility for research support in all fields guarantees that no project will be denied funds because it falls between the terms of reference of a multiplicity of councils. Secondly, a single council is in the best possible position to sort out priorities among competing claims on the public purse. Thirdly, a single council, speaking with one strong voice in the interests of research support, is the best guarantor that these interests will be respected.

We find the case for a single council unconvincing. While such a council might indeed guarantee that no project falls between the terms of reference of a multiplicity of councils, it by no means constitutes the only mechanism through which this objective can be achieved. We shall discuss an alternative mechanism later in this chapter.

As to the claim that a single council is in the best possible position to sort out priorities, we submit that this proposition shows a questionable grasp of the priority-setting process. In our democratic parliamentary system, priorities are ultimately the responsibility of Cabinet and its instrumentality, Treasury Board. Government organization should of course be such that priorities can be set broadly rather than among minutiae. But research expenditures have grown to the point where they hardly fall into the latter category. Indeed, the support of research for its own sake has become a sufficiently large enterprise that Cabinet, in our opinion, should have expert advice in setting its priorities. But the single council, which has already tried to sort out all its priorities within its own conference room, can hardly be expected to act as an impartial advisor. For that matter, there is a noticeable tendency, both throughout the world and in this country, to divorce the scientific advisory function from operational responsibilities. We shall take up certain aspects of the advisory function as it relates to priority-setting in a subsequent section.

Finally, the claim that a single council will speak with one strong voice on the subject of research support is to us dubious in the extreme. There exist widely different attitudes and viewpoints among the major divisions of the scholarly and scientific community. In our view, by the time agreement, if any, on research policy emerged from the bosom of a single agency also charged with sorting out priorities, the one strong voice would in all likelihood have become a pathetic squeak.

Only once or twice in the course of our hearings was a single research council advocated. In addition, we are impressed by the notable absence of such monolithic agencies in the major countries of the world. And not least among the negative aspects of a single agency is that it leaves no room for experimentation in differing patterns of government-university relations.

At the other extreme from a single agency is a great multiplicity of councils. Summing up proposals that were made to us at one time or another, it would appear that we should countenance, in addition to the existing councils, a Business Administration Council, an Engineering Council, a Learning Council, a Renewable Resources Council and an Environmental Council, among others. Frequently, as in business administration, education and architecture, such proposals coincided with complaints concerning the present availability of federal research support.

We have carefully considered the need for additional councils. Uppermost in our mind has been what we consider the principal role of a council: to be an agency whose prime purpose is to finance research for its own sake. All of the additional councils proposed to us share the common characteristic of being oriented in large part toward a problem area of our national life, be it the managerial or technological capability of industry, the school environment, resource conservation, or the plight of our urban or rural regions. We do not for a moment belittle the importance of research in these or any other problem-oriented fields. However, we have reached the conclusion that it is inappropriate to clothe a problem area in the organizational garb of a research council. It is our view that a council whose prime purpose is to support research on the basis of its intrinsic merits runs the risk of deviating from its own all-important mission if its terms of reference are tied to a problem-oriented field.

We wish to state that this viewpoint has led us to consider very carefully whether one of the existing councils should retain council status. We refer to the Medical Research Council, whose aims are intimately linked to the nation's health. We acknowledge a case for placing the Medical Research Council in the Department of National Health and Welfare in that the total mission of this department, the nation's health, surely embraces research oriented toward this goal. On the other hand, however, we must weigh the long evolution that has led to the existing position and practices of the present Council. Medical research first received organizational recognition through the formation of an associate committee of the National Research Council in 1938. Subsequently, NRC formed a Division of Medical Research. The Medical Research Council was formed by Cabinet directive in 1960 as a body virtually autonomous from NRC but operating under the National Research Council Act.

Given its long-standing association with the National Research Council, the Medical Research Council shares the outlook and aims of its parent organization. It has a deep commitment to sponsored research in the basic sciences. There is no doubt that it judges proposals strictly on their merits and on those of the scientists who put them forward. The management practices of the Medical Research Council are patterned on those of the National Research Council and in the main are the ones appropriate to an agency whose prime objective is research sponsorship. These considerations

have led us to believe that, notwithstanding its link to an operational mission of government, medical research can be appropriately organized under the council form.

This is not to say that we envisage no alterations in the structure of the Medical Research Council. To the contrary, we wish to propose rather far-reaching changes in the organization of this Council, and also of the National Research Council and the Canada Council. But suitably restructured, we believe that the existing number of councils, three, will constitute the best organizational means of discharging the Federal Government's responsibilities in general research support for the foreseeable future. This number accommodates the organizational evolution that has taken place in the medical sciences, together with one council for each of the humanities and social sciences, and the natural sciences and engineering. Subject to the elaborative comments that appear below, we wish to point out that a restricted number of councils by no means precludes a degree of organizational recognition for individual areas or disciplines within the embracing structure of individual councils. Thus the National Research Council in particular has made use over the years of a number of associate, advisory and grant selection committees. With the rapid development of the university research support program in recent years, there has been a vigorous growth in the number of grant selection committees. These committees now number four in biosciences, one in chemistry, two in physics, four in engineering, and one each for pure and applied mathematics, earth sciences, space and upper atmosphere physics, and computer science. Their growth offers impressive testimony to the capacity of councils to provide organizational recognition appropriate to the needs of individual disciplines. In the particular context of NRC, the unfolding role of committees constitutes a most important means of reconciling the somewhat different needs of natural scientists and engineers with the essential unity that exists between the pure and applied sciences. Bearing in mind importance of committees, we now proceed to discuss the structural changes that we deem desirable for each of the councils in turn.

**The Medical Research Council**

Of the three councils, the Medical Research Council is the most recent and its organizational form is still in a state of flux. Its terms of reference, which have encompassed research in the medical sciences properly speaking, were extended to include research in pharmacy in 1967, and in dentistry in 1968. Research support for such fields as public health and nursing is confined in the main to the Department of National Health and Welfare.

Consistent with our opinion that the three councils should in their totality embrace all disciplines, we believe that the mandate of the Medical Research Council should be broadened to include all the health sciences. We recognize that the Department of National Health and Welfare may still wish

to support research in such fields as public health either directly or through the medium of the provinces. From our perspective this is entirely appropriate and in keeping with our view that the existence of research councils in no way precludes mission-oriented departments from supporting research consistent with their practical objectives. What is important is that researchers in each of the health sciences recognized by universities have a council, with no mission other than research, to which they can turn.

In 1964, the Report of the Royal Commission on Health Services recommended "that the Medical Research Council be broadened by appropriate legislation to include all fields of health research, and renamed the Health Sciences Research Council".[2] We wholeheartedly endorse the position taken by this Commission. Accordingly, *we recommend that:*

**The Medical Research Council be reconstituted as a Health Sciences Research Council and authorized to support research in all sciences related to health.**

In endorsing the Hall Report's recommendation, we wish to note pointedly that the same Report states that "We do not . . .envisage that the Council would conduct its own research program in areas of medical, dental and pharmaceutical research in the near future".[3] We would ourselves go a step further and record our opinion that, should the Federal Government wish to create intramural health sciences laboratories, these should be elsewhere than under the Health Sciences Research Council. In reaching this conclusion, we have been conscious that the principal American agency for research sponsorship in the health sciences, the National Institutes of Health, operates its own laboratories. But NIH is in turn a part of the United States Department of Health, Education and Welfare, a mission-oriented agency. Our reasons for wishing to divorce research sponsorship by councils from intramural laboratories will be developed further in our discussion of the National Research Council, to which we now turn.

### The National Research Council

The National Research Council was created in 1916 because of wartime technological and scientific necessity. It acted from the beginning as the principal science advisor to the Government, and maintained this function until the advent of the Science Council in 1966. Also from its inception, the National Research Council was linked to industrial research, and its relations with universities date from an early time. After some bitter controversy, NRC decided to build and develop its own laboratories. This decision was justified beyond doubt in World War II. As a result of the performance of

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[2] Royal Commission on Health Services, *Report* (Ottawa: Queen's Printer, 1964), Vol. I, p. 80.

[3] *Ibid.*, p. 127.

scientists both in its laboratories and in co-ordinating Canadian scientific efforts during the War, NRC came to be looked upon as a model scientific organization.

Perhaps because of this reputation, earned during a period of great stress, NRC encountered difficulties in responding fully to postwar needs. In any event, there have been many criticisms during recent years of NRC and of its relations first with industry and then with universities. Industry required and sought technological and scientific advice in 1916; 40 to 50 years later it was being told that it must become scientifically and technologically oriented in order to be competitive in world trade. Universities, meantime, perhaps because NRC allowed its public relations to fall into neglect, began to look upon the laboratories as a competitor for both academic manpower and government funds. This suspicion notwithstanding, the fact is that in recent years the NRC budget for university support has been increasing at a rate of about 33⅓ per cent a year and, by 1968-69, was approximately equal to the total vote for the laboratories.

In 1951, the Massey Commission stated "The suggestion has been made that the National Research Council should be relieved of all direct administrative responsibility for the laboratories now under its control",[4] but refrained from making a recommendation on the subject. We have received the same suggestion from a number of quarters and have given it the most careful consideration.

The National Research Council since it was first established in 1916 has undergone a series of evolutionary changes. Among the most important of these has been the development of new agencies born in the work of the Council. In 1947, a group of NRC staff who had participated in NRC's contribution to scientific and technological services related to the war effort, became the nucleus of the newly established Defence Research Board. In 1952 the Atomic Energy Division of NRC became Atomic Energy of Canada Limited, an agency corporation of the Federal Government. In 1960, after being first an Associate Committee and then a Division of NRC, the Medical Research Council was established as a virtually autonomous body. The most recent evolutionary change has been the appointment of a Vice-President of NRC in charge of extramural programs. These changes provide ample evidence of NRC's ability to respond to changing conditions and requirements over the years.

We believe that this evolutionary process must continue and that there are now a number of reasons why independence of the extramural programs from the management of the laboratories would enhance the performance of both functions.

The chief of these is the increasing divergence in the functions of the intramural and extramural programs. University support has grown large; in

[4] Royal Commission on National Development in the Arts, Letters and Sciences, *Report* (Ottawa: King's Printer, 1951), p. 179.

1967-68 it exceeded $45 million. It will grow much larger during the next few years and indeed will continue to grow much faster than the intramural program. The numbers of university staff in sciences and engineering will double by 1975-76 (see Table 3:18); costs no doubt will continue to rise; and, in addition, several new types of support programs proposed in Chapter 6 will require substantial increases in levels of support. Thus by 1975-76, NRC extramural expenditures can be expected to be a multiple of what they are now. No such rapid growth in intramural budgets seems likely.

Aside from growth, the character of the NRC support program is becoming more complex. The support of program grants, negotiated development grants, strategic development grants and major proposals all described in Chapter 6 will require an increasing sophistication and commitment in relation to the administration of large sums of public money. This commitment must be founded on a firm understanding of the importance of maintaining the strength of fundamental research in the universities in a period when interest and participation in applied research will be increasing.

The NRC laboratories in contrast have less responsibilitity for basic research for the very reason that they have fostered the emergence of a strong scientific capability in the universities. We agree with the Science Council[5] that the laboratories need a mission or indeed several missions, and can be most useful to Canada so organized. We see them under independent leadership responding to government directives as a group of flexible task forces capable of adjusting their organization and regrouping their manpower from time to time to tackle important scientific assignments. We believe they differ from the research operations of federal departments in the range of missions to which they might be devoted. They might concentrate on sophisticated industrial technology or problems of resource development or the promise of modern cellular biology—wherever there are prospects of contributing to the solution of problems or the exploitation of opportunities. The laboratories, in our view, would continue to conduct basic research but we see such research as "oriented" basic research pursued because, in the judgment of the scientists, it is relevant to a mission.

The point is that the goals of the laboratories in pursuit of specific missions are different from the goals of universities as the fountainhead of basic research. They are as different for example as the differences between the natural sciences and the social sciences which led us to reject the idea of a single monolithic council covering all research in the universities. The differences in purposes require differences in policies, organization, management and personnel. An analogy may help to illustrate: it could be argued that fisheries, forestry and agriculture have much in common and could be organized as a department of renewable resources. In fact the differences in their goals, solutions, methods of operating and management requirements

[5] Science Council of Canada, *Report No. 4*, October 1968.

are reason enough to have them organized as separate departments. For the same kinds of reasons the intramural and extramural programs of NRC deserve separate organization.

The present combined operation of NRC is disadvantageous in several ways. Both the laboratories and the extramural support programs need a spokesman for their claims. It will be increasingly difficult for one man to speak for both. He must argue for the importance of strengthening research missions on the one hand, and for the importance of research unrelated to missions on the other. The disproportionate growth of the extramural programs will aggravate his problem.

At present the voice of the Council is dominated by the universities. The universities have no reason to complain about this but it can hardly be said to be in the best interests of truly effective laboratory programs. Each group needs a council of advisors tuned to their special needs and devoting itself solely to improving their performance.

The use of NRC scientists as conveners of grant selection committees is inadequate for modern demands. About 40 NRC scientists are engaged in this activity and devote to it on the average 15 to 20 days a year. This scarcely seems sufficient for the administration and careful review of a grant program of $45 million. Their task is to serve as consultants to a small administrative staff (34 persons including clerks and secretaries), to review applications, to make a preliminary assessment and a preliminary allotment of support, to serve as secretary for the grant selection committees, and to prepare budget estimates. Some of these tasks are unfair responsibilities to place in the hands of the conveners; they should represent solely judgments of the committees after the completion of good staff work. Moreover the use of scientists engaged in mission-oriented research to make the initial judgments about research often unrelated to a mission is not likely to be the best way of proceeding in the future.

We believe the grant support program needs full-time conveners who will perform a different set of tasks from those now assigned to the NRC scientists. As proposed in Chapter 8, they should undertake site visits to the universities to develop a broad first-hand contact with the relevant academic community; they should review applications for completeness and correspond with applicants to insure adequate documentation; they should assign applications to referees, review referee reports, and again seek augmentation of the documents when necessary; they should forecast trends and growth rates and should participate in developing annual estimates. These full-time requirements (assuming more frequent processing of applications) are obviously impossible for NRC scientists engaged in research, and one of the reasons for having the grant program and the laboratory program under the auspices of a single agency disappears.

Finally, we believe that a strong laboratory program requires outside scientific review just as does the support program. Part of the membership of

review or advisory committees examining the laboratories will be drawn from the universities. To ask university scientists to evaluate objectively the laboratories of the agency which supports their research is to place them in a most uncomfortable situation, tempting them either to under-assess the work of the laboratories because they look upon them as competitors or to over-assess their worth because they wish to please their sponsor.

Having carefully weighed the above considerations, *we recommend that:*

> **The National Research Council be reconstituted so as to have as its sole responsibility the support of scientific and engineering research in universities and related institutions.**

The organizational form that might be assumed by the laboratories upon the implementation of the above recommendation does not relate to the federal support of university research and hence falls beyond our terms of reference. Whether the laboratories might be reconstituted as a new Crown corporation or emerge in some other guise is an open question that deserves close study by government in the light of recommendations made by the Science Council.[6]

**The Canada Council**

As constituted in 1957, the Canada Council was declared to be a sponsor not only of the humanities and social sciences but also of the fine and performing arts. In addition, the Council was directed to establish a fund to be called the University Capital Grants Fund, to which the Federal Government credited the sum of $50 million from its general revenues. The Council has now committed the entire amount of the Fund, and it appears that, in the wake of the new federal-provincial fiscal arrangements and other developments, the Council's role in capital financing, in its time of signal value to the universities, will be allowed to lapse.

It is precisely in its remaining role as a combined patron of the fine and performing arts, and of the humanities and social sciences, that the Canada Council has been heavily criticized. One of the points most frequently advocated at our hearings was that the patronage of the arts should be divorced from research sponsorship in the humanities and social sciences. A powerful case for separation of the two functions has recently been documented by Professor Mabel Timlin in a report to the Social Science Research Council of Canada.[7] Professor Timlin writes:

> There are probably no two fields of human intellectual endeavour much further apart in their nature, needs and effective organization for productive results in the national interest than the arts and the social sciences. To combine responsi-

[6] *Op. cit.* p. 178(a).
[7] Timlin and Faucher, *op. cit.*, pp. 62-63.

bility for both and also for the humanities in one organization makes the appointment of a governing body competent to formulate sound decisions respecting all the disparate interests entrusted to it, practically speaking, an insoluble problem. It is quite possible that the necessity for informed decisions by the Council had not over a number of years even been foreseen or the dimensions of the problem to be met understood.[8]

This comment is a reflection, in the context of the Canada Council, of the proposition which we set forth above in respect to the National Research Council. Clearly the differences between patronage of the arts and support of research in the social sciences and humanities offer another example of the need to separate their management in the best interests of both. Support of the arts requires a director and a council of persons knowledgeable about the special needs and problems of performance in music, theatre and art. Such persons must not only have an appreciation of art and artists but must be sufficiently discriminating in this appreciation that they can develop policies which will cause artistic enterprise to flourish in our country. To expect to find such persons who are equally sensitive about the conditions required to develop sound research in economics or political science, for example, is to expect fortuitous and unlikely coincidence. It would be just as logical to associate patronage of the arts with the NRC as with the support of research in the social sciences and humanities, for there are probably as many physicists or biologists who are connoisseurs of the performing arts as there are historians or sociologists. The same argument applies to the function of supporting research. The council for the humanities and social sciences needs a strong core of humanists and social scientists among its members.

As in the case of NRC, the organizational and management practices of the body supporting research in the social sciences and humanities needs to be tailored to the goals of a research support program. In fact the whole argument for separating the cultural activities of the Canada Council from research support is essentially the same as the argument in respect to NRC.

As in the case of NRC, the management practices of the Canada Council in respect to support of research can be much improved along the lines elaborated in Chapter 8. Accordingly *we recommend that:*

**The mandate of the Canada Council to support research in the humanities and social sciences be terminated.**

We have given careful thought to whether the Federal Government should create distinct research councils for the humanities and social sciences. It is our considered opinion that separate councils are undesirable. For one thing, it is extremely difficult to place a number of important disciplines, linguistics and history, for example, in the category of humanities

[8] *Ibid.*, pp. 62-63.

or in the category of social sciences. Then, too, as in the use of quantitative attribution techniques in literary criticism, there is a growing tendency in the humanities to borrow social science methodology. Conversely, much important work in social science, such as in the history of political thought, continues to be humanistically oriented. Accordingly, *we recommend that:*

**The Federal Government create a Humanities and Social Sciences Council having as its prime function the support of research in Canadian universities.**

Always consistent with our view that the three federal councils should encompass all legitimate areas of research, we would envisage the new Council as supporting research in the history of art, the history of music and related fields. The Canada Council, for its part, would be solely responsible for the fine and performing arts as such, and would not form a part of the research council structure.

**Need for an Intercouncil Committee**

Our three councils—the National Research Council, the Health Sciences Research Council, and the Humanities and Social Sciences Council—are designed between them to support research in all fields of scientific and scholarly endeavour. It would be naive to expect this to be an easy task in practice. There will be instances where, as in psychology, research proposals may be submitted to the Health Sciences Research Council (clinical psychology), the National Research Council (experimental psychology), or the Humanities and Social Sciences Council (social psychology). Then there are disciplines like geography, anthropology and the history of science and medicine which might come under the terms of reference of one council for one purpose, and of another council for another purpose. The existing councils have proved themselves conscious of such problems, and have evolved various practices and mechanisms to deal with them, with varying degrees of success. We believe that the most appropriate way of meeting the problems posed by research in certain disciplines, and by multi-disciplinary research, is through a formal organism created for the purpose. Such an organism should be composed of the presidents of the three councils, together with such staff and advisors as they deem necessary. *We therefore recommend that:*

**There be established an Intercouncil Co-ordinating Committee.**

With all the goodwill in the world, a co-ordinating body such as our proposed intercouncil committee may find it difficult to meet its obligations fully. This may be so especially when an interdisciplinary proposal should appropriately be funded in part by one council, in part by another. Here the capacity to enter into binding agreements becomes most important. Such capacity is in part a function of the legal status of the councils.

**Legal Status of the Councils**

Each of the existing research councils has a different legal status. The National Research Council is a Crown corporation; more precisely, it falls in the category of Crown corporations known as departmental corporations. Legally, the Medical Research Council does not have an existence distinct from that of NRC. By Cabinet directive, the MRC is a "virtually autonomous" branch of NRC but it operates by authority of the National Research Council Act. As to the Canada Council, it operates as a corporation by virtue of its own Act and reports annually to Parliament through a Minister designated by the Governor General in Council. But the Canada Council is not a government agency.

The National Research Council (and hence MRC) was set up as a departmental corporation so that it might enjoy a greater degree of autonomy from government regulations than operating departments. The Council is indeed independent from certain government regulations, for instance those pertaining to the Public Service, but for many purposes its autonomy is slight. Thus, for instance, the NRC as a departmental corporation is subject to the same provisions of the Financial Administration Act as an operating department. As to the Canada Council, its rather special status was due to a number of considerations. First, the Council was funded by an endowment paid out of the Consolidated Revenue Fund. It was not envisaged that the Council would become dependent on annual appropriations. Secondly, and bearing the endowment fund in mind, it was felt that the Canada Council should have maximum freedom to manipulate the investment of the fund. Finally, it was decided that the Canada Council should appear to be as independent from the Federal Government as possible.

Changing circumstances have made the legal status of the Canada Council ripe for re-examination. For one thing, the Council is now heavily dependent on annual appropriations. For another, it is withdrawing from the area of capital support to universities. Rather than have our proposed Humanities and Social Sciences Council inherit the same legal status as the Canada Council, we believe that status as a government agency is in order. Furthermore, given the similar responsibilities that exist among our three proposed councils, and the close relations we envisage among them, we deem it most desirable that they should have the same legal status.

What should that status be? The logical starting point is the existing legal status of the NRC as a departmental corporation, this because NRC has for the longest period supported research from annual votes of Parliament. Within the governmental framework, the broad alternatives to the status of a departmental corporation are status as a regular department of government or status as some other kind of Crown corporation. We reject as a possibility for our councils the status of an operating department for the same reasons that prevailed when NRC received its present form. The remaining alternative is therefore some other form of Crown corporation, of which there are

two: the agency corporation and the proprietary corporation. The latter form applies essentially to what are government business enterprises, Air Canada for example, and so need not detain us.

In its Report, the Royal Commission on Government Organization indicated that the role and powers of Crown corporations hardly constituted a model of clarity.[9] Thus in the Financial Administration Act we read that a departmental corporation "is responsible for administrative, supervisory or regulatory services of a governmental nature".[10] An agency corporation, for its part, is charged with "the management of procurement, construction or disposal activities on behalf of Her Majesty in right of Canada".[11] Bearing in mind that any government body is administrative in nature, the definition of a departmental corporation hardly offers a neat fit for the National Research Council. The definition of an agency corporation does not suit much better, except that it could be argued that research sponsorship is "procurement". Whatever the case, nothing in the Financial Administration Act precludes the possibility of designating a research support body as an agency corporation rather than a departmental corporation.

From the viewpoint of research support, the differences that attach to status as an agency corporation are favourable and profound. Agency corporations, unlike departmental corporations, are free to set their own standards in remunerating their staff and consultants. More important, they normally enjoy a degree of independence from ministerial supervision that may prove desirable when research findings turn out to be controversial. They are exempt from detailed Treasury Board regulations that govern the letting of contracts, and have complete freedom to invest any trust or endowment funds as they see fit. On the last point, we noted that status as an agency corporation would enhance the capacity of the NRC to manage its trust funds, and would give to the Humanities and Social Sciences Council the same flexibility as the Canada Council enjoys. Generally speaking, agency corporations possess all the broad powers granted to companies by the Canada Corporation Act, under which they are in fact incorporated. Again, however, because they are agents of Her Majesty, they confer to a donor all the tax advantages of a charitable institution in the matter of gifts and bequests. Finally, and of great interest in the support of multi-disciplinary research, agency corporations can enter into legally binding agreements with one another. On the other hand, an agreement between departmental corporations can only be an agreement between ministers and hence is always subject to change.

Agency corporations can and do receive annual appropriations from Parliament. From the government's point of view, agency corporation status

[9] Royal Commission on Government Organization, *Report* (Ottawa: Queen's Printer, 1963), Vol. 5, pp. 68-72.

[10] The Financial Administration Act, 1967, Sec. 76(3)(a).

[11] *Ibid.*, Sec. 76(3)(b).

for all three research councils would terminate the rather anomalous situation with respect to annual appropriations that has only recently begun to prevail with respect to the Canada Council. Furthermore, this status would ensure the same degree of ministerial responsibility to Parliament for each of the three Councils. For all the reasons stated above, *we recommend that:*

> **The National Research Council, the Health Sciences Research Council, and the Humanities and Social Sciences Council each receive the status of an agency corporation of the Government of Canada.**

**Composition and Membership of the Research Councils**

As agency corporations, all three research councils will necessarily be under "councils", or boards of directors, appointed by the Governor in Council. This will involve a departure from present practice only in the case of the Medical Research Council, whose governing body, pursuant to its still-existing ties with the National Research Council, is appointed by NRC.

A number of representations were made to us concerning the manner in which members of the research councils might be selected. In sifting through these representations, our main perspective has been that it is essential to respect the fact that appointment by Governor in Council is a Cabinet prerogative, and that this prerogative is essential to ensure the responsibility of the research councils to the public. Because they would detract from the exercise of the Cabinet's prerogative, we reject as inappropriate such suggestions as those that would give a formal role to learned societies or universities in nominating council members. We would point out, however, the importance of Cabinet making full use of its unfettered prerogative of appointment in the sense that it should canvass researchers, universities and the greater public widely before making appointments. The points of view expressed to us on council membership share in common the fear that such membership runs the risk of becoming restricted to a relatively closed network of individuals. To forestall such uneasiness, we urge that Cabinet, in the exercise of its prerogative, avoid the easy route of canvassing only existing members or officers of research councils before making appointments.

As to the number and terms of research council members, we find several provisions in the existing National Research Council Act which in our opinion should serve as guidelines not only for the reconstituted NRC, but for the Health Sciences Research Council and the Humanities and Social Science Research Council as well. We deem the number of members laid down in the Act, not more than 22 including five officers, as providing a council of suitable size. A council much smaller than this number may be insufficiently representative while one larger than, say, 24 may become unwieldy. In this context, we note that the existing Medical Research Council has 21 members, and the Canada Council 19. Next, we give our unqualified

approval to three-year terms for council members other than officers, with eligibility for re-appointment limited to a second three-year term only. Properly staggered, three-year terms once renewable give simultaneous accommodation to the objectives of continuity and change. Similar practices currently govern terms of membership on the Medical Research Council and the Canada Council. Finally, we fully endorse the inclusion of the president and one or more senior executive officers as full members of councils. We are somewhat mystified that the Canada Council Act does not extend membership to the Director and Associate Director despite prevailing practice to the contrary not only in private enterprise but in Crown corporations.

Our last comment respecting research council membership is in the domain of representativeness. Not going so far as to suggest quotas, we find it entirely consistent with our respect for the Cabinet prerogative of appointment to draw attention to the need for balance in the walks of life from which research council members are chosen. Because the councils serve science and scholarship, the universities, and the greater public, their membership at any point in time should be a judicious blend of researchers, university administrators, the private sector and perhaps public officials.[12] A mix of this type has characterized the membership of the National Research Council, and we urge that it prevail in all councils. Accordingly, we would have for our proposed Health Sciences Research Council a much more broadly based membership than the almost exclusively academic mix prevailing at present on the Medical Research Council, whose total membership other than the Chairman comprises a representative of each of the medical schools in Canada, plus three representatives from dentistry and one from pharmacy. And conversely, we would urge that our proposed Humanities and Social Sciences Council never be allowed to approach even remotely the extreme reached by the Canada Council in 1963-64, when it could be said that "the list of *members of the Council contains not a single name of a social scientist, distinguished or undistinguished!*"[13]

In sum, with respect to the composition and membership of the research councils, *we recommend that:*

**(a) appointments by Cabinet to membership on research councils be preceded by a broad canvass of researchers, universities and the greater public;**

**(b) the number of members on each council be no smaller than 19 and no larger than 24;**

**(c) two or more of the senior executive officers of each council be full members of council;**

[12] Admittedly, representatives of the last-mentioned group may perhaps be less necessary since government has numerous other means of presenting its point of view to councils.

[13] Timlin and Faucher, *op. cit.*, p. 68. The italics are Professor Timlin's.

**(d) save for the senior executive officers, members be appointed on a rotating basis to three-year terms once renewable; and**

**(e) the total membership of each council at any point in time offer a judicious blend of researchers, university administrators and the greater public.**

**Advisory Mechanisms**

By virtue of both their membership and their staff, the three research councils we propose should constitute an invaluable source of expertise upon which government can draw in making major decisions of a policy nature. Given our confidence that the respective councils and their staff will be important repositories of expert knowledge, we deem it most desirable that their advice receive consideration at the highest levels of government. Accordingly, each of the three councils should have direct access to Treasury Board, and should look upon the annual preparation and substantiation of its estimates as one of its major responsibilities.

While the advice that emanates from the councils in the process of defending their estimates will prove invaluable, it will in the nature of things be composed of conflicting elements. Taken together, the three councils will be advancing claims on behalf of research in universities. But what proportion of the nation's research effort should be performed in universities as opposed, let us say, to government departments and industrial firms? When looked upon individually, each of the councils will attempt to build the strongest possible case for research support in the natural and engineering sciences, the humanities and social sciences, and the health sciences, respectively. But how is government to judge the validity of the claims put forward on behalf of each of these broad lines of scientific and scholarly endeavour?

The nature of these questions, which go to the heart of the priority-setting process, is such that they can be answered ultimately only by the government. We are concerned that, in its attempts to resolve them, the government should have the benefit of expert advice. We also realize that government will have to look beyond the research councils, which are competitors in the appropriations process, for the required expertise.

We believe that the logical starting point is to recognize that the two questions we pose are of a different order. The first question, which focuses upon what constitutes an appropriate balance in the respective research efforts of government, industry and universities is a long-run question, and is particularly relevant in the domain of science and technology. It is a long-run question because the respective research capacities of government, industry and universities cannot be re-oriented from year to year, but rather should evolve in keeping with an over-all plan of development. It is one that must be posed especially in the domain of science and technology because it is

here above all that each of the government, industrial and university sectors has legitimate claims that are far from automatically compatible.

There has existed since 1966 an organism charged with the task of tendering advice to the government on science policy. The Science Council of Canada was formed "to assess in a comprehensive manner Canada's scientific and technological resources, requirements and potentialities, and to make recommendations thereon" to the Minister responsible. In meeting this responsibility, the Council is required specifically to engage in "long term planning for scientific and technological research and development in Canada", and to advise on "the responsibilities of departments and agencies of the Government of Canada in relation to those of universities, private companies and other organizations in furthering science and technology".[14]

It is our considered opinion that these tasks require the expertise not only of natural scientists and engineers, but of social scientists as well. The benefits and costs, and also the social effects of alternative science policies, constitute problem areas in which the assistance of social scientists is indispensable. The Chairman of the Science Council of Canada, in his testimony before the Senate Committee on Science Policy, and the Economic Council of Canada, in its Fifth Annual Review, have both called attention to the role of the social sciences in shaping science policy.[15] *We therefore recommend that:*

**The Science Council of Canada Act be amended so as to provide for appropriate representation on the council of the social sciences.**

The question of how the nation's research effort should be apportioned among universities, government and industry, as we have pointed out, is particularly acute in the domain of science and technology. Where the social sciences and humanities are concerned, the fact is that this effort is much more exclusively in the domain of the university sector. Accordingly, while we have considered the possible expansion of the Science Council into a broader "Knowledge Council", and also the advisability of creating a parallel body to the Science Council to deal with scholarly policy, our conclusion has been that such moves would be premature at this time. However, such recent developments as the announcement in the 1968 Speech from the Throne of a government-sponsored social science research institute suggest that the time for concrete action on such possibilities may not be far removed.

We have posed a second major question, which touches upon the allocation of funds among our three research councils. This question is of a

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[14] Science Council of Canada Act, 1966, Sec. II.

[15] Senate of Canada, *Proceedings of the Special Committee on Science Policy*, March 13, 1968, p. 55; Economic Council of Canada, *Fifth Annual Review*, Ottawa, 1968, p. 53.

different order from the first because it affects the university sector exclusively, and is of necessity one that arises on a year-to-year basis as well as over the long run.

In deciding on yearly appropriations, the government uses as its principal organ the Treasury Board, which is a committee of Cabinet. In performing its task, Treasury Board is reinforced by an expert staff of public servants who have specialized in the operations of the many departments and agencies of government. We greatly appreciate the magnitude of the responsibility discharged by Treasury Board staff in rendering impartial advice on the claims advanced by the spending agencies of government, and we would countenance no diminution in the capacity of staff to perform this role with respect to university research support. But given the delicate task of apportioning what we trust will be annually growing outlays among the natural and engineering sciences, the health sciences, and the humanities and social sciences, we deem it most important that the work of Treasury Board and its staff be supplemented by a source of outside advice divorced from the research councils, yet sensitive to university needs and practices.

We wish to propose the creation of a Canadian universities research advisory committee to fill this need. Composed of not more than, let us say, seven persons closely acquainted with university operations, we envisage this committee as a body that would supplement rather than obviate the analyses of Treasury Board staff. The committee would enable Treasury Board, among other things, to gauge the impact of its decisions upon research in the country. In proposing a Canadian universities research advisory committee, the farthest thing from our mind is to provide the universities of Canada with an advocate that other interest groups lack in the rough and tumble of the appropriations process. Our concern, which we are confident is shared within the government, is rather to ensure that decisions on the allocation of public funds for research support are made in fuller awareness of their potential impact on research than may be the case at present. Pursuant to this aim, we do not envisage the Canadian universities research advisory committee as a body that would report to the public on what is regarded as sound government policy. Public knowledge and debate are both appropriate and desirable in the matter of long-term national goals, on the scholarly and scientific content of which such bodies as the Science Council can properly advise. But the annual spending decisions are in the last analysis decisions upon which Cabinet members must stand or fall before the nation's elected representatives in Parliament. Accordingly, *we recommend that:*

**The Government of Canada create a Canadian universities research advisory committee to make available to Treasury Board advice on the allocation of public funds for sponsored research in Canadian universities.**

## Chapter 6

# POLICIES FOR RESEARCH COUNCILS

### Role of the Research Councils

Having dealt with the organization of the federal research councils in Chapter 5, we turn in this Chapter to their broad policies in support of university research. The management practices associated with these policies are discussed in Chapter 8. Both the organization and the broad policies of the research councils are considered within the context of the whole federal role in university research. Therefore we begin by reiterating the distinction between the objectives and policies of the research councils and the mission-oriented agencies of the Federal Government.

Federal research relationships with the universities range from grants-in-aid with a minimum of limitations on how the money is spent, to research contracts where the terms spell out what is expected of the recipient; from very small amounts of a few hundred dollars or less, to large amounts involving several million; from rules against the payment of researchers' salaries, to payment of full salaries with assurance of support until retirement age; from partial payment of the direct costs of research, to payment of nearly all direct and indirect costs including salaries of grantees; from basic studies of interest only to the university researcher, to applied studies of direct interest to government departments; from support concerned with stimulating research and producing manpower, to support that draws faculty away from their academic concerns and obstructs the production of manpower.

The bewildering multitude of practices and policies is a product on the one hand of a gradual evolution of procedures followed by different councils and, on the other, of growing dependence of departments and agencies on the universities. As noted in Chapter 5, all of the policies can be divided into two classes: (1) those concerned primarily with the welfare of the universities and the promotion of research in them; (2) those concerned primarily with the accomplishment of some mission important to the Federal Government where the universities directly (or indirectly through the provision of specialized manpower) can contribute to the mission. In short, one class of support serves primarily the university and the other class serves primarily the mission.

Although these ultimate purposes are in most instances clear, the practices intended for one purpose may equally support the other. Indeed, the practices themselves may be indistinguishable regardless of the purpose. A

department wishing to encourage the development of manpower to meet its internal requirements may make grants to universities indistinguishable from those made by the National Research Council. The opposite is also true—a practice intended to help the universities may in fact operate as a threat; or a practice designed to help a government department may entirely fail in its objective. We have seen examples of practices of the latter type which nevertheless have served the university well. In judging policies or procedures, a first criterion must be how well they serve the primary goal. A second criterion is whether they serve ancillary goals. A third criterion is whether they serve their primary goal without conflicting with the accomplishment of other goals.

Our discussion of Federal Government policies in university research makes a clear separation according to the primary objectives. This Chapter is concerned with the Federal Government's direct interest in Canadian universities as expressed through the councils whose duty it is to support university research. In the following Chapter we deal with the Federal Government's interest in supporting research related to its various departmental missions. We are concerned in this Chapter with the role of Councils in: (1) the provision of funds related to the direct or indirect cost of conducting research; and (2) the support of personnel aimed at allowing them or encouraging them to engage in research activity. Considered elsewhere are the support of graduate students and the costs of research buildings.

**General Policy Principles**

A major recommendation we wish to reiterate is that the councils must be prepared to sponsor meritorious research in any academic discipline in which Canadian universities are involved. In point of fact it must be recognized that there exist striking differences in levels of research support in different fields. This, to some extent, reveals less an unwillingness to support particular fields than a shortage of university personnel qualified to put forward meritorious proposals and a lack of an established research tradition in some disciplines. Data illustrating the striking differences in research activity in different sectors of the university are shown in Chapter 3. An example from one large university, the University of British Columbia, shows dramatically the differences that exist in different fields (Table 3:6). In this particular university, the total funds allocated to research in 1967-68 amounted to about $9 million. The natural sciences received 40 per cent of the total; the combination of the natural sciences, engineering and health received 92 per cent of the total. Social sciences received only $433,000, humanities $100,000 and arts just $11,000. Several of the most active research departments each received in excess of half a million dollars—more than all the social sciences, humanities and arts combined.[1] The important

[1] The allocation of disciplines to sectors of university activity was arbitrary and in some cases is debatable, e.g., home economics, social work, librarianship. Reallocation would make little difference to the total figures.

observation is that within each sector wide differences occur in the research activity in different disciplines. Some departments are active, some are not. Neither these figures nor those showing support through councils according to discipline can disclose whether the reason for little support is lack of sympathy on the part of the councils or lack of interest within the disciplines.

However, we do not feel that any reasonable policy on the part of the councils should be expected to eliminate all of the wide differences which are observed. Some fields by reason of content, personnel and stage of development are ripe for exploitation by research; others are not. Research in some fields requires expensive facilities and instrumentation; in other fields the opportunities may require very modest sums for useful research. Some fields place demands on faculty for creativity to a degree that over-shadows the effort devoted to research. Examples include creative writing, theatre, music, fine art, architecture. This is not to say that opportunities and need for research may not exist in such fields but only that the emphasis on creative art at the present time is greater than on research.

Although the councils should be prepared to sponsor meritorious research in any academic discipline, they should not be seeking to allocate funds evenly to all disciplines. We see the councils in a responsive role, organized and prepared to react promptly to university initiative but we do not feel that they should formally attempt to stimulate interest in particular fields. That responsibility, to determine in which fields it wishes to mount research efforts, lies with the university. This point bears emphasis. We have heard proposals (which we reject) that councils should by their granting policies mould the research efforts of the universities. If they consider particular fields to be important, they should adopt policies to emphasize them. If they consider the manpower in certain fields to have reached saturation, they should restrict research grants to dampen further development. If, however, manpower shortages exist they should be generous in research support to encourage development in such fields. These arguments appear to us to offer an unsatisfactory means of dealing with a genuine problem.

The country as a whole and the provinces must be concerned about manpower requirements. This concern can be expressed in the first instance through careful survey and forecasting of manpower needs on a continuing basis. Such forecasts should be given wide circulation. It is reasonable to expect that universities will respond by creating additional opportunities for study in the areas of shortage. In addition, the universities through their counselling services have a duty to advise students about the opportunities in various fields from the standpoint not only of intellectual challenge but also of vocational prospects and social utility. The reaction of prospective students to such forecasts is likely to provide an effective control. We believe the market-place, if its trends are made explicit, offers an adequate governor to prevent serious surfeit and to encourage movement of students toward fields of opportunity. We suggest that the councils should pay little attention to

such matters even in the award of scholarships and fellowships. Students should have the right to select their field and we believe their understanding of the market-place to be sufficiently canny that the proffering of more generous fellowships in some fields than others is unlikely to influence the decision of very many.

Assuming the councils adopt a position of being prepared to respond to initiatives emanating from the universities, they remain faced with the difficult task of allocating funds between fields. This matter must be looked at differently in the councils than in government departments. The latter, properly, should emphasize those fields with most relevance to the departmental missions. Councils are concerned with research in universities *per se* and should avoid judgments implying, either on a short-term or long-term basis, greater significance of one field than another. After all, it is a truism that the application of basic research, regardless of the field, is unpredictable. As observed by Kistiakowsky, "no man was wise enough in 1900 to foresee that the Curies would make a major contribution to the cure of cancer".[2] We propose therefore that the basic criterion which councils should use in allocating funds to various fields should be the number and merit of requests for support and the peculiar costs of different types of research. Thus, developed fields with large numbers of competent investigators would receive a larger share than undeveloped fields. Nevertheless, the councils would be sensitive to changes in demand and would reallocate their resources accordingly. In judging demand the councils should be aware of support coming from mission-oriented agencies of government and should make appropriate adjustments in their support of particular fields. The councils should in fact serve a "balance-wheel" function, placing their resources more heavily at the disposal of disciplines not effectively supported through mission-oriented agencies, and meeting demands in areas within disciplines which are not of interest to the agencies.

We refer above to formal relationships between councils and the universities. We are conscious, however, of the expertise that will be found on all councils which may lead members to personal views about research opportunities and needs. We would expect and encourage interaction between members of the council and researchers in the universities aimed at identifying exciting leads and possibilities, as a normal way of aiding Canadian academics to develop and maintain positions at the forefront of research.

The coverage of research costs by a federal research council is a complex and controversial question about which we heard a variety of opinions. Should the grants made by the councils be merely "grants-in-aid" making the universities partners of the councils in the funding of research? Alternatively, should the research councils pay realistic overhead along with their grants and should they pay the research components of academic salaries? Both

[2] *Basic Research and National Goals*, National Academy of Sciences, 1965.

extremes are fraught with danger. The "grant-in-aid" philosophy often means that the universities must rob their normal academic programs to pay for their share of the research partnership; full cost coverage could lead to undue control of the universities by the Federal Government. Our answer to the question of cost coverage comes in five parts and steers a middle course aimed at retaining university autonomy, establishing Council responsibility for council actions and removing the jeopardy to other academic programs. The university research costs are divided into direct costs (research materials, salaries of research personnel, research services such as computing, travel, etc.), indirect costs (plant maintenance, general administration, etc.), academic salaries, research buildings, and graduate student support. The last two of these are dealt with in later chapters. The direct costs have been the objects of grants made by the research councils but the grants have not always allowed coverage of all the direct costs. *We recommend that:*

**The research grants of the federal research councils cover all the normal direct costs of university research whenever these grants are made.**

To implement this recommendation the councils will need to adopt uniform definitions of direct costs. The indirect costs of research and the payment of academic salaries are dealt with later in this Chapter where we are led to recommend that the universities should pay academic salaries while the councils should pay the indirect costs. Before dealing with this matter we describe our proposals for the research grants to be made by the councils to cover the direct costs of university research.

The councils at present offer a variety of grants covering the direct costs of research in a number of different situations. They have arrived at their granting policies independently and similarities between the policies, where they exist, are fortuitous. We believe the adoption of basically comparable granting programs by all the councils would be helpful, although we do not favour any slavish dedication to conformity. We believe too that a small number of basic types of grants can cover the range of situations deserving support. They fall into two classes: (1) the support of projects or programs and (2) the support of personnel (postdoctoral fellowships or leave fellowships). The project or program grants range from small individual grants to large multi-disciplinary grants involving many research workers. The review procedures to be adopted by the councils vary with the size of the grant and are described below in association with each kind of grant.

### Individual Project Grants[3]

The first type of grant is the project grant applied for by individuals. The bulk of federal support for university research has come in this form and

[3] The term "grant" in this Chapter means only an allocation of funds and is not intended to describe the form of legal instrument used to provide support.

we believe support of this kind will continue to be important. The applicant should be requested to specify the purpose of his investigation, the methods he proposes to use, the facilities available to him, his qualifications and the qualifications of other personnel participating in the project, the time required for the study, and an annual budget, listing personnel and salaries (including released time if necessary),[4] materials and supplies, equipment, travel and other expenses. The project should be refereed, in general by two referees independently, and should be judged by an expert committee covering applications in the discipline of the applicant and perhaps related fields. The adjudicating committee should have available to it the application and the referees' reports. It should judge the project on its merit and the applicant's qualifications to carry it out. It should also assess the reasonableness of the budget if the application otherwise warrants approval.

The question of merit is an important one. The number of truly outstanding research workers is very small. Harvey Brooks estimates that in the United States the truly talented and creative researchers may not represent more than five per cent of all those capable of doing competent and significant work.[5] He argues for the necessity of funding not only those who are highly talented and creative but also those competent investigators whose individual contributions may be modest but whose work in sum provides the foundation for occasional major discovery. We agree, but we believe that the judgments require a hard look at the proposed program as well as at the credentials of the investigator. NRC has tended to support the man with little consideration of the merits of the project. Those who begin to receive support from NRC are more or less assured of continuing support at increasingly higher levels year after year. The result is that NRC has had an extraordinarily high rate of approval of applications. In 1968-69, of 3,816 applications in all fields, 3,570 were supported. Only 6.4 per cent were rejected (Table 6:1). On the other hand, NRC awarded only 60 per cent of the requested funds in the same year. The Medical Research Council considered 1,465 applications for grants-in-aid in 1967-68 and rejected 299 (17 per cent). The Canada Council approved 350 applications which represented 66 per cent of those it received—a rejection rate of 34 per cent. We believe all the councils should consider carefully the quality and significance of the work they are asked to support. We are convinced that the National Research Council in its policy of supporting persons rather than projects has erred in neglecting to make a continuing critical judgment of the merit of proposals. More of the weak requests should have been rejected and more of the meritorious requests should have received full funds. We understand and sympathize with one of the considerations which encouraged the NRC policy,

[4] As noted below in connection with research leave fellowships, released time should be allowed only when essential to the research and not for the purpose of compensating for heavy teaching assignments.

[5] *Basic Research and National Goals,* National Academy of Sciences, p. 99, 1965.

namely, the fact that often the funds were being used largely as stipends for graduate students. Elsewhere we propose a different solution to this latter problem. *We recommend that:*

> **In the interest of a strong program of research, the primary considerations of all councils in judging grant applications be the merit of the proposals and the qualifications of the applicants to carry them out.**

An important consideration in facilitating the above recommendation and those that follow is the structure and operation of review committees in all the councils. The review committee, of course, must be expert. Its membership should consist of persons actively engaged in research in the fields for which the committee is adjudicating applications. They need not all be engaged in research in universities. Indeed, we believe it desirable and sound wherever practical to seek some review committee members from the ranks of researchers in government and industry. The committee size should be large enough to include specialized knowledge covering the general range of applications submitted and small enough to encourage meaningful discussion of applications. Depending on the field, the number of members might be as small as six or eight or as large as 12 to 15.

The number of review committees should be related to the number of applications with the object being to guard against overloading the committee and thereby ensure proper attention to applications. We suggest that a committee, provided with properly documented applications and at least two referee reports, cannot deal adequately with more than perhaps 50 applications a day (although this number may vary somewhat in different fields). To deal effectively with such numbers, each member of the committee would need to receive all the relevant documentation well in advance of the meeting.

Most important of all is the system for appointing members to review committees. Obviously, membership should be for specified terms (three or four years) non-renewable,[6] to ensure a constant infusion of fresh thinking on each committee. For the same reason it is essential to avoid self-perpetuation of membership arising from the committee choosing its own replacements. Such a system runs the risk of inadvertently perpetuating biases as members seek replacements whose views reflect their own attitudes. Each committee should have a secretary who is a staff officer for the council. He should be responsible for seeking the opinions of the research community about suitable persons for membership on the committee and he and the chairman (whose term also should be limited) should make recommendations to the council for appointment of new members to the committee.

[6] We believe "turnover" of membership on review committees should be faster than that of membership on councils. The review committee is concerned with the merit of individual proposals; councils are concerned with policies.

Terms of membership, of course, should be staggered so that the committee would always have some experienced members.

The above proposal for reviewing committee appointments represents only one way of accomplishing the desired infusion of fresh thinking. Others could be devised and we hold no special brief for the one suggested except that we know it has been used with success by the National Institutes of Health in the United States. We believe, however, that the principle is important and *we therefore recommend that:*

**Membership on review committees be for limited terms and that replacement members be selected by a system which does not depend on the judgment of members of the committee.**

### Program Grants

A second type of grant required is a program grant—distinguished from a project grant in that the former will engage the efforts of a number of investigators working jointly on a problem. Such a grant might be used to support the research of one or more departments where the work of various investigators would follow a general line with an over-all objective. Program grants could be made to departments or named groups of investigators or scholars. Applications would require, in addition to the types of information outlined for a project grant, the naming of a program administrator. We see the advantage for the group involved being a greater degree of flexibility and a greater chance of responding quickly to new opportunity arising out of findings than would be possible when supported by a series of individual project grants. The disadvantage is the danger that a review committee may find one or two parts of a complex proposal weak and as a result reject the whole application. To avoid this possibility the review committee might provide partial funding of the program and make explicit recommendations concerning the parts of the program it considers lacking in sufficient merit.

Our treatment of program grants suggests that they can be handled by the normal review committees established by the councils for dealing with individual project grants. This will usually be so but a large program may require special treatment, perhaps an *ad hoc* review committee of the kind required by the large multi-disciplinary grants discussed below. We wish to have all the councils consider program or group grants but we wish to leave them free to adopt *ad hoc* review procedures whenever the councils deem them appropriate. *We recommend that:*

**Each of the federal research councils consider applications for group grants or program grants in addition to individual project grants.**

### Major Grants

More and more opportunities will arise for large-scale multi-disciplinary research in universities, concerned with issues such as transportation, urban

planning, pollution, crime, mental health, communications, etc. These opportunities will vary in scope and complexity. Sometimes opportunities will exist for members of a few departments to co-operate in an enterprise. Sometimes targets will require the co-ordinated efforts of natural scientists, engineers and social scientists. Sometimes proposals may be beyond the resources of any single university and require the efforts of a consortium.

A comparable situation is the requirement for large expensive installations or equipment for certain types of work. Examples include accelerators, telescopes, data banks, space hardware, etc. In these cases the requirements may or may not involve several disciplines but the costs may be very high. The TRIUMF project involving a meson accelerator for several western universities is a case in point. This project in low-energy nuclear physics will commit $20 to $30 million. The costs involved are of three types: (1) those required to construct, house and install the equipment, (2) those required as an annual operating expenditure to maintain and operate the equipment, and (3) those required to cover regular research proposals emanating from the physicists, chemists and engineers who may wish to use the facility for their research.

We see such major proposals differing from program proposals in two and often three ways. In the first place, to be classified as a major proposal subject to stringent *ad hoc* review procedures proposed below, the funds involved will generally be larger than in the case of a program grant. While no arbitrary distinction between the two types of support based on dollar value alone would be wise, we visualize major grants as involving in the order of $1 million a year or more. Secondly, because of the significant sums required, decisions about such grants involve questions of public policy and priority requiring a different emphasis in adjudication than the smaller program grants. Thirdly, the nature of such proposals is likely in most cases to involve the need for expensive physical facilities—buildings or major equipment. None of these criteria is precise or absolute, and yet together they describe a proposal which differs from a program grant. Because they are not precise, we leave the decision about how to classify a particular proposal to the administrative fiat of the councils or their intercouncil co-ordinating committee. In any case, we wish to leave the councils free to adopt appropriate *ad hoc* review procedures for other large grants which are not formally classified as major proposals.

Whatever the complexity and numbers involved in these major proposals, the granting agencies should be in a position to provide expert appraisal. *We therefore recommend that:*

**Funding of Major Proposals should be available where the submission warrants such action.**

The relatively simple arrangements suitable for adjudicating project and programs applications would not be suitable for these major undertakings in

the category of "big science". No standing review committee would be likely to have the breadth of expertise to make the judgments required. In some instances no one council could provide the expertise. Beyond the problem of judging technical merit, a question of priorities arises in the expenditure of very substantial sums. How important is the proposal from the standpoint of scientific significance, Canadian interest? Is it within the financial capabilities of the councils or would it require special funding?

Here the line which we have drawn, distinguishing research supported because it is of interest to the universities and research supported because it will contribute to some other government objective, becomes obscured. The very size of these projects requires that they be reviewed from the standpoint of both university interest and public interest. The basic principle we propose, therefore, is that the approach to appraisal for major multi-disciplinary proposals be *ad hoc*. We suggest a standing committee of the councils (one serving all councils) which shall be responsible for setting up the necessary *ad hoc* arrangements for reviewing proposals. This committee in fact should be the intercouncil co-ordinating committee referred to in Chapter 5. The review committee established on recommendation of the intercouncil co-ordinating committee should have representatives from all interested parties. These would certainly include the councils, each of which would want the necessary expertise on the review committee. It might also include nominees from one or more departments of government where the proposal relates to departmental missions. In some cases the public interest may be involved in ways which extend beyond the current objectives of departments. In such cases it may be desirable to have persons appointed to the review committee by the Governor in Council. Other parties which may have an interest in particular proposals include provincial or municipal governments, business, industry, etc. Beyond the confines of the review committee, such matters are of interest and concern to the general public. We suggest therefore that the review committee augment its private deliberations with hearings open to the press and that efforts be made to see that the public is informed about the nature and significance of the proposal while the review is in progress. The decisions taken, because of their size and the large commitment of both money and men, are strategic decisions of importance to the nation. In the case of the very large proposals, the decisions become essentially political after the feasibility of the proposal appears to be assured. How important is it to the country? The more comment that can be heard from the academic community and an informed public, the better. These decisions will settle a number of research priorities for years ahead and the price of error is high. Therefore participation in the debate should be as broad as possible.

The review committee would be required to judge:

1. the scientific and technical merit of the program;
2. the ability of the applicant group to carry out the program;

3. the adequacy of proposed arrangements for administering the program;
4. the size of the budget required;
5. the degree to which the program relates to the interests of departments of government;
6. the degree to which the program would serve the national interest beyond the objectives of established departments of government;
7. whether or not joint funding from councils and departments is desirable; and
8. whether a recommendation should be made to government for special funding beyond the regular budgets of the councils and interested departments.

The recommendations of the review committee would be made to the councils and departments involved. These in turn would decide whether to proceed and whether to request from government any special funding deemed to be required. In the event the major multi-disciplinary grant is approved, the *ad hoc* review committee (possibly with some modifications in membership) should remain active to receive reports from the grantees and to be available for advice to them.

Before leaving this topic we wish to draw attention to the useful discussion concerning the role for the Social Sciences Research Council developed by Mabel Timlin in a study of the social sciences in Canada.[7] Professor Timlin emphasizes the great size and complexity of many of the issues to which the social scientists should be devoting much of their efforts. She offers a number of examples within the United States of highly significant programs which have been far beyond the capabilities of any one university. The Brookings Quarterly Econometric Model of the United States is a case in point. A vast undertaking, it has involved the planning services of the Committee on Economic Stability of the Social Science Research Council of the United States and it has employed experts from 15 universities, the Brookings Institution, the Federal Reserve Board, the United States Bureau of the Budget, the National Planning Association and the International Monetary Fund.

Professor Timlin argues, and we agree, that there is need for a planning and catalyzing function for the social sciences in Canada. She proposes that a reformed social sciences research council:

1. act as partner and adjunct to the universities and other research institutions in facilitating communication among specialists and helping to implement research and granting ventures that cannot be encompassed within a given institution;

[7] Timlin and Faucher, *op. cit.*

2. institute gradually a structure of research-planning committees so open with respect to membership that the most highly qualified specialists in any area of the social sciences may be brought together for the formulation of research projects important to Canada;
3. arrange for surveys and studies of human resources in the various areas of the social sciences in Canada; and
4. in conjunction with the organization which is the source of funds, establish a register of all current research projects being carried on in the social sciences in Canada.

We believe such a reformed social science research council would be performing important functions and we would only add the proposal that the advice of this council or appropriate committees within it should be available when needed to *ad hoc* committees reviewing major multi-disciplinary proposals.

In fields other than the social sciences there are also bodies which might serve a role similar to that proposed for the Social Sciences Research Council. Thus the Humanities Research Council or various voluntary agencies such as the Canadian Heart Foundation, the Cancer Foundation, etc., might be asked to serve in an advisory capacity for review committees of major multi-disciplinary proposals in the appropriate fields.

**Negotiated Development Grants**

Two types of grants are currently offered by two different councils under the same name—Negotiated Development Grants. We believe both models serve useful purposes and should be used by all the councils. To avoid confusion we suggest different names for each model.

The Negotiated Development Grant as employed by NRC is designed to build on strength. A sizeable grant (currently in the area of one or more hundreds of thousands of dollars per year) may be given annually over a limited number of years, three to five, to an area of research where a university already has effective strength (Table 6:2). The object is to assist the university to develop a real centre of excellence by adding staff and facilities to its group. The policy recognizes that there is such a thing as "critical mass" in terms of establishing highly productive research groups, and the grants are intended to facilitate attaining this objective. Here we depart from our policy of assigning responsibility for staff salaries to the university because we believe development grants provide the only practical way to create centres of excellence. The university in accepting the grant, moreover, is making commitments for future salary because the grant is for a limited period. *We therefore recommend that:*

**All the federal research councils be prepared to consider applications for Negotiated Development Grants designed to build on strength.**

The negotiated development proposals received by each council will need to be reviewed by *ad hoc* committees of the council, similar in nature to the *ad hoc* committees required by the major multi-disciplinary proposals.

**Strategic Development Grants**

The Medical Research Council employs the term "Negotiated Development Grant" for a different purpose. Here the object is to recognize a need, desire, and willingness to initiate a significant program where it does not exist. The university must decide that it wants a development in the pertinent area and it must indicate how it intends to proceed. The Council judges the prospects of the proposal being successful and assesses the importance of encouraging this effort in terms of developing regional strength in special field in all areas of Canada, and in terms of unique opportunities and needs in the region.

We consider this type of grant desirable under the auspices of all the councils. Like the negotiated development grant discussed above, it should be available for periods of three to five years after which the grantee would have to depend on regular competitive support programs. We propose that this type of grant be known as a Strategic Development Grant. Since it will commit the university to continuing support following the development periods, the application should identify the source of future funds and certify their availability. The application should be signed by the president and carry the imprimatur of the board of governors. *We therefore recommend that:*

> **All the federal research councils be prepared to consider applications for Strategic Development Grants designed to initiate new programs.**

Like the proposals for Negotiated Development Grants, the proposals for Strategic Development Grants received by each research council will need to be reviewed by appropriate *ad hoc* committees of the councils.

A corollary of our recommendation concerning Strategic Development Grants is a recommendation to discontinue certain types of support now in existence. We refer to support such as the 7½ per cent premium on total research grants to an institution, which NRC allocates to university presidents. This amount is for the support of research in fields covered by NRC support and its allocation is at the discretion of the president. In universities with limited research support a minimum of $25,000 is available on request in lieu of the 7½ per cent provided automatically. A second example is the annual grant of $24,000 allocated to deans of medical faculties by MRC. This amount serves essentially the same purpose in medicine as does the president's fund relative to the whole scientific effort of the university. A third example, analogous to the first two, is an annual grant of $40,000 paid by the Department of Forestry to deans of forestry. This latter example represents support from a mission-oriented agency but because it is so similar

in design and purpose to the general grants provided by NRC and MRC, we have chosen to include it in the present discussion. All of them are examples of funds allocated essentially "without strings".

We believe grants of this kind have been much needed in the past because they have permitted the universities to achieve a small measure of flexibility in the support of research despite the fact that the policy of providing grants-in-aid without meeting indirect costs has placed a financial burden on the universities. Such funds have been used for summer research stipends, for salary supplements, for "start-up" support of new faculty members, as a fund against which faculty can apply for direct support of their research, etc. We believe that, if the councils provide the universities with funds to cover the indirect cost of research as recommended below, general purpose grants would become much less essential. The universities in fact would be placed in a better position to budget from their own general revenues for the purposes for which these funds are intended.

It is not for this reason, however, that we advocate discontinuing such grants; rather it is because no adjudication is attached to these "general" grants and therefore no application of criteria is entailed. We believe that the concept of Strategic Development Grants is preferable to general support grants. The grantee institution is compelled to develop a concrete proposal about how it intends to strengthen its research. The grantor has the opportunity of judging the soundness of the idea. The concept of merit should be broadly applied and should be addressed to such question as:

1. What is the proposed program and why is it desirable?
2. How well does it conform to the goal of encouraging balance among regions and among English and French speaking universities?
3. In the case of small institutions and those without graduate schools, how well does it solve their special problems in generating research capability?

We believe a significant program of strategic development grants can be more effective in implementing new strength in both small and large institutions than can any program of automatic general purpose grants. We see no reason why NRC, for example, should not reserve all of the funds at present allocated as a $7\frac{1}{2}$ per cent premium for the purpose of awarding Strategic Development Grants. We would hope that the other two councils might do likewise. *We therefore recommend that:*

**Subject to initiation by the councils of a program of strategic development grants, non-adjudicated general purpose grants be discontinued.**

### Support of Research Personnel

The support of research personnel falls into several categories including secretarial assistants and technicians, graduate students, research assistants or

associates, post-doctoral fellows and university academic staff. Of these the secretarial assistants and technicians as well as the research assistants or associates hired for a specific project are covered within the direct research costs of the various grants. Graduate student support during the academic term is *not* considered by us to form part of the costs of research grants; their support is considered in Chapter 10. Here we deal with post-doctoral fellowships and the support of academic staff requiring research leave.

Later in this Chapter we adopt the general principle that all academic salaries should be paid by the universities themselves. This principle arises in part from the wish to retain for the university control over its own faculty and partly from the difficulty in separating university research from other university programs such as teaching and administration. The one exception we would make to our general principle concerns payment of leave whenever a particular research project requires a staff member to relinquish his other academic duties. Such leave arrangements must be short-term (normally at most a year) and must not be used for sabbatical leave. The post-doctoral fellowships are quite distinct from the research leave fellowships discussed below and do not form an exception to our general principle concerning academic staff. Research leave fellowships apply to full-time academic staff desiring to obtain leave from their institution to carry out their research project; post-doctoral fellows do not hold any continuing full-time academic appointment.

The National Research Council for some years has offered post-doctoral fellowships in the sciences. These have been looked upon as a means of enhancing qualifications acquired by scientists in their doctoral studies through an opportunity for concentrated experience in research at the beginning of their careers. The long tradition of post-doctoral fellowships in the sciences has no parallel in the social sciences and humanities. However, the potential contribution of a post-doctoral research experience to these disciplines is gaining increasing recognition. Thus, the Canada Council has recently instituted a post-doctoral program. Because we recognize the desirability of offering post-doctoral fellowships in all disciplines *we recommend that:*

**All councils offer post-doctoral fellowships for recent graduates to enhance their qualifications for a career in research.**

The applicant should apply directly to the council but his application should identify the name of a faculty member prepared to sponsor and accommodate him. Alternatively, the councils may wish to make arrangements for larger institutions to handle their own applications for post-doctoral fellows. Such fellowships should be tenable for a maximum of two years.

The second type of personnel support concerns research leave. *We recommend that:*

**Research leave fellowships be available through each council.**

This type of support is particularly important to the humanist but may also be essential for the social scientist or natural scientist. A common experience for the humanist is the need to spend a year away from his campus making use of the resources of one or more of the world's great libraries. The social scientist or the natural scientist may require a period of absence from the university to gather essential data for his research. A faculty member, because of the nature of his research, may require a period of time on his own campus to concentrate on his project, a period during which he will need to be free from all or part of his other duties. All these situations represent legitimate research requirements which can be met by a policy of offering research leave fellowships. We suggest that such fellowships provide up to full salary and the cost of essential travel. They should be applied for by the individual through the university and the application should carry the university's endorsement. Depending on the research, the leave might be short (three or four months) or up to a year. Longer periods might occasionally be justified by the nature of the work. The applicant should make clear the exact purpose of the research and should be eligible to apply for a project grant in addition to the fellowship. An applicant applying for a fellowship to permit work on his own campus should be asked to indicate what, in the nature of the project, requires concentrated effort justifying a leave from other duties. We would not like to see such leave used to compensate for unreasonable teaching loads imposed by the university. We propose that the councils make payments to the university which would hold the income in a special trust fund payable to the grantee. By making the university the agent of the council responsible for making the payments, the councils would ensure that the universities were promptly informed when fellowships were approved. By making the applications through the university in the first instance, the councils would be assured that approval would not confront the university with unanticipated difficulties in arranging for replacement.

Although we support the idea of research leave fellowships for specific and identified purposes and propose that the councils pay full salary in such cases, we do not think councils have any business in the field of sabbatical leaves.[8] This is not to say that a person eligible for sabbatical cannot apply for a research leave fellowship but only that the two decisions should be independent. A sabbatical leave is a leave to which faculty members are entitled by right or the terms of their contract in some universities. Originally it was offered every seventh year but customs now vary in institutions having such a policy. A sabbatical leave carries no responsibility and the recipient is free to spend the time as he pleases. This matter should be entirely at the discretion of the university. The purpose of the councils is to support research and they should assure themselves that the leaves they support are serving that end. Of course faculty members should not be entitled to more than full salary by reason of holding both a sabbatical and a research leave.

[8] See recommendation 37, p. 171.

The Medical Research Council offers an additional form of personnel support—Medical Research Associateships. These are competitive awards which pay the full salary and benefits for a period of three years, renewable. Thereafter they are reviewed every five years and are renewable if, in the opinion of the university and the Medical Research Council, the holders have continued to perform meritorious research. The purpose of the Associateships is to help the medical schools develop research programs. Grantees are required to spend 75 per cent of their time engaged in research.

Although these awards have been effective in encouraging research in Canadian medical schools, we have misgivings about them and are not prepared to recommend extending them to other councils or other fields in their present form. In the first place the council exercises control over tenure rather than the university since renewals require council approval. Of course the university can guarantee to pick up the salary in the event that the council fails to grant a renewal. However, this commitment, it has been argued in our hearings, tends to distort the university's decision-making process. The university, always hard pressed for enough dollars to accomplish its ends, will find it hard to resist the offer of full salary for a faculty member with excellent qualifications even though the field of the Associateship may not represent the university's most pressing need. Yet the university if forced to meet the salary commitment at a later date would in fact have permitted the availability of Associateship funds to dictate its policy.

The above argument may seem to some more theoretical than real. After all there are only 80 Associates in the whole country. It is true that the present program has not resulted in distortion of the universities and it clearly has been helpful to medical research. Suppose, however, that associateships of a similar nature were offered in all fields. A very large number of faculty members would hold their appointments at the pleasure of the Federal Government. The universities would find it difficult, if not impossible, to guarantee tenure should the councils for any reason find it expedient or necessary to withdraw. Even worse, the councils would exercise a substantial measure of control over the composition of the faculty of universities if the universities were prepared to follow the pattern of the MRC Associateship program and forward likely proposals in all fields to the councils for adjudication.

Beyond the above difficulties we find the Associateship awards inconsistent with our view expressed below that universities should appoint and pay for their faculty, partly because such persons teach, and partly because this seems a wise contribution of the universities (and the provincial governments) to the support of research. Therefore *we recommend that:*

**The councils not engage in programs such as the Medical Research Associateships.**

Of course the terms of presently held Associateships should not be changed, and MRC should meet any commitments it has made to the universities for future Associateships. Nevertheless, it should discontinue new awards as rapidly as feasible.

The funds at present spent by MRC on Associateships could be diverted to other types of personnel support which could accomplish the same aims without the concomitant difficulties. For example, the Negotiated Development Grants to build on strength are not part of the present program of MRC. The present post-doctoral fellowship program of MRC could be extended.

**Grants for Computing**

Computing is one of the largest and most rapidly growing components of the university research budget. Like library facilities, university computing facilities are important to all disciplines: unlike libraries, computing centres of Canadian universities are currently enjoying a measure of financial support that is in line with their needs.

Computing centres have received special treatment from federal budgets and in some cases from provincial budgets, but in our view, which is elaborated below, they are now sufficiently mature to be supported by the normal mode of operating grants awarded by the councils.

The growth of the cost of computing facilities, as well as a seven-year projection, are shown in Table 6:3. The costs include equipment purchase or rental, payment of computing centre staff, supplies and incidental expenses; they do not include building cost.

We have not made our own assessment of the growth of computing facilities; the rate of about 30 per cent growth per year during the next seven years, estimated by Porter, Hartle and Hull (Table 6:3), appears to be reasonable. The estimate is based, in part, upon the growth of student population and on achieving a desired level of computing costs per university student. An extrapolation of past growth, together with the anticipated development of university research funds, support the estimate. It is clear that by 1974-75 the computing costs that might reasonably be ascribed to federal research councils will amount to several tens of millions of dollars.

University computing centres support research programs, instructional programs and some administrative work, and are also rented to non-university users. According to estimates we received from a number of university computing centres, about 70 per cent of computing time is allocated to the research of faculty and graduate students, 15 per cent to instruction, and about 15 per cent to administrative work and outside use. It is reasonable to assume that about two thirds of the total computing centre costs will continue to be allocated to research.

The distribution of computing costs by discipline is shown in Table 6:4. Computing costs are currently concentrated in science and engineering but

the use of computing facilities in the humanities, social sciences, health sciences and business administration is increasing more rapidly as the advantages of computers are becoming appreciated.

Although the total growth of computing costs (30 per cent per annum) exceeds the growth of the total university research budget, the component due to science and engineering has levelled off at about 20 per cent of the total direct research costs in these disciplines. In other disciplines the computing costs might level off at a different value, depending not only upon the potential use of the computer but upon the magnitude of total research costs. However, it is not unreasonable to expect that computing costs will reach a steady state between 10 and 30 per cent of direct research costs in most disciplines.

In the past, only one federal agency—the National Research Council—has supported university computing centres. (Some federal grants from other agencies include funds for computing but these represent a negligibly small fraction.) NRC's support has been through direct lump-sum grants to university computing centres and, as indicated by Table 6:3, these grants cover about one third of the costs of computing facilities. Through this aid the university computing centres have freely supported computing in all disciplines. The problem of developing viable computing facilities in Canada was recognized by NRC a decade ago and in a bold and successful policy of granting—not unlike the Strategic Development Grants recommended earlier in this Chapter—it supplied the funds that have stimulated the present healthy condition. But having achieved this success, it is neither necessary nor desirable to maintain the same policy. Accordingly *we recommend that:*

**The present form of NRC grants to university computing centres be discontinued, and that computing for research be supported from the normal operating grants of all federal research councils.**

Assuming that the full costs of computing associated with research projects are so covered, the provincial or university contribution to computing costs should reside only in the costs associated with instructional and administrative functions of the computing centre and in the research programs financed from the universities' own general revenues. Whether computing facilities for research are better housed on each campus, whether a few large central facilities are preferable, or, indeed, whether the research is best served by a commercial agency's terminal, seems to us to be a decision that has to be made by each university in concert with other universities within the same region.

Our recommendation is intended not only to recognize the maturity of university computing centres but also to normalize administrative procedures. Current policy gives computing centres an unreasonable position as entrepreneurs: it unnecessarily inhibits the use of commercial facilities because computing is substantially free at the university centres. More important, any

staff member or graduate student finds it relatively easy to obtain thousands of dollars worth of computing, whatever the merit of his research, and there is little recognition among legitimate users of the actual costs of computing or of the need for restraint. While a generous attitude is to be encouraged when computing is just being introduced into a discipline, it is no longer appropriate in subjects that have grown to rely upon computer facilities.

We have heard the counter-argument that any attempt to finance computing centres by making individual users pay their costs would inhibit the development and use of university computer facilities; a preferable system, it is suggested, is the open-ended one, analogous to library operation. But computer use differs from library use; according to recent estimates made by one large university computing centre,[9] about one third of research computing involves users who individually employ more than one per cent of the total time (or, typically, average $10,000 in computing costs); another third use 0.3 to 1.0 per cent of the total time. The remainder involves small-time users (less than 0.3 per cent total time), but even these users have an average computing cost of several hundred dollars. Thus the computing centres have a pattern of major users each of whom should be made accountable for his major costs.

We appreciate that our recommendation requires a considerable change in the administration of university computing, and it may take several years to implement. Individual users must learn that they are to pay real dollars for computing facilities. (To prepare for such a change several Canadian universities are already allocating "paper dollars" in payment of computer time.) Federal research councils will have to redistribute funds so that the operating grants are augmented to include computer support—probably to the extent of 10 to 30 per cent of total funds. Universities which, in an early stage of research activity, are unable to generate enough funds through operating grants, will make application for special consideration through a Strategic Development Grant as discussed above.

The difficulty of predicting computing needs presents an obstacle to the institution of our recommendation. We do not envisage any serious problem here if various other recommendations of our report are adopted. The unexpected need for computing by one individual in a department could be compensated by the disappearance of an anticipated need by another individual; the pooling of their grants for computing would then solve the problem.

Our recommendation need not jeopardize university computing centres even though it will place them in a more competitive position. The universities are at present in a very strong position to maintain their computing centres through provincial assistance because all rental charges—and even purchase charges—are allowable items under the federal-provincial fiscal transfer arrangement (see Chapter 4 for a detailed discussion). At the same

[9] Information supplied to us from the University of British Columbia.

time the arrangement accommodates our recommendation with respect to federal payment of computer charges since such payments are excluded from the calculation of allowable post-secondary costs.

**Responsibility for Salaries and Indirect Cost Coverage**

The questions about a possible federal role in indirect costs and the support of the salaries of principal investigators are less straightforward than the corresponding questions about direct costs. Are grants for sponsored research merely grants-in-aid and should the universities therefore not cover the salaries and indirect costs themselves? How are the indirect costs of research in Canadian universities to be identified? Are any possible federal contributions to indirect costs and salaries to be administered by the granting councils on the basis of individual grantees or as lump sum payments to the university as a whole? What auditing procedures can be devised to prevent any misuse of possible federal contributions to salaries and indirect costs? We seek here to answer these questions. Although our answers are not complete, a clear role for the Federal Government in support of indirect costs of research emerges from our answers. At the same time we conclude that it should be the normal practice of the universities to continue to pay the salaries of their faculty.

The question of who should pay the indirect costs of sponsored research and the salaries of principal investigators involves the very nature and independence of the universities. The tradition in Canada has been that the grants of research councils are grants-in-aid not intended to cover any faculty salaries or indirect costs. In many instances the grants-in-aid to research workers at Canadian universities have not even covered all the direct costs. In some other countries, notably the United States, individual research grants have often included the research salaries of principal investigators and the grants have also been accompanied by substantial amounts (in the neighbourhood of 65 per cent of research salaries[10]) to cover the indirect costs of research. The payment of the salaries of a large number of research workers has jeopardized the control of the university over its own destiny, and the payment of such indirect costs have involved complicated administrative and auditing procedures.

The Canadian tradition of grants-in-aid has raised major problems only recently. Until a few years ago the assisted research funds received by Canadian universities were usually a small fraction of the total ordinary expenditures of the universities—so small that in most cases the coverage of the corresponding salaries and indirect costs could usually be accommodated within the universities' general expenditures without distorting other programs. In the past four years the assisted research funds have grown much more rapidly than the universities' general revenues (see Chapters 2 and 3).

[10] We are indebted to Dr. G. Robinson of the University of Toronto and to his colleagues on the executive of the Association of Universities and Colleges of Canada (AUCC) for a clear exposition of the treatment of indirect costs in various countries.

At present (1968-69), the assisted research funds constitute about a quarter of the total ordinary expenditures of the universities. The universities' own expenditures on research salaries an dindirect costs are °f similar magnitude. The universities' own contributions here are no longer incidental items and the Canadian tradition is less comfortable than it was.

We heard a considerable amount of reaction to the problems of indirect costs in our discussions with university research workers, with university administrators and with representatives of federal granting agencies. Generally the grant recipients like the present policy—they are not responsible for the distribution of the universities' general revenue and they are afraid that any arrangement to increase the scope of coverage might tend to reduce the funds for the direct costs presently covered. The university administrators greatly feel the financial pressure imposed on the universities by the need to provide the indirect costs. We heard opinions that they would like federal councils to provide 30 per cent of the assisted research funds to the universities in lieu of indirect costs. Such an amount was also recommended by the Bladen Commission.[11] The research councils like the present grant-in-aid policy. Any proposal to make them responsible for indirect costs would mean that the councils would need to request more funds from the federal Treasury Board for the same amount of work performed.

There is a real problem to be faced. Under the present fiscal transfer arrangements between Ottawa and the provinces, the latter receive 50 per cent of the federally allowed costs of post-secondary education. Since these costs are based in part on university expenditures, including those incurred by universities to meet the indirect costs of federally supported research, the Federal Government pays to the provinces an amount that, in effect, covers 50 per cent of the indirect costs met by universities. We stress the fact that this payment is made *to the provinces.* Meantime, the universities have borne the actual indirect costs arising from federally supported research out of their general revenue. This general revenue, of course, has been largely supplied by the provinces. But we observe, at this juncture, that the provincial grants to universities are geared primarily to enrolment, and cannot be expected to reflect the volume of federally supported research in any given university. Accordingly, since each university meets the indirect costs of research out of revenue which does not include indirect cost allowances directly proportional to the volume of federally assisted research, it can pay these costs only through deliberate budgetary allocations that will entail important marginal sacrifices in other outlays, notably the teaching program, or non-assisted research, or administrative services.

The upshot is as simple as the following: the failure of federal agencies to finance indirect costs exactly where they are incurred—in each university with a given volume of federally assisted research—has meant that federal

[11] *Financing of Higher Education in Canada,* Association of Universities and Colleges of Canada, 1965.

research grants distort the university budgetary process. Accordingly, the availability of federal research funds restricted to direct-cost coverage impoverishes universities through a budgetary substitution effect similar to that which can be induced by conditional grants.

We firmly believe that, in the interest of strong universities whose overall academic performance is vital to the nation's research capacity, federally supported research should have a neutral budgetary effect in universities. Among other things, a neutral budgetary effect should be welcomed by the provinces, who bear the general responsibility for universities. The only way to guarantee this effect is through full federal payment, directly to each university, of all indirect costs associated with federally supported research. We strongly urge this policy on the research councils, whose prime mission is the support of research for its own sake, and whose responsibility to avoid any action that weakens universities is grave and inescapable. *We therefore recommend that:*

> **The federal research councils meet the full indirect costs arising from council-supported research in each university.**

We wish to note that the structure of the existing fiscal arrangements for post-secondary education easily accommodates the above recommendation. Since federal research support is excluded from the defined costs, half of which are recovered by the provinces, full federal payment of indirect costs will be exactly reflected in the size of the exclusion. Therefore, the possibility of a double federal indirect cost payment, once to the universities and again to the provinces, is precluded. Below, we assess the magnitude of the indirect costs and make recommendations about their payment.

Having adopted a strongly polar view on indirect cost coverage we adopt a strong view, of the opposite polarity, on research salaries. The portion of university faculty salaries allocated to research (Chapter 3, Table 3:10) is an important component of the total research bill. It is a direct cost which we would like to see paid out of the universities' general revenues. At present, the salaries are usually paid entirely by the universities. Exceptions are the medical research associates in the medical schools of many Canadian universities whose salaries are paid by the Medical Research Council and a few other similar arrangements between individual universities and government agencies.

The principal argument for ascribing the payment of salaries to the universities themselves is that university control over the acquisition and retention of academic staff is essential for the maintenance of the universities as strong and independent institutions. Research is part of every university's function and supports the other basic teaching and training programs. Correspondingly, we found a fairly uniform commitment to research among academic faculties (Table 3:10) and between universities. The large universities or the faculties with large research grants ascribed the largest fraction of their faculty salaries to research. However, even in the smaller universities

or the faculties without substantial research funds an appreciable fraction (approximately 15 per cent) of faculty salaries was allocated to research. To a considerable extent, therefore, the universities have the capacity to acquire staff for research using their general revenues and arguments based on the teaching and training programs.

Any effort by outside agencies to augment the universities' normal capacity for hiring faculty can jeopardize their independence as institutions. The acquisition and retention of its academic staff is the most important element in determining the nature of a university. Canadian universities have budgets delicately balanced between high priority items. In this situation they find it difficult to turn down possible arrangements to acquire staff paid from funds outside their general revenues. Such arrangements can therefore strongly influence the basic nature of the university. We would like to see diversity in Canadian universities with individual institutions excelling in particular disciplines of their choice and with different institutions offering different approaches to teaching, training and research. Such diversity should not be imposed by outside agencies. In our view, Canadian universities will have the flexibility and capacity to develop in such diverse ways only if they pay all academic salaries out of their general revenues.

Leaving staff salaries in the hands of the universities removes the principal argument against extending the grants-in-aid policy toward the payment of indirect costs. The proponents of the grants-in-aid policy argue that the university must want to carry out the research and must therefore share in its costs. The academic salaries allocated to research are a major fraction of the whole research bill. Assigning responsibility for staff salaries to the universities themselves makes the universities major partners in sponsored research.

The recommended policy on staff salaries also implies that the universities must be responsible for the indirect costs which may be associated with faculty salaries. This view parallels that used above in recommending that the research councils pay the indirect costs engendered by research grants. Whoever pays the costs must pay full costs.

The arguments for payment of staff salaries by the universities do not imply that short-term arrangements of a different kind should not be possible. Some research projects will require the withdrawal of staff members from the normal teaching and training program of the university. In such cases it seems reasonable to have the staff members' salaries paid out of research grant funds for the duration of the project. The point is that such arrangements should be both exceptional and short-term. On the other hand, our conviction about the universities' own responsibility for academic salaries is sufficiently strong to lead us to the recommendation, above, that the program of MRC Associateships should be discontinued. This program was both timely and beneficial for the universities but it involved long-term arrangements by the MRC in the payment of staff members, many of whom

achieve academic tenure. Such an arrangement therefore conflicts with our general principle and we therefore conclude that in the future the same benefits should be achieved in other ways.

**Amount of Indirect Costs**

The estimation of the indirect costs which might reasonably be ascribed to the sponsored research grants of federal research councils is beyond the scope of present university cost studies or accounting procedures. The best that we can do is to give a broad outline of the problem and a rough answer for the amount of the indirect costs. We suggest that the universities institute accounting procedures which will make possible an accurate assessment of the indirect costs of research.

Figure 6:1 shows in general terms how the estimate of indirect costs might be made. First of all, direct cost items (e.g., academic salaries, assisted research funds, university research funds) and indirect cost items (e.g., plant maintenance, general university administration, etc.) are defined. All of the universities' expenditures are put in one category or the other. Next, suitable divisions of the university are chosen (e.g., faculties or departments). In the first step of the indirect cost estimate (top half of Figure 6:1) suitable accounting procedures are devised to allocate the indirect costs of each university division to the direct costs of that division. The accounting procedures are described below. At the end of the first step, one achieves the combination of the indirect costs with each of the direct cost items shown by the big circle in the upper right-hand corner of the figure.

A second step in the indirect cost estimation shown on Figure 6:1 involves the reallocation of some of the 'direct' items (with their associated indirect costs) to the basic teaching and research programs of each university faculty or department. Thus, the fraction of faculty time spent on administration or on community service is reallocated, by means of appropriate accounting procedures, to the teaching and research items. At the end of this step the true indirect costs of each basic item are found.

Various possible methods of estimating the indirect costs differ in the definition of items and in the procedures for allocating items. We adopt a gross breakdown of costs and a simple pro-rata method of allocating indirect cost items to the various items. The definitions and procedures of the various AUCC Cost Studies[12] are much richer and more complex than those we use but they were designed primarily to produce estimates of the cost per student of the various teaching programs. For estimating research costs they are essentially equivalent to our simpler approach.

[12] The Cost Studies carried out under the auspices of the AUCC at all Canadian universities for the financial year 1966-67 are still in progress. We are indebted to Mr. David Fish, Research Director for the AUCC, for providing us with detailed information about the Guide Lines for the Cost Studies and to the Bursars and Comptrollers of a number of universities for making their preliminary results available to us.

A brief description of the nature of the AUCC Cost Studies will serve to illustrate not only the complexities of the indirect cost analysis but also some of the best approaches and some of the remaining difficulties. The starting point in each university is a recapitulation of the university expenditure items given in Table 3:9. The principal indirect cost items in step one are plant maintenance, general administration, student administration, *all* library expenditures and computing centre expenditures. The direct cost items include assisted research funds and all of the academic expenditures. The academic expenditures are made up of the following items: academic salaries (about 70 per cent), group benefits (about five per cent), funds for research provided by the university out of its general revenue (two per cent), and the expenses of deans' offices (five per cent), equipment, supplies and expenses (10 per cent) and miscellaneous (eight per cent).

The academic expenditures of the AUCC university Cost Studies are subdivided into programs and the university is subdivided into faculties and departments. The programs are:

| | |
|---|---|
| Instruction (first year) | Student research and thesis work (Doctoral level) |
| " (second year) | Research |
| " (third year) | General reading and study |
| " (fourth year) | Non-academic student services |
| " (fifth year) | Administration (departmental) |
| " (Master's level) | " (faculty) |
| " (Doctoral level) | " (university) |
| Student research and thesis work (Master's level) | Professional organizations |
| | Public and community services. |

Not all of the programs can be clearly separated. We described earlier (in the discussion accompanying Table 3:9) the difficulties of separating the research of faculty members from the supervision of graduate students. As we warned there, the AUCC Cost Studies employed a separation of these programs which was arbitrary and could easily be misused to provide a distorted picture of graduate studies in Canadian universities. We prefer not to make such a separation.

The salary of each individual is subdivided among the programs on the basis of a questionnaire completed by the individual. The other academic expenditures are subdivided among the programs by consultation with each department. After suitable additions, the Cost Studies then achieve departmental, faculty or university summaries, each listing all of the academic expenditures subdivided into programs. Table 3:10 illustrates the results obtained from the individual salary questionnaires.

The combination of the indirect costs of the AUCC Cost Studies with the various direct cost items involved a variety of procedures illustrated on Figure 6:2. The whole plant maintenance costs are allocated first on a pro-rata basis employing the number of square feet of floor space used by

each program in each department. By this prescription a small fraction of the plant maintenance costs also end up in the other indirect cost items (e.g., general administration, library, etc.) The general administration costs are allocated to the faculty administration program of the academic expenditures on the basis of the total direct expenses of each faculty. In turn, the faculty administration costs are allocated to departments, 50 per cent on the basis of the number of full-time equivalent staff of the department (lecturer and above) and 50 per cent on the basis of students enrolled in courses given by the department. A small component of the general administration is allocated to the library on the basis of its total expenditures. Student administration is allocated to instruction by year and level. The library expenditures are allocated by a complex set of procedures which are not satisfactory for our purposes and which it is not necessary to describe in detail. The principal basis of the allocation of library expenses to various university faculties is student usage as obtained from a questionnaire. The allocation within faculties to departments and programs is based on number of staff, number of students and the breakdown of direct expenses (excluding assisted research funds). The cost of computing centres formed a small part of the total indirect costs in 1966-67 and moderately accurate usage data were available for allocating the costs.

In the second step of the AUCC Cost Studies—along the lines of Figure 6:1—the various non-basic programs are reallocated to the basic ones. The reallocation is made on a pro-rata basis using the academic expenditures but excluding the assisted research funds. On completion of this step, the AUCC Cost Studies achieve their aim of distributing all the university expenditures among the teaching and research programs of the university.

The AUCC Cost Studies tackle the problem of university research costs but do not solve it. They are a rich lode of ideas and data. They promise to provide reasonably accurate data on the costs of instruction at Canadian universities. But the Cost Studies have a number of weaknesses which make them fall short of assessing the indirect costs of research. First of all, the library costs (which constitute about a quarter of the whole indirect costs of the universities) are not at all separated into research and instruction; even further, a subdivision of the research component of the library into acquisition (a direct cost) and operation (an indirect cost) costs should be part of the initial recapitulation of university expenditures. The procedures adopted by the Cost Studies for allocating library costs are arbitrary and they likely underestimate the fraction of the library costs which might be assigned to research. There was also some difficulty in the allocation procedures for other indirect costs. Perhaps the best procedures are those for the administrative costs, allocated primarily on a pro-rata basis using the dollars spent on each direct item. The plan for the allocation of plant maintenance costs was a good one—the square-foot space usage appears to be an attractive method of dealing with this important item. However, in the preliminary results

available to us the space-usage data were usually not available. Instead the plant maintenance costs were allocated to each direct item according to its proportion of the direct costs. Finally, the AUCC Cost Studies mix inextricably the indirect costs for assisted research and those for the component of academic salaries which are ascribed to research.

The treatment of indirect costs for research of the AUCC Cost Studies turns out to be little more than an allocation of these costs on a pro-rata basis to the various direct costs. Because such a pro-rata allocation is much simpler than the allocation procedures of the Cost Studies appear to be, and because it makes possible the separation of the indirect costs for assisted research and for salaries, we adopt it here.

To make a pro-rata allocation of the indirect costs of university expenditures we simply group all the university expenditures into the direct and indirect categories. We have done this for a number of universities using data from their AUCC Cost Studies and find the results in Table 6:5.

The division of university expenditures into direct and indirect costs in Table 6:5 are rather arbitrary. Thus, student administration is considered a direct cost, because we are interested only in research costs: student administration does not contribute to the indirect costs of research and it uses its share of plant maintenance, general administration and some of the other indirect items. If we had been interested in teaching costs we would have considered student administration as an indirect cost item. On the other hand, we regard "equipment, supplies and expenses" as an indirect cost: in the AUCC Cost Studies this item was treated as a direct cost—it is part of the academic expenditures of Table 3:9. The same comment applies to the expenditures on deans' offices which we have also removed from the academic expenditures.

The total indirect costs of Table 6:5 are 35 per cent of the total direct costs; 26 as a percentage of 74 is 35 per cent. Therefore the indirect cost percentage that we might reasonably ascribe to the assisted research fund is 35 per cent. If we had been interested in the indirect costs of teaching we would have arrived at a different percentage because of a different recapitulation of expenditures. The percentage would also be different for the research fraction of academic salaries. If we had been dealing with salaries we would have recapitulated expenditures in the same way and arrived at the same 35 per cent in the first step of the analysis (see Figure 6:1). However, in considering salaries we would have continued on to the second step and reallocated the non-basic salary programs to teaching and research. The result would have been roughly double the 35 per cent value or about 70 per cent for salaries. Combining salaries with 70 per cent indirect cost and research grants with 35 per cent indirect costs, we would have achieved a total of grants and salaries whose indirect cost would have been intermediate—in the neighbourhood of 50 per cent. Such an intermediate result is

commensurate with a result of 47 per cent found in the AUCC Cost Studies.[13] However, we do not feel that it is necessary to carry out the second step of the analysis in arriving at the indirect costs to be ascribed to assisted research funds. The non-basic salary programs appear to be unaffected by the presence of assisted research funds—they are roughly the same fraction of the salary budget in faculties with research grants as in faculties without. Our view is that the *full* costs of all academic salaries should be paid by the universities. *Therefore, we recommend that:*

**The indirect cost allowance payable by the federal research council over and above the direct research support be 35 per cent of the direct research support given to each university.**

The value of 35 per cent for the indirect costs associated with research grants is very rough; realistic but not accurate. It does not appear to be possible to achieve better estimates at the present time. Hence our suggestion above that the universities go beyond the AUCC Cost Studies and establish accounting procedures suitable for the estimation of the indirect costs to be associated with research grants. Similarly, there are a number of items described below, which form exceptions to the pro-rata treatment of indirect costs.

### Administration of Indirect Cost Payments

The way in which indirect cost payments are to be administered follows from the policy we recommend. In the United States the granting agencies often pay all of the research costs—the full costs of assisted research funds and research salaries. Such a system allows a detailed approach to the question of payment. The adopted approach involves a very comprehensive and detailed list of allowed costs and unallowed costs.[14]

At the same time a variety of tight auditing procedures ensures that the universities are reimbursed only for allowed items. This system is difficult to administer and many universities—particularly the less well-established ones—find the administration burdensome. We do not recommend such a system because we want to leave the research salaries in the hands of the universities while the grant funds come from research councils. Such a separation makes the universities and the research councils partners in research. At the same time we want each partner to pay the *full* costs of its share. Because the indirect costs of research ascribed to grants are strongly interwoven with those for salaries, we cannot adopt an item-by-item approach. This loosens the administrative procedure, which is a disadvantage of our approach. In our view this disadvantage is a small price to pay for the

[13] Based on the same universities whose data are presented in Table 6:3.

[14] *Principles for Determining Costs Applicable to Research and Development under Grants and Contracts with Educational Institutions,* U.S. Bureau of the Budget Circular A-21, March 3, 1965.

flexibility and freedom which our approach restores to the universities. Hence our recommendation that the indirect costs be paid as a percentage of direct grant funds to each university by each research council.

In our approach, a detailed audit of indirect expenditures is not possible but a more careful analysis for the proper percentage is both necessary and possible. We would like to see Treasury Board with the advice of the Canadian University Research Advisory Council (CURAC) (see Chapter 5)—whose establishment we recommend—held responsible for recommending the percentage payment to be made for indirect costs. Our result of 35 per cent could be adopted as an initial value pending better analyses.

The payment of indirect costs on a pro-rata basis would need to be accompanied by change in the research administration of Canadian universities. Individual grant recipients might demand that the university return the 35 per cent to them leaving the real indirect costs unmet. We have faith in the ability of university administrations to adopt appropriate defensive mechanisms. Further, it is inevitable that the payment of indirect costs, by removing existing university budgetary distortions, will improve numerous services (secretarial, technical, etc.) at present inadequate in most of the universities, resulting in tangible benefits to each individual grant recipient. In addition, the development of the appropriate research machinery to administer the funds might well lead to more research planning and co-ordination—a matter in which the universities are at present rather naked.

There are a number of exceptions to our pro-rata formula for paying indirect costs. Examples of these are:

1. large institutes managed by the universities;
2. large grants, in excess of $100,000 such as negotiated development grants or strategic development grants;
3. book acquisition grants (for which a 100 per cent rate would be more realistic); and
4. major equipment grants above $10,000.

For some of these an item-by-item approach would be preferable and for others a pro-rata treatment with a rate lower than 35 per cent would be reasonable. For such cases, and any other similar ones, we envisage a review mechanism to establish the equitable payment of indirect costs. *Therefore we recommend that:*

**A system be established to referee cases that might be exceptions to the normal pro-rata payment of indirect costs. Cases to be considered could be initiated either by the councils or the universities.**

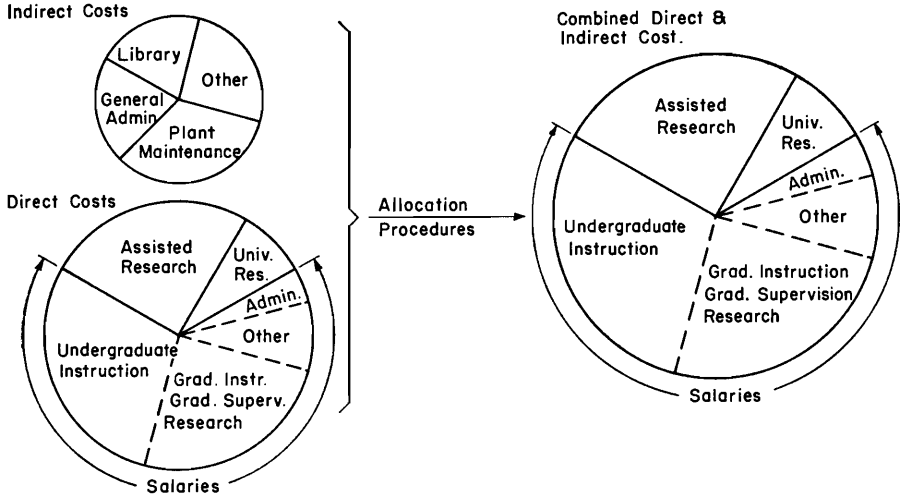
While it is important that in introducing the proposed changes funds available for direct research costs be not reduced, it is difficult to over-

emphasize the importance of indirect cost payments to the universities. The payments would remove many of the distortions at present imposed on the financial operations of universities by federal research grants. They should lead to more efficient performance of university research and to greater planning and co-ordination of various university research endeavours. Many of our other recommendations about research policies for federal councils can be effective only if the indirect costs are met directly by the councils.

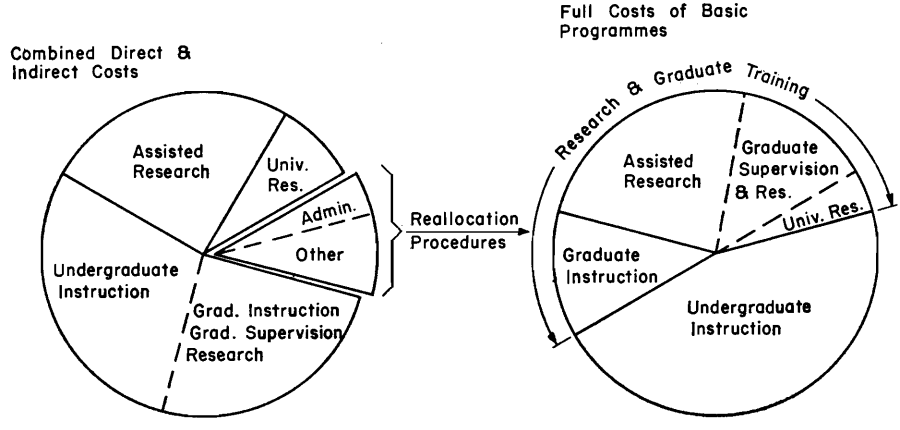
**Figure 6:1**

**THE QUALITATIVE FEATURES OF THE ANALYSES OF UNIVERSITY EXPENDITURES FOR INDIRECT COSTS**

(Expenditure categories and the allocation procedures are described in text.)



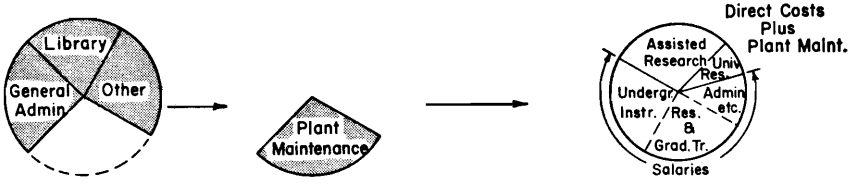

STEP 1: Allocation of Indirect Costs



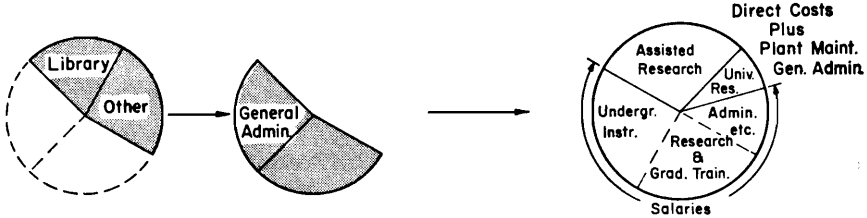

STEP 2: Reallocation of Non-Basic Programmes

**Figure 6:2**

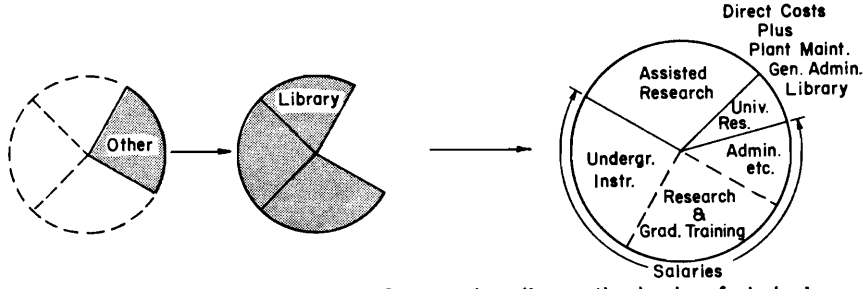
**SEQUENTIAL ALLOCATION OF INDIRECT COSTS IN THE AUCC COST STUDIES**



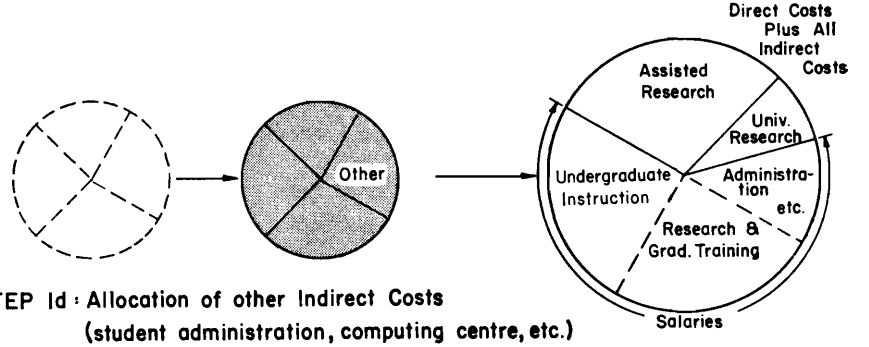

STEP Ia : Allocation of Plant Maintenance Costs on a square foot usage basis.




STEP Ib : Allocation of General Administration on a pro-rata basis.




STEP Ic : Allocation of all Library Costs primarily on the basis of student usage *(see text)*




STEP Id : Allocation of other Indirect Costs (student administration, computing centre, etc.) using various procedures.

**Table 6:1—National Research Council Operating Grants, 1968-69**

| Grant Selection Committee | Requests Recommended for Approval | Awards | Percentage of Successful Applicants |
|---|---|---|---|
| | No. | No. | % |
| Animal Biology | 242 | 227 | 93.8 |
| Cell Science and Genetics | 280 | 242 | 86.4 |
| Plant Biology | 185 | 171 | 92.4 |
| Population Biology | 265 | 247 | 93.2 |
| Dental Research | 57 | 55 | 96.5 |
| Experimental Psychology | 193 | 164 | 84.9 |
| Chemical and Metallurgical Engineering | 239 | 233 | 97.5 |
| Chemistry | 531 | 519 | 97.7 |
| Civil Engineering | 150 | 148 | 98.7 |
| Electrical Engineering | 222 | 206 | 92.8 |
| Mechanical Engineering | 203 | 184 | 90.6 |
| Earth Sciences | 378 | 360 | 95.2 |
| Computing and Information Science | 72 | 61 | 84.7 |
| Nuclear Physics and Physics | 343 | 330 | 96.2 |
| Pure and Applied Mathematics | 349 | 321 | 92.0 |
| Space and Astronomy | 107 | 102 | 95.3 |
| **Totals** | **3,816** | **3,570** | **93.6** |

**Table 6:2—National Research Council Negotiated Development Grants, 1967-68 and 1968-69**

| University | Program | Amount | Duration |
|---|---|---|---|
| | | $ | |
| **Begun in 1967-68:** | | | |
| British Columbia | Materials Research Centre | 375,000 | over 3 yrs. |
| McMaster | Materials Research Centre | 500,000 | over 3 yrs. |
| Toronto | Materials Research Centre | 325,000 | over 3 yrs. |
| **Begun in 1968-69:** | | | |
| Laval | Centre de recherche sur les atomes et les molécules | 724,000 | over 4 yrs. |
| Waterloo | Solid Mechanics Research Centre | 600,000 | over 3 yrs. |
| Montreal[a] | Centre de recherches mathématiques | 1,367,000 | over 5 yrs. |
| Simon Fraser | Pestology Centre | 323,000 | over 3 yrs. |
| Memorial | Human Abilities Research Institute | 180,000 | over 3 yrs. |
| Calgary | Environmental Sciences Centre | 375,000 | over 3 yrs. |
| Queen's | Pure and Applied Mathematics Centre | 300,000 | over 3 yrs. |
| **Total to Date** | | **5,069,000** | — |

[a]Defence Research Board will provide an additional $410,000 over 4 years.

**Table 6:3—Estimated Annual Costs of Canadian University Computational Facilities and their Financial Support by the National Research Council, 1963-64 to 1974-75**

| Year | Total Annual Cost[a] | NRC Support |
|---|---|---|
| | $'000,000 | $'000,000 |
| 1963–64 | 1 | 0.3 |
| 1964–65 | 2 | 0.6 |
| 1965–66 | 3 | 0.9 |
| 1966–67 | 5 | 1.3 |
| 1967–68 | 9 | 2.3 |
| 1968–69 | 14 | 3.9 |
| 1969–70 | 20 | — |
| 1970–71 | 27 | — |
| 1971–72 | 35 | — |
| 1972–73 | 43 | — |
| 1973–74 | 53 | — |
| 1974–75 | 68 | — |

[a]Taken from "Computer Facilities in Canadian Universities" by A. Porter, D. G. Hartle and T. E. Hull, University of Toronto report, September 7, 1967.

**Table 6:4—Research Use of University Computing Facilities by Various University Sectors, 1967-68**

| Sector | Percentage of Research Use |
|---|---|
| Science | 35 |
| Engineering | 20 |
| Arts (humanities disciplines) | 1 |
| Arts (social Science disciplines) | 3 |
| Agriculture | 1 |
| Medicine | 1 |
| Other | 9 |
| **Total Research Use** | **70** |

SOURCE: Usage data obtained by the Study Group from the University of British Columbia and the University of Toronto. The percentages are an average for the two institutions.

**Table 6:5—Recapitulation of Expenditures of Canadian Universities for the Financial Year 1966-67, classified as Direct Costs and Indirect Costs for the Purpose of Allocating the Indirect Costs of Research on a Pro-rata Basis**

| University Expenditures | Per Cent |
|---|---|
| Direct Costs— | |
| Salaries and group benefits | 47.0 |
| Assisted research funds | 16.6 |
| Research funds from university general revenue | 2.0 |
| Student administration[a] | 2.5 |
| Library, acquisition and processing | 2.9 |
| Other[b] | 3.0 |
| **Total, Direct Costs** | **74.0** |
| Indirect Costs— | |
| Plant maintenance | 10.1 |
| General administration | 3.8 |
| Equipment, supplies and expenses[c] | 4.1 |
| Library operating costs | 4.3 |
| Deans' offices | 2.2 |
| Other[d] | 1.5 |
| **Total, Indirect Costs** | **26.0** |
| **All Costs** | **100.0** |

[a]Student administration is regarded as a direct cost here because we are interested only in research costs: it uses its share of plant maintenance, etc., but does not contribute to the indirect costs of research.

[b]Includes the expenses of summer schools, half of the expenses of extension departments, the expenditures on bursaries and scholarships, expenditures on computing centres, etc.

[c]Equipment, supplies and expenses as listed here refers to the departmental expenditures (using funds from the universities' general revenues) for incidental items such as telephones, paper, photocopying, lecture and demonstration equipment, etc. It does not include any major equipment or any items purchased from assisted research funds. It might reasonably be considered part of general administration.

[d]Includes half the expenses of the extension department and other similar items.

SOURCE: Data supplied to us by the University of Manitoba, the University of British Columbia, the University of Western Ontario, Lakehead University, and Trent University.

## Chapter 7

# POLICIES FOR MISSION-ORIENTED RESEARCH

More than 150 years have passed since Sydney Smith, in his celebrated essay "Too Much Latin and Greek", wrote the indictment: "When an University has been doing useless things for a long time, it appears at first degrading to them to be useful."[1] During the intervening period of time, universities have shown an increasing willingness to help fill the more practical needs of society. It is not least to forestall the potential article of a latter-day Sydney Smith entitled "Too Little Latin and Greek" that we have emphasized that the federal research councils have an important balancing role in the nation's total research effort.

Since its sporadic beginnings around the first decade of this century, the financing of university research by mission-oriented agencies has been a fact of life. The extent to which such agencies are inclined to turn to universities for assistance in their research effort is underlined for us by the doubling and redoubling of their financial contributions in the course of the past two decades. The developing links between universities and mission-oriented agencies, sketched in broad outline in Chapter 4, show considerable promise of further growth. A desire to expand research ties with universities was apparent in all the federal agencies we visited in the course of our hearings. Among the university representatives with whom we met, the opinion was generally expressed that increased university involvement in suitable mission-oriented projects supported by government and industry would be mutually beneficial to the sponsor and the university.

Although universities may be generally receptive to mission-oriented research in principle, it is to be expected that these institutions will harbour rather different views as to the terms under which such research should be conducted. Some universities may wish to avoid research that does not directly involve graduate students, for instance, while others may refuse projects any part of which involves classified information. In the last analysis, we believe that it is the responsibility of each institution to determine for itself what constitutes an optimal research program, mission-oriented or otherwise. But we cannot refrain from quoting with approval the Convocation address of Dr. D. T. Wright, now Chairman of the Ontario Committee

[1] Sydney Smith, "Too Much Latin and Greek", *Selected Works of Sydney Smith*, ed. by W. H. Auden, New York, 1956, p. 269.

on University Affairs, in which he warned that too great an obeisance to "the purist attitude of research for research's sake" may lead to an academic research effort overly conditioned by "the rarefied atmosphere of artificial problems generated in university laboratories."[2] In short, we believe that although a generous component of university research activity must spring solely from the happy inspiration of scholars, the portion that arises from the need to meet practical requirements also has an important place.

The willingness of universities to engage in mission-oriented research cannot be divorced from their capacity to do so. Their capacity, in turn, is intimately bound up with the circumstances in which mission-oriented agencies extend their support. These circumstances raise important questions of policy. What sort of liaison should exist between universities and mission-oriented agencies? What should be the terms, financial and otherwise, under which mission-oriented research is supported in universities? Through what indirect means should the Federal Government endeavour to encourage the development of a general capacity for mission-oriented work in universities? It is to these questions that this Chapter will address itself in turn.

## NEED FOR LIAISON

Some of the most eloquent testimony presented to us in the course of our hearings concerned the need for more effective communication between mission-oriented agencies and universities. Essentially, the problem of liaison has two dimensions—one involves the state of relations between the Government's intramural laboratories and universities, the other the existence of effective links between universities and the mission-oriented agencies that support university research.

### Relations between Government Laboratories and Universities

In comparison to other advanced countries, Canada has long been marked by the extent to which a major proportion of the national research effort takes place in government laboratories. Through such programs as the Geological Survey, intramural government research antecedes Confederation. Agricultural experimental stations were operating before the turn of the present century. By 1967, as noted in Chapter 2, the dollar value of scientific research and development performed in the Government's own laboratories was over $300 million, almost 50 per cent of the total performed in Canada. As for the social sciences, royal commissions alone accounted for some $3 million in expenditure, with millions more undoubtedly spent within government departments and such agencies as the Economic Council. In the fall of 1968, the Speech from the Throne outlined plans for a research institute that would in effect become an intramural "laboratory" for the social sciences.

[2] D. T. Wright, "Remarks on Research Policies", *University Affairs*, Vol. 9, No. 1, October 1967, p. 11.

From the time when, in the 1920s, the subject of National Research Council laboratories was first broached, government intramural research has been a sensitive subject in university circles. When academic criticism takes the form of an all-out attack on intramural research, coupled with a rejection of mission-oriented research as inappropriate to the university, it cannot be entertained seriously. But there are astute critics, both in government and in universities, who ask whether an overly large proportion of the national research effort is not at present divorced from the training of graduate students. Again, these critics pose the question of whether universities might not perform rather more mission-oriented work in keeping with a general responsibility for public service. Then too, while allowing that the excellence of mission-oriented research in government laboratories hinges on their accommodating some work of significance in the basic sciences, the critics ask whether there has not been a tendency for government laboratories to impinge overly on what is above all the legitimate province of the universities. These are all questions of degrees. None is susceptible to a neat black or white answer.

Because a searching study of intramural government laboratories lies beyond our terms of reference, we cannot reasonably attempt to cope with the above questions. We are prepared to state, however, that a fundamental starting point for any such study is that it would be as unrealistic to expect government laboratories to forego all "basic" research as it would be to expect universities to fulfill the national requirements of day-to-day problem solving. Universities and intramural laboratories each have a legitimate role in mission-oriented research, including its basic component.

With this point in mind, we wish to urge that the Government undertake a comprehensive study of its intramural laboratories as a matter of high priority. We would further urge, in a setting where the respective roles of universities and government laboratories pose what is anything but an either/or proposition, that particular attention be paid to developing smooth relations between the two. Thus, for example, the geographical siting of government laboratories in proximity to university campuses should be examined in the context of what it can contribute to effective government-university relations. As pointed out in Chapter 4, several Federal Government agencies—including such major mission-oriented departments or agencies as Agriculture; Fisheries; Forestry; Energy, Mines and Resources; NRC; and Wildlife Service—now have regional laboratories on or near university campuses.

Geographical proximity can do much to facilitate effective working liaison between government and university laboratories. However, we have observed that even when intramural laboratories are located on a campus, there is no guarantee of collaboration. At times, the laboratory and the university appear to strike token attitudes of friendship and then agree to

ignore each other. The underlying causes of this phenomenon are doubtless varied and complex, and may even, in particular instances, extend to such intangibles as personality differences between laboratory and university researchers. We are convinced, however, that some of the key contributing factors lie in such tangible domains as the terms under which laboratories can be used by researchers who are graduate students or who hold university teaching appointments. Looking at the other side of the relationship, the conditions under which government employees are permitted to teach in universities and engage in university research are likewise important. These factors can and should be the subject of searching examination.

Finally, no study of the relations between universities and intramural laboratories would be complete without a detailed analysis of the advisability of setting up certain mission-oriented laboratories under administrative forms not yet in use in Canada,[3] but common in the United States. We refer to the use of master agreements or contracts whereby certain laboratories are financed entirely by government but managed directly by one or more universities. The Argonne and Brookhaven Laboratories provide but two of many American examples. University management of certain designated laboratories can constitute a most desirable means of reconciling public service with academic research. On the basis of all of the above considerations, *we recommend that:*

**The Federal Government, through the Privy Council Office or some other appropriate central agency, undertake a comprehensive study of government intramural laboratories with particular attention to:**

**(a) the siting of such laboratories in relation to university campuses;**

**(b) the terms under which intramural laboratoires can be used by graduate students and researchers holding university appointments;**

**(c) the conditions under which government employees may teach in universities and engage in university research; and**

**(d) the advisability of placing certain designated laboratories under university management.**

### Government-University Liaison in Research Funding

As we have already had occasion to point out, the funding of university research by mission-oriented agencies has kept pace with the considerable growth in recent years in the total research outlays of these agencies. Under these circumstances, we are impressed by the need to develop, on a regular

[3] An exception is the TRIUMF project recently founded in Western Canada. It is a large accelerator laboratory managed by the University of British Columbia on behalf of four universities in British Columbia and Alberta.

and sustained basis, points of mutual contact between university researchers and the agencies that support them. Such contact is essential if mission-oriented agencies are to be fully informed of the state of the art in the disciplines they support. Conversely, our hearings have convinced us of the need to keep academic researchers aware of the changing problems and goals that challenge the operating agencies of government. In this context, the origins of research projects funded by mission-oriented agencies in universities frequently constitute a chicken-and-egg proposition. Although the project will be funded because it meets a need generated by the agency's mission, the identification and elaboration of the need in question may as easily have stemmed from an academic researcher as from the agency's own officials.

A substantial number of agencies now make use of advisory committees made up in whole or in part of academic personnel. These include the Departments of Agriculture; Energy, Mines and Resources; Labour; Manpower and Immigration; Indian Affairs and Northern Development; and Transport; and such other agencies as the Fisheries Research Board, the Defence Research Board, and the Atomic Energy Control Board. The terms of reference given to advisory committees differ from agency to agency, and may vary among committees within a given department. But an appropriate example, in our opinion, is the National Advisory Committee on Research in the Geological Sciences of the Department of Energy, Mines and Resources. Established in 1951 under the old Department of Mines and Technical Surveys, the purposes of this Committee are "to stimulate and coordinate geological research in Canada; to suggest research projects that should receive attention; and to aid in having these projects undertaken".

The proven record of certain advisory committees strengthens the case for the creation of such committees in those mission-oriented agencies that are engaged in research support and do not now make use of them. Advisory committees, made up in part of university personnel, can serve not only an increasingly needed liaison function vis-à-vis universities, but be a useful source of advice in evaluating an agency's intramural research program. Accordingly, *we recommend that:*

**Each mission-oriented agency engaged in research support establish, as appropriate, one or more advisory committees made up in part of university representatives and charged with:**

**(a) evaluating the balance between the agency's intramural and extramural research programs;**

**(b) advising the agency as to on-going research of relevance to the agency's mission; and**

**(c) advising the agency as to the disbursement of funds for the support of research relevant to its mission.**

In taking steps to ensure more effective and widespread use of advisory committees, mission-oriented agencies would be well advised to re-examine

the status of their relations, often woefully underdeveloped, with learned societies and related bodies. As we had occasion to note in our discussion of the research councils, such bodies are repositories of expertise that gives them unusual potential for liaison, planning and catalytic functions. Among the more illustrative examples of relevance to mission-oriented research, we would cite the Agricultural Economics Research Council, the Canadian Council for Urban and Regional Research, and the Institute of Public Administration of Canada, which are groupings not only of academics but of public servants at all three levels of government—federal, provincial and local. Such bodies, into which university researchers are already well integrated, invite much more intense exploitation by government.

More effective liaison between mission-oriented agencies and universities can do much to enhance the research capacity of universities and the resources to which government can turn for the fulfilment of public needs. To the extent that one of the by-products is an enlargement in the scope of mission-oriented research in the universities, we shall heartily endorse the result. We have already taken pains to point out that the role of mission-oriented agencies in research support is no substitute for strong research councils and should be restricted to projects and programs that are indeed related to the mission of the funding agencies. Nevertheless, we greatly appreciate the desirability of an over-all government structure for research support that is pluralistic in nature. Simply by diversifying the sources of available research support, mission-oriented agencies make a positive contribution to the total Canadian research effort. They help to ensure that healthy diversity of viewpoints and judgments as to the merit of research projects lacking which the evaluation of research can all too easily become insulated from fresh ideas and approaches.

As advocates of a pluralistic structure of government research support, we of course recognize that such a structure can become on occasion a source of needless and wasteful duplication. Our preoccupation with this problem has already led us to recommend an Intercouncil Co-ordinating Committee, a Canadian Universities Research Advisory Committee, and elaborate procedures for the funding of what we have called Major Proposals. We also applaud the on-going efforts to rationalize the budgetary process throughout the Government of Canada, and the unheralded but longstanding record of co-operation between such research funding agencies as the National Research Council and the Canada Department of Agriculture. But we wish to emphasize the need for an up-to-date central register of all research projects and programs funded from federal sources. That such a register has not yet been developed is to us a source of some surprise. We would note that, once established, this register might well evolve, with the co-operation of learned societies and related bodies, into a more comprehensive list of all on-going research projects, including those financed from provincial or private sources. *We therefore recommend that:*

**The Federal Government designate an appropriate agency as responsible for the development and maintenance of a central register of all research projects and programs funded from federal sources.**

## TERMS OF MISSION-ORIENTED RESEARCH SUPPORT

In Chapter 6, we developed at length the terms under which the federal research councils should extend support to universities. Since it is our considered opinion that a number of the policies pursued by mission-oriented agencies should parallel those of the councils, many of the comments that follow will be summary in nature. Duly noting where the policies of these agencies should depart from those of the councils, we shall deal in turn with forms of research support, financial terms and research personnel. Finally, we shall address ourselves to a problem peculiar to certain types of mission-oriented research—that of secrecy.

### Forms of Research Support

We have recommended that research support be available from the federal research councils in five forms covering projects, programs, Major Proposals, Negotiated Development Grants and Strategic Development Grants. Of these, only the last two are in our opinion inappropriate to mission-oriented agencies. Because they are forms of cost-sharing designed to help universities to develop a new research capacity or to build on existing strength, Negotiated and Strategic Development Grants should be reserved exclusively to those agencies whose sole mission is the support of research for its own sake—the councils. By their very nature, these grants go to the heart of a university's priority-setting process and can have a most comprehensive academic impact.

For the others, however, the forms of project and program support we have discussed are at present widely used by mission-oriented agencies. As to Major Proposals, we have already acknowledged that these often lie in whole or in part in the province of the operating agencies of government. Always bearing in mind that the key test for mission-oriented support should be the relevance of the research to an operating agency's mission, we would urge that mission-oriented projects, programs and Major Proposals be entertained under generally the same terms and procedures as prevail in the research councils. *We therefore recommend that:*

**Each mission-oriented agency requiring research be directed to solicit and entertain university submissions for support of research projects, programs or Major Proposals relevant to its mission under generally the same terms and procedures as the councils.**

In the context of the above recommendation, we note that the Department of Forestry and Rural Development, which now makes flat grants of $40,000 to

each of the four faculties of forestry in Canada, plans to recast this support into program form.

### Financial Terms

Since mission-oriented research responds to the on-going needs of government, all of the arguments that we have developed for full payment of direct and indirect costs by councils apply *a fortiori* to mission-oriented agencies. Before proceeding to our formal recommendation, we wish only to note that a few mission-oriented agencies, notably CMHC and ARDA, have already shown a grasp of the principles of university finance far more sound than that which has prevailed in the research councils. *We recommend that:*

> **All mission-oriented agencies be directed to pay the full direct and indirect costs of any research they may support in universities.**

### Research Personnel

In keeping with a policy of full payment of direct costs, mission-oriented agencies, like councils, should fund the total cost of all research support personnel, including technicians, secretaries, assistants and research associates. However, for the same reasons developed in Chapter 6, we would not wish these agencies to pay the salaries of principal investigators holding full-time university appointments. Of course, where a project or program requires a principal investigator to take a leave of absence, or to assume a part-time teaching load, we deem it proper for a mission-oriented agency, again like a council, to purchase released time in short-term arrangements. We would also note that, given mechanisms for the purchase of released time and the funding of support personnel, mission-oriented agencies will not need formal programs of what we have called elsewhere research leave and post-doctoral fellowships. We wish to reserve such fellowships to councils, because they are not necessarily tied to concrete research designs and hence cannot be readily subject to the test of whether they are relevant to the mission of an operating agency.

A final aspect of policy toward research personnel relates to the practice whereby many mission-oriented agencies have supplemented the regular earnings of university staff through the payment of honoraria or summer stipends. We have no objection in principle to such supplements, provided that they do not violate a university's enunciated policy on the subject. However, it is our opinion that where such supplements are paid, the amounts involved should not be included in the base on which the indirect costs of a project or program are calculated. Inclusion would clearly do violence to the pro-rata calculation of indirect costs we have recommended, and might create an undesirable incentive for universities to frame policies on supplementation in such a way as to maximize their overhead allowances. *We therefore recommend that:*

**Supplementary remuneration to university researchers, where permitted by a university, be excluded from the base on which indirect cost allowances are calculated.**

## Secrecy in Research

Of all the various matters that can sometimes become associated with mission-oriented research, "secrecy" evokes the most emotional response. Properly understood, secrecy can indeed negate the very ends of academic research—the accumulation and dissemination of knowledge. But secrecy, because it alternatively evokes images of bureaucratic furtiveness, military establishments or cut-throat industrial competition, is regrettably conducive to less than fully rational discussion. We hardly claim that the comments we are about to put forward will constitute the last word on the subject, but we offer them in the hope that they can shed a modicum of light on the continuing debate over secrecy.

We begin by distinguishing three types of secrecy in research. First, certain sources of raw data may be considered confidential. Second, publication of the findings may require deferment for a reasonable time period mutually agreeable to the sponsor and the researcher. In the third situation, the findings are, properly speaking, "classified", and will be published, if ever, at the sole discretion of the sponsor.

The confidentiality of raw data is a fact of life in certain research endeavours, particularly those that pertain to the social sciences. Thus, for example, a common rule in research involving the use of questionnaires or interviews is that the information obtained will not be divulged in such a way that an individual respondent can be identified. Again, and very pertinent to certain projects supported by government agencies, researchers may be given access to such confidential information as parole records, tax returns and the like. They are free to discuss and publish their data in aggregated form but are expected to divulge their material in such a way that no inference can be drawn with respect to any individual person.

We can see no objection in principle to "secrecy" that applies only to the confidentiality of raw data. To hold such an objection would be to preclude highly valid university research in any of a number of fields including criminology, public finance and personnel administration. In practice, however, we would urge, where possible, that government agencies make every effort to provide raw data in such a way that individual anonymity is ensured before the information is placed in the hands of university researchers. In the event that this is not feasible, both the terms under which researchers are to be given clearance and the conditions under which they can publish the data in aggregated form should be clearly stated and agreed upon in advance. *We therefore recommend that:*

**In any instance where only the raw source material to which university researchers are to be given access is confidential, each government agency specify the terms under which researchers are to be given clearance and certify in advance the conditions under which findings based on this source material will be made public.**

The second type of secrecy we have distinguished is that in which publication of findings is to be deferred for a reasonable period. Many university researchers are familiar with this type of situation. Thus, for instance, royal commissions, task forces, or study groups may stipulate that the publication of studies conducted under their auspices be deferred until after the release of the official report. Again, government agencies or business firms may request a brief delay between delivery of the findings and their publication in the original form. Although the deferment of publication is open to abuse, we again see no objection in principle provided that proper safeguards are observed. Above all, the length of the time period should be reasonable, say six months to one year. We are tempted to admit no exceptions to the one-year rule, save that we can ourselves offer rueful testimony to the fact that royal commissions, study groups and related bodies have a notorious inability to submit their official reports, whose advent the publication of research studies must reasonably await, within stipulated time periods. In any event, we offer as our prime criterion in the domain of deferment the test of reasonableness, coupled of course with a firm and explicit agreement acceptable to the university, the researcher and his sponsor.

Our third and final form of secrecy, the classification of research findings at the sole discretion of the sponsoring agency, is that which gives us serious pause. It is under this guise that secrecy does irreparable violence to the most fundamental objectives of academic research. Classified research is not subject to the open judgment of scholarly and scientific peers and accordingly fails one of the most crucial tests of a true accretion to knowledge—universal accessibility. While we are sensitive to the claim that classified research findings may on occasion be in the public interest, we cannot reconcile this claim with the greater public interest that universities serve as our society's principal repository of open inquiry. Universities exist to maintain a free flow of ideas and observations and to examine critically all aspects of man and the universe. They provide through research and criticism the catalysts of change, and they are by tradition and mandate the mainstream of renewal in society. It is a simple fact that these functions are undermined when academics within the jurisdiction of the university engage in work whose findings do not become universally accessible. To the limited extent that academics feel called upon to do such work, they should seek leave of absence from the university and should conduct their work entirely on the premises of the sponsoring agency.

We recognize that the stance we take in principle might perhaps brook certain exceptions arising, for example, from a state of full-fledged national

emergency. Again, it might be that an individual university, for what it considered to be valid reasons and in a deliberate exercise of its autonomy, admitted a classified project into its midst. Since principles do not invariably provide infallible answers applicable to all circumstances, what is necessary is to ensure that any exception will be clearly treated as such. At New York University, for example, a written policy stipulates that any project restricting open accessibility "must have the approval of the President, after review by a Committee composed of the Chancellor or his designate, a faculty member chosen by the Faculty Council, and the dean of the school under whose auspices the research is to be carried out".[4] Were any Canadian university to consider housing a classified project, some such searching procedure should be strictly mandatory. Likewise, government agencies themselves should have undertaken a thorough inquiry before approaching any university on a research matter involving classified findings. *We recommend that:*

**Neither government nor universities attempt to enter into arrangements involving universities in work which cannot be published. Any exception to this principle should be subject to the most formal review procedures in both the university and the agency concerned.**

## INDIRECT SUPPORT FOR MISSION-ORIENTED RESEARCH IN UNIVERSITIES

A final aspect of government support for mission-oriented research relates to certain means through which the expansion of such research in universities has been indirectly stimulated. We refer in particular to the funding of university research institutes, which may in time serve a number of governmental and corporate clients, and to incentives whereby industrial firms are encouraged to finance research, either in their own laboratories or in universities.

### University Research Institutes

What is now one of the best-known university research institutes in Canada, the University of Toronto Institute for Aerospace Studies, was founded in 1949 through an initiating grant by the Defence Research Board. The University of Toronto assumed a share of responsibility for the Institute in 1954, and subsequently members of its staff were given regular university appointments. By 1967, the Institute had some 14 clients, and its staff had established a consulting organization called Aerospace Engineering and Research Consultants Limited. Initially funded by a Federal Government agency, then recognized by a university, the Institute of Aerospace Studies

[4] Quoted in Stephen Strickland and Theodore Vallance, "Classified Research: To Be or Not To Be Involved", *Sponsored Research in American Universities and Colleges* (Washington, D.C.: American Council on Education, 1968), p. 211.

now has a record of outstanding work consistent with the graduate programs of the university and of benefit to government, industry and the academic community.

Recently, a more general program to encourage the development of university research institutes has been initiated by the Department of Industry. Called Industrial Research Institutes, these bodies are envisaged as vehicles for the performance of university-based research in engineering technology at the behest of corporate or governmental clients. The Department undertakes to fund the start-up costs of such institutes, which are expected over time to become self-sustaining. The first Industrial Research Institute emerged at the University of Windsor in January 1967, and three more have since been established at the Nova Scotia Technical College, McMaster University and the University of Waterloo.

Provided that government-sponsored university research institutes are firmly under university control and funded without financial loss to the university, we heartily favour their cultivation. We would point out that such institutes are appropriate not only in engineering technology but in any of a number of mission-oriented fields such as taxation, urban studies, health, welfare, and transportation. Accordingly, we would urge the several mission-oriented agencies of government to examine closely the program launched by the Department of Industry. By funding the start-up costs of research institutes, these agencies stand to gain functioning units to which both they and other organizations can turn as clients. Parenthetically, we would note that the policy of full payment of direct and indirect costs urged by us in the support of research projects can only enhance the capacity of research institutes to become self-sustaining in relatively short order. Accordingly, *we recommend that:*

> **Any mission-oriented agency be eligible to apply for authority to fund the full start-up costs of university research institutes destined to be of service to governmental and industrial clients.**

**Industrial Research Incentives**

In 1944, the Federal Government introduced, among other measures, a tax provision whereby corporate firms would be permitted to deduct, as an expense of doing business, current expenses for scientific research not directly related to immediate production activities. Since that time, various other means of encouraging business to support research, either within its own laboratories or in universities or other approved institutions, have been tested. In 1962, a positive tax incentive was adopted, permitting an additional annual deduction equal to 50 per cent of the amount by which a corporation's Canadian scientific research expenditures exceeded those incurred in its last taxation year. Since 1967, in line with a general disenchantment as to the efficacy of tax incentives, a direct subsidy approach was substituted. Under the Industrial Research and Development Incentives Act (IRDIA), Canadi-

an corporations are eligible to apply for subsidies equal to 25 per cent of the aggregate of (1) capital expenditures on scientific research in the fiscal year and (2) the amount by which eligible current expenditures exceed those in a defined base period. The provisions of IRDIA are supplemented by certain additional programs, notably the Industrial Research Assistance Programme (IRAP), associated with the National Research Council, and the Department of Industry's Program for the Advancement of Industrial Technology (PAIT). All these programs remain closely linked to income tax provisions, which continue to provide for the deductibility of expenses that exceed grants paid under IRAP and PAIT and, most important, lay down the definition of scientific research and development expenditures under which IRDIA subsidies are paid.

This definition, incorporated in Section 2900 of the Income Tax Act Regulations, is relatively narrow. It excludes all categories of research in the social sciences and humanities, research to find commercial uses for new or improved processes, and market research. By implication, research designed to improve forecasting techniques or business operations is similarly excluded.

We heartily approve of the fact that business outlays for scientific research and development carried out in universities are included in the current expenditures eligible for IRDIA subsidy. By comparison with other advanced countries, there is ample scope in Canada for an expansion of industrially supported research in universities. Precisely for this reason, however, we are concerned that the definition of scientific research and development governing both IRDIA subsidies and general deductibility of expenses may be excessively narrow. Although we understand that there may be a strong case for designing the definition in such a manner as to orient it toward productivity, we would emphasize that much research in the social sciences, including such fields as industrial organization, operations research and forecasting, can have a direct impact on business efficiency.

In any event, we are impressed by the fact that Section 2900 of the Income Tax Act Regulations has apparently not been re-examined in the light of what is evidently a greatly heightened federal interest in the expansion of industrial research activity, including business sponsorship of university research. Accordingly, we would urge a sweeping study of the definition of research and development found in the regulations, beginning from the broadest possible perspective, which might well include the advisability of including the humanities. *We recommend that:*

**The Federal Government thoroughly re-evaluate Section 2900 of the Income Tax Act Regulations to determine the advisability of including in the term "scientific research and development" research in the social sciences and humanities, and generally all research designed to improve decision-making in business.**

## Chapter 8

# MANAGEMENT PRACTICES IN FEDERAL COUNCILS AND MISSION-ORIENTED AGENCIES

In Chapters 6 and 7, we have outlined broad policies for the support of research by federal councils and mission-oriented agencies, respectively. Some of these policies, such as payment of indirect costs, should be common to all federal research support bodies. Other policies would in our view be peculiar to the councils—negotiated development grants, for instance—or to certain mission-oriented agencies—university-managed research institutes, for example.

In this Chapter, we turn our attention to the management practices that should prevail in federal research support. For reasons which will become apparent as the discussion unfolds, these practices can be common to both councils and mission-oriented agencies in the overwhelming majority of instances. It is because we have reached this view that we have chosen to record our comments on management practices for both councils and other agencies in a single chapter.

Sound management practices are part and parcel of a rational research policy. This is so not only because there is no neat dividing line between policy and administration, but also because the very effectiveness of research depends in no small part on how it is administered. As a recent publication of the American Council on Education points out, the link between research and administration "is well exemplified by research team projects and the establishment of research centers. But even the single investigator, if he is to be scientifically productive, requires services to help manage personnel, payroll, procurement and supply, technical services and facilities. Administration is an essential part of the research effort."[1]

Much of the burden of administering university-based research must necessarily fall upon the universities. In Chapter 3, we briefly described a few of the more salient features of present-day research administration in Canadian universities. This is plainly an embryonic portion of the over-all administrative scene at present, and the universities must themselves take firm steps toward greater internal efficiency if they are to play their role in supporting the implementation of a number of the policies we have recommended. Thus, for instance, our recommendations regarding federal payment of direct and

[1] Karl R. Reinhard and John F. Sherman, "Administration: Continuing Challenges, Maturing Capabilities", *Sponsored Research in American Universities and Colleges* (Washington, D.C.: American Council on Education, 1968), p. 79.

indirect costs hinge in no small part on improved management practices at the university level.

Generally speaking, universities have become aware of the principal tasks that must be undertaken by an office of research administration worthy of the name. We compiled a list of these duties in Chapter 3, and noted that even in some of the larger universities, there remains a noticeable gap between intent and performance. We deem it of critical importance that every university whose research component is at all substantial make a concentrated effort to attract personnel of the highest quality to research administration. Furthermore, each university should take the steps necessary to adapt its general accounting, personnel and related services to the support of research.

Effective research administration within universities will, to no small extent, hinge upon specialized skills whose development can be greatly enhanced through an on-going exchange of ideas and experience. In our view, the Federal Government, as the principal source of research support in the country, has everything to gain from assisting universities in developing the requisite expertise. We are of the opinion that an annual conference of research administrators, bringing together university personnel and representatives of federal funding agencies, would make a vital contribution to this end. *We therefore recommend that:*

**In co-operation with the universities, the Federal Government convene an annual conference of research administrators.**

The improvement of management practices by universities cannot proceed in isolation from parallel efforts on the part of federal agencies to rationalize the administrative process through which their research support is made available. In keeping with our mandate to examine all aspects of federal operations affecting university research, it is primarily to these agencies that the remainder of this Chapter is addressed. The bulk of federal support is now available for individual projects, and we accordingly begin this Chapter with an examination of management practices relevant to the financing of research projects.

## MANAGEMENT PRACTICES FOR PROJECT SUPPORT

### Use of Legal Instruments

Without exception, federal councils and mission-oriented agencies support research projects by means of one or the other of two legal instruments. The first is called a grant, the second a contract. The use of the grant as a research support instrument was pioneered by the National Research Council. In particular, all three research councils—the Canada Council, the Medical Research Council and the National Research Council—now use grants as

the legal medium through which they support research. The National Research Council, by Treasury Board ruling, is prohibited from committing monies in its university support vote for extramural research support under the form of a contract. Mission-oriented agencies, for their part, may support research through contracts, or grants, or sometimes both. Whether a given agency will in fact use a contract or a grant appears in many instances to be the product of happenstance, save that some agencies may lack authority to make grants and accordingly must use their ordinary contractual authority in order to support research.

A point of enormous significance, in our view, is that neither the grant nor the contract is an instrument developed specifically to support research. Rather, each is a longstanding instrument that antecedes government involvement in research support, and that has been adapted, with varying degrees of success, to provide public funds for research conducted outside the government's own establishment. By long tradition, the grant has constituted the means of making available Her Majesty's pecuniary assistance for worthy undertakings. Both in theory and in practice, the potential objects of Her Majesty's bounty are as unlimited as Her right of largesse. The contract, for its part, is as old as government procurement itself. Does the government need military uniforms, office supplies, a public building or the assistance of expert advisers? If so, it will purchase these goods or services by means of a contract.

The process of adapting grants and contracts to the support of research has proved to be a challenge to administrators not only in Canada but in a number of other countries as well. In general, the use of grants for research support has probably proved to be a somewhat less challenging exercise, at least in the short run, than that of contracts. This is because the making of a grant involves the widest latitude on the part of the donor. His "gift" can be presented with or without condition and, to the extent that it is conditioned, the number of riders attached to it is theoretically limited only by the point beyond which no recipient will make himself available. Viewed in this light, the art of research grant administration is to attach no fewer and no more conditions to the grant than will expedite the research for which the grant is made. The main pitfall in applying grants to the support of research lies in imposing conditions that will in fact prove too stringent to enable research to proceed smoothly. The temptation to be overly stringent may stem from motives that are entirely laudable (the protection of the public purse) or from a pernicious attitude ("they should be grateful for what they can get"). But it should be resisted in the long run not least because recipients need to be protected from themselves. Grants may continue to be accepted well beyond the point at which the conditions attached to them provide optimal protection to the donor and financial adequacy and flexibility to the recipient. The long-term result may be poor research and fiscal deficiencies in the institutions that house it.

Adapting contracts, for their part, to the support of research, has not proved to be easy. As a long-established procurement device, the contract is most amenable to situations where the parameters are known. If the government wishes to procure uniforms, or a building, or—to borrow the classic *omnium gatherum* of the Law School classroom—"widgets", it is in a position where it can draw up detailed specifications on the basis of known considerations. Accordingly, quantity, quality and time considerations can all be specified and agreed upon in the contract on the basis of firm and mutually shared expectations. But research projects, unlike widgets, are not subject to detailed specifications as to time, quantity and quality. This is because the actual product to which research will lead cannot be clearly known at the time the contract is made. While money costs and manpower input can be approximated in advance, there is no guarantee that the very process of research will not require major changes in direction, give rise to new manpower and equipment needs, or involve major overruns in time and cost.

Accordingly, the use of the contract for research support has been accompanied in certain instances by the development of provisions far more flexible than those dictated by standard government procurement practices. On occasion, the result has been a research contract that approximates a grant in terms of flexibility. Meantime, it is a fact that certain agencies, perhaps yielding too readily to the temptations already alluded to, make grants whose provisions are overly rigid. The development of research support instruments has therefore yielded a situation where, in some instances, the grant and contract have crossed one another; certain contracts are more flexible than some grants and some grants are more stringent than certain contracts.

**Existing Management Practices under Contracts and Grants**

The phenomenon just alluded to can be clearly illustrated by comparing the management practices of the Central Mortgage and Housing Corporation (CMHC), much of whose research support is made available by contract, with those of the Canada Council, all of whose support is disbursed through grants. Each of the two agencies exhibits a like degree of flexibility with respect to justified alterations in the nature of the research undertaking, changes in equipment needs, and time overruns, all of which are part and parcel of the uncertainties that accompany the research process. Again, both agencies are willing to accept published findings in lieu of a terminal report on the research undertaken. But for the rest, the CMHC contract is generally more flexible than the Canada Council grant. Although Canada Council does not require that grant funds be spent within a specified period, it will not meet costs estimated over longer than an 18-month period without a complete review of the project. CMHC, for its part, can and does operate with longer time horizons, subject only to satisfactory progress reports. There is a

further contrast between CMHC and Canada Council on the matter of progress reports. On grants in excess of $10,000 and extending at most over 18 months, Canada Council requires, in addition to terminal findings, two interim fiscal reports and two interim reports on the substance of the research. Operating within a more flexible policy, CMHC will in many instances be content with annual reporting. As to project costs, Canada Council imposes a number of fixed ceilings—a maximum rate of $7,000 per year for each research assistant holding a doctorate, for instance—while CMHC has no ceilings and negotiates instead on the criterion of reasonableness. Finally, CMHC has an open attitude toward a number of cost categories, ranging from computer time to overhead costs, that Canada Council excludes from support.

The above contrasts should not be deemed to constitute a judgment by this Study Group on the over-all merits of Canada Council and CMHC as research support agencies. To make such a judgment, a host of factors would have to be taken into account—for instance the larger number of projects funded by Canada Council, its wider ranging and doubtless more difficult terms of reference, and so on. But inasmuch as the comparisons just drawn indicate that management practices under a contractual instrument can be not only similar to but more flexible than those that obtain under grants, the point that the difference between the two legal instruments is more nominal than real can be considered amply made.

That the administrative flexibility that research demands has gone as far as to obliterate distinctions between contracts and grants in certain instances should not obscure the fact that there is little discernible tendency for the management practices of federal agencies to converge around a common set of administrative principles. To cite one example in the contractual realm, the Department of Labour, which may occasionally require monthly progress reports, is obviously far removed from the flexibility exhibited by CMHC. And among agencies that make grants, management practices vary widely.

The National Research Council, whose long experience in sustaining a widespread program of project grants is not matched by any other agency, proceeds along the following lines. Its grants are normally on an annual basis, although a 24-month period may be contemplated in exceptional circumstances. The grantee is not obligated to spend the funds allotted to him within the prescribed time period. While the Council makes no legally binding commitments to support a project beyond the period referred to, it commonly enters into informal understandings with a grantee that his funds will be renewed after review, thereby approximating the situation that might obtain if it made longer term grants. Save for senior fellowships and certain kinds of travel assistance, all NRC grants are paid directly to the university at which the principal investigator holds his appointment and, to facilitate fiscal adjustments, the NRC maintains common grant accounts with each university. Council grants never provide salary payments to the principal

investigator, or supplementary stipends, or overhead costs. They normally cover such direct expenses as equipment, materials, supplies and incidentals, although full coverage of these items may be jeopardized by the Council's tendency, discussed in an earlier chapter, to spread available funds among large numbers of projects. In the realm of personnel, Council practice is to provide funds for post-doctoral fellows and student assistants subject to stipulated ceilings, but to allow salaries payable to research assistants and technicians to find their own levels.

The National Research Council pays its grants in instalments, attempting however to provide half of the total for each grant as early as possible in the fiscal year. Title to equipment purchased with grant funds almost invariably goes to the university, and the Council takes a very flexible approach if equipment needs change in the course of research. Progress reports are required of the principal investigator only on an annual basis, and publications are readily accepted in lieu of formal reports. Universities need only submit annual fiscal reports, and supporting vouchers are not required. The Council accepts university audits for purposes of verification.

Harking back to our earlier description of Canada Council grants, differences between the management practices of this Council and of NRC are abundantly apparent—in the extent to which funds are channeled exclusively through universities, in the existence of ceilings on personnel costs, and in the frequency with which fiscal and progress reports are required, for example. A brief survey of other agencies yields numerous other departures from NRC practices. Thus, for instance, Canada Council is joined by at least three other agencies—ARDA, Indian Affairs and Northern Development, and Labour—in the practice of not invariably channeling research funds through universities. As to the time period over which grants are made, the pattern of annual terms is that which reoccurs most frequently among agencies but a number of them commonly enter into firm commitments for periods of from two to five years, subject, of course, to the availability of funds from Parliament. Among these are the Medical Research Council, CMHC, the Department of Energy, Mines and Resources, the Department of Indian Affairs and Northern Development, the Department of Forestry and Rural Development, and the Department of Manpower. In the domain of cost coverage, only ARDA and CMHC appear to be generally receptive to the coverage of all costs, including overhead. Of all the agencies surveyed by us, only one—the Canada Department of Agriculture—appeared to be consciously emulating the management practices of another agency—in this case, those of NRC. There were a number of instances where management practices differed among different grant programs administered by a single agency. Thus, for example, the Canada Council follows an entirely different set of practices in its administration of the special grants made under the Killam bequest. And the Department of National Health and Welfare offers numerous variations as among its welfare, public health, and fitness and amateur sport research grants.

**Some Guidelines for Federal Management Practice**

A number of policies already recommended by us will have the effect of achieving an unprecedented degree of uniformity in the practices of federal councils and agencies. We refer in particular to the full coverage of direct costs and to payment of indirect costs. But there is a clear need for greater uniformity in a number of other practices whose content is more purely administrative in nature. Such uniformity, if tailored to appropriate guidelines, will at once facilitate the task of university business offices in administering research and improve the conditions under which researchers operate.

The first guidelines we would lay down are the essence of simplicity. Funds destined for the support of research projects in universities, or of staff on research leave, should be paid without exception to the university and never to the principal investigator. Furthermore, the university, through a responsible administrative officer, should have indicated its endorsement of the project or leave prior to final agency approval. The need for these guidelines is to us self-evident. In their absence, the university lacks full knowledge of the research effort generated by its staff, the principal investigator cannot take advantage of the university's administrative services, and the university is unable to provide appropriate accounting for the funds and for the demands made on its facilities. Save in the case of research leaves, most federal agencies now adhere to the guidelines we espouse. Those that do not have been a source of endless problems. At our hearings, we collected a sufficient variety of sad stories—for instance, of justifiably upset student assistants demanding payment from the university while the project cheque lay in the principal investigator's mailbox—to convince us that no deviation from these guidelines should be tolerated. *We therefore recommend that:*

> **Without exception, federal funding of university research projects or of research leave fellowships require prior endorsement of the project or leave by a responsible university administrator, and be channeled exclusively through universities.**

When all project funds are channeled through universities, they are handled by university business offices according to recognized accounting procedures. With very few exceptions, federal agencies currently accept, without supporting vouchers, a university's accounting of grant or contract expenditures, subject only to the university's own annual audit. The agencies retain an over-riding right to audit university accounts but it is understood that this right will be exercised only in exceptional circumstances. In the interest of administrative simplicity, both at the federal and the university level, *we recommend that:*

> **While retaining the over-riding right to audit the appropriate university accounts when circumstances clearly warrant, all federal**

**agencies accept, without supporting vouchers and subject only to the university's own internal audit, university accounts of research project expenditures.**

There now exist certain federal-provincial programs for the support of research projects where automatic acceptance of university accounting records is not the rule. As a leading example, we cite the Public Health Research Grants program of the Department of National Health and Welfare. Here, because provincial accounts are audited by federal officials, the provinces in turn audit the university research accounts through their own representatives. Always for the sake of simplicity and uniformity, we would deem it highly advisable for the Federal Government to specify that its own audits of provincial books will accept university project accounts under the same conditions that would obtain if the research projects were funded solely by a federal agency. *Accordingly, we recommend that:*

**When university projects are funded through a federal-provincial program, the federal auditing of provincial books require no evidence of university disbursements other than that which universities would normally be required to provide for projects supported solely by federal agencies.**

In any given fiscal year, especially at the major universities, certain federal agencies are likely to be supporting large numbers of research projects. This would be true of each of the three councils, and may well obtain in the case of some half-dozen mission-oriented agencies. The experience of leading universities indicates that, where an agency simultaneously funds a number of projects, a common grant account contributes greatly to efficient administration. The National Research Council has pioneered in the use of common grant accounts, and universities have found that this form of account generally simplifies the process of reimbursing unspent funds, enables them to cope with the inevitable delays that sometimes arise in the making of instalment payments, and otherwise assists them in the management of public monies. We deem it most desirable that, where circumstances warrant, any federal agency be able to permit a university to manage its project funds in a common grant account. For any given federal agency, the appropriate circumstances will exist only in those universities where a number of projects concurrently receive that agency's support. Accordingly, individual agencies should negotiate common grant accounts on a selective basis. *We recommend that:*

**Each federal agency be authorized to negotiate common grant accounts in those universities where, in the joint opinion of the agency's representatives and the university's business officers, the number of research projects concurrently receiving support is such as to make a common grant account desirable.**

One of the existing management practices that varies most from agency to agency is the timing of payments to universities. As already pointed out, the National Research Council attempts to pay half of its project support as early as possible in the fiscal year, and then normally provides the balance in three equal instalments. The Medical Research Council follows suit. The Canada Council, meanwhile, pays its grants in one, two or three instalments annually, the number of instalments increasing with the size of the grant. Then, according to reports which they submitted to us, there are agencies that make single, lump-sum payments (Agriculture and the Fisheries Research Board), and others that pay bi-monthly (Defence Research Board), quarterly (Atomic Energy of Canada Limited), and semi-annually (the Forestry Branch of the Department of Forestry and Rural Development). CMHC contracts are on a cost-reimbursement basis, but ARDA, which also uses contracts, makes advance payments.

Clearly, there exists no common thread linking federal agencies on the timing of payments. There are further disparities among the agencies that use an instalment system. In some instances, instalment payments are automatic; in others they are contingent on the submission of fiscal reports. We deem it most desirable that a measure of order be brought to bear on the situation that now obtains with respect to the timing of payments. In particular, we believe that the practice of funding projects by the cost-reimbursement method should be discontinued altogether. The cost-reimbursement system entails financial loss to the universities unless accounts are presented and paid frequently, that is on a monthly basis. The result is an overdose of paper work, both for the university and the funding agency, accompanied by inevitable delays on the part of one or the other. *We therefore recommend that:*

**The practice of funding university research projects by cost-reimbursement be discontinued.**

For the others, we hesitate to lay down hard and fast rules. Where grants are small, single lump-sum payments are desirable but even small grants can suitably be paid by instalment where a common grant account is in existence. From a university point of view, the practice of limiting fiscal reports to an annual basis would obviously be ideal but it might create problems for government when agencies become concerned with their flow of funds. We are therefore inclined to suggest the following as minimum guidelines within which agencies can develop what they deem to be the most suitable practices. Agency support for research projects should be made available in no more than four quarterly instalments, payable in advance. In no instance should payments be contingent on more than a semi-annual fiscal report from the university. *We recommend that:*

**All federal agencies make available their support through advance instalments, that the instalments be no more frequent than quarterly**

**and that no agency require universities to submit more than semi-annual fiscal reports.**

Certain mission-oriented federal agencies occasionally make a practice of holding back a portion of their support monies until the project is satisfactorily completed. We would severely disapprove of the adoption of this practice by councils, whose mission is solely to support research and accordingly entails the normal risks that accompany attempts to advance knowledge. On the other hand, we can see a measure of justification in the use of hold-backs by mission-oriented agencies, especially if the work is of an applied nature and the agency's research support program is not such that the sanction available to the councils (non-support of future applications) can be applied. But we are most emphatically of the opinion that hold-backs should not create a situation where universities are out of pocket because they have had to pay for the personnel, equipment and other costs originally agreed upon by the principal investigator and the supporting agency. If the practice of holding back a portion of the support funds is followed at all, it should apply only to the personal remuneration of the principal investigator, if any. *Accordingly, we recommend that:*

**The practice of holding back a portion of research support funds to ensure satisfactory project completion be available only to mission-oriented agencies and be applied only against the personal remuneration of the principal investigator.**

We now turn to a particularly important topic, the time period over which project support should be available. While an annual term prevails in the overwhelming majority of instances, a *de facto* practice of extending the term of support beyond a single year is manifest in a number of agencies. This practice is normally achieved through informal understandings. But as we have already pointed out there are certain agencies, notably the Medical Research Council and CMHC, that enter into formal commitments for periods of two or more years, subject only to the voting of funds by Parliament. Where such commitments are made, the research project in question has priority over any new projects that the agency might consider funding during the approved term.

While it follows that such commitments should not proliferate to a point where any given agency has lost the means of entertaining new projects as they arise, we see great virtue in extending the formal term of support, wherever appropriate, to time periods longer than a single year. From the viewpoint of the university and the principal investigator, formal commitments to support projects over a long term make it possible to attract qualified support personnel on conditions more nearly competitive with those that prevail in the academic marketplace. Again, the availability of long-term support makes possible more rational research planning, and reduces administrative drains on the energy of the principal investigator. From the

viewpoint of federal agencies themselves, longer term support should prove attractive. Thus, for instance, the National Research Council's practice of generally limiting project support to a one-year period, along with informal understandings that renewal is likely, produces a yearly mountain of formal applications. The ensuing pressures on Council time create a situation where it is rather likely that projects are less closely reviewed than they would be if they were formally supported for, say, three years. Under such a practice, each project could be subject to a searching triennial review, with progress over the three-year period subject to the adequate check of annual interim reports by the principal investigator. We know of project support in the United States and Canada that has been formally committed for as long as five years. As a general guideline, a term of three years appears to us reasonable. *We therefore recommend that:*

> **All federal agencies be authorized, where the nature of the project warrants, and subject to the funds being voted by Parliament, to enter into formal agreements to support research projects for periods of up to three years.**

The availability of longer term grants need not, and in our view should not, alter the practice whereby principal investigators annually report on the progress of their work. However, there are certain agencies that now require substantive reports at intervals of less than a year. We seriously question whether such a practice serves the interests of the research process. *We therefore recommend that:*

> **Save in exceptional circumstances mutually agreed upon by the principal investigator and the supporting agency, the only substantive report required of projects whose duration is one year or less be the terminal report.**

*We further recommend that:*

> **Where the term of project support exceeds a period of one year, annual progress reports be the rule.**

In making the above recommendations, we are not attempting to belittle the interest that federal agencies should legitimately have in the projects they support. Rather we wish to promote the efficacy of the research process by protecting the principal investigator from excessive paperwork. We would point out that federal agencies can satisfy their quite legitimate interests in the research projects they support through means other than a stack of seriatim reports. A particularly attractive alternative is a well-planned program of site visits. In yielding information on progress, such visits can often be more valuable than the most carefully prepared interim report. Site visits have the further value of establishing personal contacts between investigators and officials, contacts that can surely lead to greater appreciation of the

research process by the agency, and a better understanding of agency objectives by the researcher.

At present, certain major mission-oriented agencies, for example AECL, CMHC, and DRB, appear to have satisfactory site visit programs. The same holds true of the Medical Research Council but lamentably cannot be said of the National Research Council or the Canada Council. The former has an avowed program of site visits but pressures on staff time have precluded an effective one. The Canada Council recognizes the need for site visits but has been plagued by manpower shortages. Hopefully, the existing situation in the Councils should be remedied in part by the organizational changes recommended in Chapter 5.

With but a few exceptions, Canadian agencies now compare unfavourably with their counterparts in the United States in the matter of site visits. We are most intent on securing the development of site visits not only as a vehicle for the interests of federal agencies in research, but because our hearings provided abundant evidence to the effect that there exists a major communications gap between researchers and the agencies that support them. *We therefore recommend that:*

> **All federal agencies engaged in the support of university research, and the councils in particular, develop a program of selective site visits appropriate to the scope of their research support activities.**

Not least among the potential benefits of site visits is that they will be conducive to an on-going dialogue between federal agency representatives and university business officers. The importance of such dialogue will be greatly enhanced by our policy of full cost reimbursement, which will necessarily entail frequent negotiation of cost items. This implies, among other things, a practice of federal cost approval that takes full account of local circumstances and market conditions. In particular, it means that cost ceilings decreed by administrative fiat must give way to the criteria of reasonableness and flexibility.

These criteria are now applied in practice by the majority of federal agencies. But an exception is sometimes made in the domain of research support personnel. The Canada Council, for instance, makes a practice of imposing arbitrary ceilings on the remuneration of virtually all classes of support personnel. In our view, such ceilings are at once inconsistent with the goals of the research process and with a policy of full payment of costs. From the standpoint of control, an adequate test lies in the extent to which the remuneration of research support personnel is consistent with the faculty and employee salary policies of a university for any given academic year. *We therefore recommend that:*

> **The test for the remuneration of research support personnel be each university's faculty and employee salary policy for the current**

**academic year, and that therefore no agency impose ceilings on the remuneration of research support personnel.**

### Management Practices: Need for a New Legal Instrument

It is not out of the question that the policies recommended in earlier chapters, together with the management practices just discussed, could be incorporated into the existing legal instruments for research support—the contract and the grant. At this juncture, of course, the two would be identical. As an alternative, it might be possible to consolidate all of the policies and practices we have recommended into either the grant or the contract, and direct that the chosen instrument should be the sole legal means of supporting university research projects.

Neither of the above courses of action commends itself to us. The fact is that the grant and the contract are instruments that long antecede government research support. The process whereby they were molded to the research function echoes with sounds of sawing and stretching. Each instrument continues to be used extensively for purposes other than research support, and evokes attitudes and responses that are sometimes far removed from the best interests of the research process. The mystique of the grant is that of assistance from a benign donor, not of funding by a responsible partner. The contract, however ably it can be bent through administrative ingenuity, retains the image, and sometimes the reality, of legal boilerplate.

A major study of research grants and contracts conducted in 1965-66 for the United States Bureau of the Budget by Dr. J. Lee Westrate concludes that research grants and contracts should be replaced in that country by a new legal instrument called a research agreement, and designed especially for the support of research in universities.[2] After a detailed examination of Canadian practices, we heartily concur.

In the Canadian setting, the replacement of contracts and grants by research agreements would have impressive advantages. First, the broad terms on which research agreements are made could be centrally determined by the Federal Government, thereby achieving close co-ordination in the management practices of all councils and agencies. Secondly, within the terms laid down by central directive, individual agencies would be able to consider flexible practices without worrying about whether the adoption of such practices might jeopardize the granting or contractual regulations that must be honored in non-research fields. Thirdly, Treasury Board would be better able to verify and evaluate the involvement of individual agencies in university research support in that estimates of expenditure through research agreements can be readily segregated from, say, contracts for consulting services and grants-in-aid to learned societies. Finally, the creation of a new legal instrument for research would offer singular testimony to the serious

[2] *The Administration of Government Supported Research at Universities,* Washington, D.C.: Bureau of the Budget, 1966.

and challenging terms of the government-university partnership in research. For all these reasons, *we recommend that:*

**The Federal Government proceed to discontinue the use of contracts and grants for university research support in favour of a new legal instrument to be called a research agreement.**

## MANAGEMENT PRACTICES FOR OTHER RESEARCH SUPPORT PROGRAMS

Project support has constituted the principal means whereby federal funds have been channeled to university research. It is for this reason that we developed the above views on management practice in the context of this particular form of support. Elsewhere in this report, we have urged federal agencies to support research in other than project form. We now address ourselves to the question of the management practices that should apply when support is extended to programs and major installations, or through negotiated and strategic development grants. We shall consider also certain general problems in the financing of research personnel.

### Program Support

Under the policy of program support recommended by us, federal councils and certain mission-oriented agencies would be authorized to depart from the project approach in order to fund teams of investigators working on a broad problem area, perhaps in a single discipline, perhaps bridging a number of disciplines. Program support could be extended to departments, or to institutes and centres, or to name groups of investigators and scholars.

We believe that the management practices we have recommended as appropriate for projects are equally applicable to programs. In particular, we deem the research agreement an excellent instrument for the support of programs. The one point on which practices for program support should differ from the project approach is that of time. Invariably, a properly constituted program of research will span an appreciable time period. Whereas in the project area we have suggested support for terms up to three years as a general guideline, it is our view that in no event should programs be supported for a term of less than three years. Again, in that programs will inevitably entail considerably vaster personnel commitments than projects, we deem it highly desirable that decisions to terminate programs be made on the basis of a one-year notice. *Accordingly, we recommend that:*

**(a) Program support be generally subject to the same management practices as project support;**

**(b) The legal instrument for program support be a research agreement;**

**(c) Program support be extended over terms of no less than three years; and**

**(d) One year's notice be given upon the termination of program support.**

### Major Proposals

The funding of what we have called Major Proposals constitutes the horizon at which the government-university relationship embraces "big science", whether of the natural, social or human variety. Since Major Proposals may frequently involve the building and installation of equipment as well as the funding of equipment operating expenditures and research expenses, it is likely that a variety of administrative practices will prove necessary for implementation. However, we can see no reason why the equipment operating and research expenditures cannot be appropriately subject to a research agreement. *We therefore recommend that:*

**The funding of that portion of Major Proposals which relates to equipment operating and research expenditures be by research agreement.**

### Negotiated and Strategic Development Support

As pointed out in Chapter 6, negotiated and strategic development support constitutes a means whereby federal funds are made available to enable universities either to develop centres of excellence or to initiate academic programs not yet in existence. Such support must of necessity be intimately tied to a university's willingness to commit its own resources to the designated area. It follows that negotiated and strategic development support should be exempt from our policy of full federal direct cost coverage and may be subject to rather varied management practices. Such support can most appropriately be viewed as a grant-in-aid. Accordingly, *we recommend that:*

**Negotiated and strategic development support be made available in the form of a grant.**

### Use of Research Agreements

Precisely because a research agreement is a flexible administrative tool, it can be adapted to a number of federal research support activities. Hence our belief that the research agreement is an appropriate instrument for project, program and major proposals support in universities, and probably for most research leave fellowships. Two important assets of the research agreement, in our view, are that it will enable government to set policy and administrative guidelines for all agencies, and facilitate the review of govern-

ment-university relations in research. It follows, however, that if research agreements are to fulfill these goals, they should not be used for ends that lie beyond the normal parameters of the research partnership between federal agencies and universities. This reasoning lies behind the recommendation just made with respect to negotiated and strategic development support.

There are a number of other instances where, in our view, the use of research agreements would be clearly inappropriate. One is where the end-product envisaged by an agency is a piece of hardware. Here, management practices geared to development are more nearly appropriate. A second is where government is purchasing the consulting services of an individual who happens to hold a university appointment. Provided that consulting services are truly consulting services rather than a university research project in disguise, complete with supporting staff, they should be covered by a contract between the agency and the individual concerned. Our third and final exception to the use of a research agreement is where the end-product is to be classified. We developed our views on classified research more fully in Chapter 7. Not least so as to emphasize that research projects whose findings are classified should be clear exceptions to the normal run of government-university research relations, we would have such projects funded by contract. Accordingly, *we recommend that:*

**Research agreements not be used as the instrument of support where:**
**(a) a piece of hardware is the end-product;**
**(b) an agency is purchasing personal consulting services; and**
**(c) the end-product of the research is classified.**

### A Note on Royal Commissions

Royal commissions, as we have already had occasion to note, defy easy classification as research support bodies. The same is true of task forces, study groups and the like. In that royal commissions and related bodies engage the services, on a full or part-time basis, of academic personnel who utilize commission staff and facilities, they can be viewed as temporary in-house government laboratories. On the other hand, when these commissions fund research that is actually carried out on university facilities, they take on the guise of mission-oriented agencies engaged in extramural support.

The principal reason why we have no accurate information concerning the impact of royal commissions on university research support is that these bodies have never distinguished clearly between on-premises employment of academics and support for university-conducted research projects. Pursuant to the terms of the recommendation just made, we would have royal commissions contract for the services of academic personnel who work on their premises, but have them enter into research agreements with universities when they fund on-campus projects. The outcome would shed considerable

light on the extent to which commissions use university facilities, and also ensure that commissions follow appropriate management practices when funding university research. *We therefore recommend that:*

**Authority to enter into research agreements be extended to royal commissions and related bodies.**

### Research Personnel: Remuneration, Fringe Benefits and Taxable Status

As we pointed out in Chapter 6, the support of research personnel falls into a number of categories. These categories can be designated as follows: (1) research support personnel, that is to say, secretarial assistants, technicians and research assistants or associates; (2) post-doctoral fellows; (3) university academic staff if on released time or research leave fellowships; and (4) graduate students. Having reserved the last-mentioned group for entirely separate treatment in Chapter 10, we presently wish to comment on certain technical matters that arise from the support policies we espouse for personnel in the first three categories.

With respect to research support personnel and post-doctoral fellows, it is our experience that these two categories are frequently interchangeable in practice. Thus, for example, whether a person engaged on a project is in fact designated a post-doctoral fellow or a research assistant or associate may hinge on such arbitrary circumstances as whether a supporting agency has a post-doctoral fellowship program, or whether an individual discipline has a tradition of designating support personnel as research assistants or post-doctoral fellows.

While our recommendation, made in Chapter 6, that each research council make available post-doctoral fellowship support distinct from project and program support serves to highlight the special responsibility of the Federal Government to sponsor researchers at an early stage of their career, it does not create an operational means of distinguishing between research support personnel and post-doctoral fellows at the university level. In the interests of administrative efficiency and of the equitable treatment of all personnel, it is our considered opinion that the test for the remuneration of post-doctoral fellows should be the same as that recommended by us for research support personnel—that is, each university's faculty and employee salary policy. As to the remuneration of academic staff on research leave fellowships, both logic and equity demand a similar practice. *We therefore recommend that:*

**The test for the remuneration of recipients of post-doctoral and research leave fellowships be each university's faculty and employee salary policy for the current academic year.**

In that we have recommended a policy of full coverage of direct costs by federal research councils and other agencies, an obvious consequence is

that the employer portion of any fringe benefits payable on behalf of research support personnel will be chargeable to the funding agency. The same would hold true of the benefits payable on behalf of any principal investigators whose projects or programs provide for released time. For the sake of consistency and equity, we deem it highly desirable that similar fringe benefits be chargeable to the Federal Government in respect of academic staff who hold research leave fellowships. *We therefore recommend that:*

**Universities be reimbursed for the employer portion of any fringe benefits payable on behalf of staff holding federal research leave fellowships.**

Bearing in mind the interchangeability of research support personnel and post-doctoral fellows, consistency and equity once more demand similar treatment with respect to fringe benefits. While universities have not considered post-doctoral fellows eligible for their normal program of fringe benefits, we would urge them to reconsider their policy. Were this class of personnel made eligible for fringe benefits, the employer portion of the resulting costs should again be chargeable to the appropriate federal agencies. *We therefore recommend that:*

**When a university extends normal fringe benefits to post-doctoral fellows, the university be reimbursed for the employer portion of the fringe benefits payable on behalf of individuals holding federal post-doctoral fellowships.**

Our pursuit of equitable standards and reasonable practices in the remuneration of federally supported university research personnel brings us finally to the question of taxation. Here the fact is that existing tax policies have tended to distort management practices at the university level, complicate the support programs of federal agencies, and create inequities among university personnel. Thus, for instance, the tax exempt status of post-doctoral fellows not only insulates these individuals from other research support personnel, but also serves to induce an undesirable degree of jockeying within universities with respect to whether an individual will be designated a research assistant or a post-doctoral fellow. Then equally complicated questions arise from the fact that the remuneration of staff under council-supported projects may in certain circumstances be considered a tax-free gift, whereas the same will not hold under other council-supported projects or those funded by a mission-oriented agency. Again, non-taxable status has been considered by a number of federal support agencies to be an open invitation to arbitrary ceilings on remuneration, whereas practical considerations call for flexibility. From the broadest perspective of all, existing tax anomalies raise what in our view is a quite unjustified element of discrimination between teaching and research. These same anomalies may well reflect what we consider the quite outmoded attitude that research funding by federal agencies is a form of giving rather than the product of a responsible government-university part-

nership. On the basis of all the above considerations, including our recommendation that post-doctoral and leave fellowships be at a level set by each university's salary policy, *we recommend that:*

> **All remuneration to university research personnel arising from federal research councils and other agencies, including research leave and post-doctoral fellowships, be deemed taxable.**

In making the above recommendation, we are conscious of the fact that existing aspects of the over-all Canadian tax structure, including the provisions of international tax treaties, may be a source of difficulties. Thus, for instance, Canadian taxation of research leave or post-doctoral fellowships might create an unintended incentive to hold such awards abroad, to the detriment of Canadian university research. There exist, however, entirely practical and equitable means of avoiding such results, for example by withholding a stipulated percentage of a fellowship that might otherwise enjoy tax-exempt status. We do not pretend to possess the expertise required to develop the exact remedies but have no doubt that they are well within the ingenuity of the federal tax authorities. *We therefore recommend that:*

> **The Federal Government study and implement appropriate means of remedying any anomalies arising from the taxation of remuneration paid to university research personnel funded by federal agencies.**

## Chapter 9

# BUILDINGS FOR RESEARCH

The basic proposition on which this report is founded is that, as one of its many goals, the Federal Government has a direct interest in the maintenance of strong universities. That interest is expressed in its responsibility for fostering research in the universities. We believe that any policy designed to meet this responsibility must take into consideration all of the elements involved in a vigorous and growing research effort. These elements include the direct support of the operating costs of research in the universities, the indirect costs arising out of a research program, the provision of trained manpower, the special facilities required for research such as major equipment, computing facilities, library resources, and buildings to house the research personnel and activities. Frustration lies in offering the social scientist operating expenses without access to computers, or offering the humanist secretarial help and supplies without providing the essential library resources, or offering the chemist grants for professional assistants, technicians, and minor equipment while denying him the sophisticated and expensive instrumentation essential to his skills and interest. Frustration on a grand scale will be the result of a policy for support of research in universities which fails to provide the buildings essential to the research. No amount of money for operating costs and for the support of graduate students, alone can ensure a growing research capability. Without the necessary buildings, universities otherwise qualified for significant programs of research and the training of research manpower will have to close their ears to the clamour for admission to the graduate schools. According to our cross-country hearings that day is clearly close at hand in major Canadian universities. Without growth of the graduate schools, research will be aborted at its source. The personnel to man the universities' staff requirements for the growing undergraduate enrolment will not be found. The specialists for governments' own research, already in short supply, will be non-existent and their absence will stunt our ability to achieve our nation's goals. The doctorates increasingly in demand by industry will not materialize and our economy will suffer.

The dire consequences which we predict if all elements of a research policy are not considered may read like "The House that Jack Built", but we make no apology for stating the case strongly. Research is central to most of our public and private aspirations whether concerned with the quality of our consumer goods, the growth of our wealth, the ways in which we live together or our intellectual and cultural opportunities. Just as research is central to much of the nation's business, the universities are central to research. They must account for the majority of basic research in all fields, a

significant proportion of the applied research and, perhaps most of all, the development of the qualified manpower on which all else depends. Systematic means for ensuring that research thrives and grows in the universities demand attention to the problem of buildings.

Throughout our hearings in the universities the expression of concern most commonly heard was concern about buildings for research. One of our group had an opportunity to attend a meeting with the presidents of a number of universities including several of the largest when each was asked the question: "What is the most serious obstruction to the growth of research and graduate programs in your university?" Almost without exception each president replied that unmet building requirements constituted the most serious obstruction. Strong statements about the inadequacy of building programs in universities appeared in the Bladen Report, *Financing Higher Education in Canada.* More recently in testimony before the Senate Committee on Science Policy, Bladen emphasized specifically the inadequacy of research buildings and the urgency of action at the level of the Federal Government.

Quantitative data on building needs in general and research buildings in particular have been extremely limited. The Bladen Report (*op. cit.*) estimated total capital requirements for each year to 1975-76 by allowing $10,000 for each additional full-time student and a five per cent annual increment. These estimates are shown in Table 9:1. The figures for enrolment projections have since been revised upward.[1] The current projection for 1975-76 is 540,000, which is 80,000 higher than the Bladen estimate. Table 9:2 applies the Bladen formula to the current enrolment projections starting with a figure of $10,000 for 1968-69. The resultant figures indicate a total requirement for capital purposes of $3,196 million through 1975-76 or an average of $400 million per year. This estimate includes a large component for student residences. The amount allocated to residences in the period 1961 to 1964 constituted 29 per cent of all capital expenditures. If residences are built for 25 per cent of the increased enrolment to 1975-76, the cost will be of the order of $500 million or 15 per cent of the total capital, leaving an average of about $350 million per year required for other purposes including research.

In 1965, the Canadian Association of Graduate Schools forecast building costs for research, based on a questionnaire addressed to the universities. Virtually all universities giving graduate work responded. The estimates were thought by the Canadian Association of Graduate Schools to be low. They are shown in Table 9.3 and yield an average annual requirement of $51.6 million.

More recently, the Forecasting Committee of the National Research Council has estimated capital requirements for sciences and engineering (Table 9:4). The average annual cost of construction estimated for the six years

[1] W. M. Illing and Z. E. Zsigmond, *Enrolment in Schools and Universities 1951-52 to 1975-76,* Economic Council of Canada, 1967.

1965-66 to 1970-71 is $35 million. To this must be added costs of major equipment and major installations to bring the total annual average to $63 million. However, NRC recognizes and pays for both major equipment and major installations of a specialized nature to the extent that its resources permit.

We have gathered original data from the universities on building requirements for research. If the Federal Government is to be involved we feel it important to apply definitions which distinguish clearly building facilities for research purposes from those for other academic purposes or administrative purposes. Thus we sought from the universities information on:

1. research laboratories for faculty and graduate students;
2. graduate student offices and study carrels;
3. research libraries;
4. computing centers; and
5. "shared" laboratories (partly for research, partly for teaching).

We excluded offices for faculty and any share of administrative or ancillary facilities because identification of a share which should be attributed to research would be speculative. The questionnaire was addressed to the presidents of universities and colleges and we received responses from 57 institutions. The data are summarized in Table 9:5.

The data place the cost of buildings for all purposes at $1,987 million for the period 1968-69 to 1974-75. The figure can be compared to the figure of $2,872 million in Table 9:2 compiled on the basis of a cost of $10,000 per additional student, escalated five per cent per year. The $10,000 figure as a target is speculative. Furthermore, the estimate can be taken as an ideal target in which buildings are constructed promptly and in sufficient quantity to keep pace with enrolment. The figures in Table 9:5 represent, on the other hand, buildings approved in principle to 1974-75. Moreover, they do not include any cost escalation. The figures would be expected to be substantially smaller than the revised Bladen estimate.

The total figure for research in Table 9:5 (excluding "shared" laboratories) is $817 million, or $117 million per year. This figure can be examined in relation to the forecast of the Canadian Association of Graduate Schools (Table 9:3) which yielded an average annual requirement of $51.6 million, based on a six per cent annual growth of graduate enrolment. The current forecast is for eight per cent but this figure did not include building requirements for medical research, at present covered under the Health Resources Fund. These have been estimated by the Medical Research Council to exceed $12 million per year on the average.[2] In addition, our forecast includes $4 million a year for computing centres, an item not included in the previous estimates. We believe our figure of $117 million a year represents a realistic

[2] The total of new space (net square feet) less relinquished space is estimated at an average of 283,000 sq. ft. per year from 1966-67 to 1972-73.

forecast of the building requirements specifically for research purposes for the next seven years. It represents about 40 per cent of total costs for buildings approved in principle.

We have omitted the items in Table 9:5 related to "shared" laboratories from the average annual costs because they represent a relatively small percentage of the total research space and present difficulties in terms of identifying the share which properly could be charged to research.

A measure of the frustration being experienced by the universities in respect to research buildings is evident in actual expenditures for 1963-64 ($8.1 million) and 1964-65 ($14.5 million)—far short of any reasonable goal.[3]

The proposal made in the Bladen Report to help meet university capital costs was for the Government of Canada to establish a fund into which would be paid $5 per capita of the Canadian population and this would be made available to the universities in each province in an amount proportional to that province's share of the total population. The grants to each university would be proportionate to its capital expenditures as approved by the provincial government. No distinctions between research space and space for other purposes were proposed, the intention being that the Federal Government share in meeting the total capital cost.

This proposal fell by the wayside when the Government of Canada decided in October 1967 to withdraw from support of education in the universities, leaving this matter entirely in the hands of the provinces where, constitutionally, it resides. To make it possible for the provinces to meet their responsibility, the Federal Government negotiated a fiscal transfer of tax points together with an annual adjustment to provide each provincial government with a sum equal to $15 per capita of provincial population or 50 per cent of the operating cost of the universities, whichever was the greater. It was the intention of the Federal Government in making this arrangement to provide an adequate transfer of tax credits to permit the provinces to cope with both operating costs and capital costs for the universities.

Provision for capital costs is inadequate. The drafters of the Bladen Report recognized that their specific proposals were a stopgap measure and as a general recommendation urged annual discussions by the Federal Government and provincial governments to review the adequacy of the federal contribution to higher education. Although this proposal is no longer appropriate in the form in which it was presented, it indicates that the commissioners considered their more specific recommendations to be temporary measures.

New evidence adds urgency to the need for arrangements covering buildings for research:

[3] NRC Forecasting Committee, 1966. Table IV-A.

1. The Bladen enrolment projections were low. The capital costs of meeting anticipated enrolment to 1975-76 therefore will be much higher than predicted. Enrolments in 1975-76 will be 80,000 more than projected by Bladen.
2. According to Bladen's testimony before the Senate Committee on Science Policy, he and his fellow commissioners underestimated the research needs of the universities.
3. Our estimates indicate the research building requirements to be significantly higher than have previous forecasts.
4. The low level of capital expenditures for research show that provincial governments have not been able to approach the real need.
5. The position adopted by the Federal Government in 1967 recognized the provincial responsibility for education in the universities and delineated its own responsibilities for the universities as being in the field of research.

All of these are reasons for developing new and satisfactory arrangements and they also are reasons why the responsibility should be accepted by the Federal Government. A division of responsibility between education and research is not an easy one but it is a necessary one, given the present position of the provinces and the Federal Government. Education lies in the provincial jurisdiction. Research, an arm of university activity equal in importance to education, represents a clear federal interest (although not to the exclusion of the provinces). We see the distinction between "education" and "research" best maintained by governments through the development of sharp (if arbitrary) definitions of what will be recognized in each area, and by acceptance by the Federal Government of responsibility in those areas designated as "research". In the last analysis, such definitions can be accepted only through federal-provincial agreement, and we would accordingly urge inter-governmental consultation as a matter of urgent priority.

We would propose for federal-provincial consideration the following provisional definitions of university research facilities, recognizing that careful administrative attention will be required to give them the necessary precision:

1. laboratories intended for the use of faculty and students for the purpose of conducting research;
2. offices and study carrels exclusively for graduate students;
3. whole buildings used exclusively for research or the support of research whether of a general or specialized nature;
4. libraries or parts of libraries devoted to research collections and reading rooms for faculty and graduate students; and
5. buildings or parts of buildings housing computing facilities and ancillary services, to the extent that such facilities are used for research (estimated as a proportion of total use).

Since the object of the Federal Government should be to help develop a strong program of research in the universities, we believe that federal support for research facilities should be made available only in response to concrete proposals adjudicated by expert committees so as to place the funds where they will do the most good.[4] This will involve several important considerations such as:

1. judging the merit of research activities in applicant institutions;
2. accepting the need for balance among regions and among English and French speaking universities, in order to maintain or develop country-wide research competence;
3. recognizing the growing research requirements of established and growing graduate programs;
4. taking advantage of the existence of strong groups who need facilities to maximize their effectiveness;
5. appreciating the need to support some research in undergraduate institutions; and
6. assessing desirably and capability for major new enterprises.

In adopting the position that each proposal should be judged on its merits, we are extending the present system of adjudication of grant proposals and we are urging rejection of the idea that funds for research buildings should be distributed according to any formula related to provincial or university populations or provincial contributions, or university income, or any other device designed to make the division "equitable". We wish the allocations to be fair but we interpret fairness to mean available according to merit in the interest of strong university research widely distributed across Canada.

We put forward for federal-provincial consideration an organization to manage these funds called a Research Facilities Corporation. It might include one or more nominees from each of the National Research Council, the Council of the Humanities and Social Sciences, and the Health Sciences Council, but its membership should be a matter for Government decision. It will be important to have persons who are knowledgeable about university research. The corporation should have the authority to appoint *ad hoc* site visit committees to visit applicant universities and referee proposals. Proposals should carry the signature of the university president and the imprimatur of the board of governors. In order to qualify for funds, the university should be required in its application to identify the amount and source of funds for parts of buildings *not* covered by a research facilities grant application and certify their availability. In addition the university would be required to

[4] Useful guidelines for administering research facilities grants have been developed by the National Institute of Health in the United States. These include "A & E Guide" (Guidelines for Architectural Engineering Documents for Health Research Facilities Construction Grant), and instructions for Preparation of Application for Health Research Facilities Grant, NIH 1212, 1967.

identify the amount and source of new funds required for operational purposes as a result of the new construction and certify their availability. Thus when the proposal involves provincial government commitments these will be identified in advance and the university would require the assurance from the provincial government of its willingness to provide the funds.

The actual processing of applications by applicants will vary in different provinces, depending on their policies governing capital expansion in the universities. For example, in some provinces the governments make commitments to the universities of fixed sums for each of several years in advance. The boards of governors are left with the choice of building priorities within the limits of the sums available (both provincial and private). In such cases the board would be able to apply for support and identify previously committed provincial funds which the board was prepared to earmark for the project. In one province (Ontario), a space inventory is being developed by the universities and the province's Committee on University Affairs. Out of it may develop a formula by which all but very large projects may be covered through general capital grants available for use at the discretion of boards of governors. Here again, boards will be able to apply on the basis of prior provincial commitments. At present in Ontario and some other provinces each building proposal is reviewed in more or less detail by government representatives. Approvals are granted for specific projects. In such cases the province could approve the project *in toto* allowing universities to recover costs if possible through the research facilities corporation and free provincial grants for other capital uses by the university. Alternatively, and more likely, the province might approve the project subject to successful application for federal funding of the research proportion. In either case, the board of governors' application would require provincial decision in advance of federal consideration. In yet other provinces, universities obtain provincial funds for their projects subject to the university providing from other sources some minimum share of the cost (say 15 per cent for example). Here the university could obtain from the province no more than approval contingent on a successful application for federal support.

In all these cases, the essential decision is provincial in the first instance. Federal contributions would be judged purely in relation to research with no consideration of teaching or other uses. The province would make the sole decision about teaching, administrative and other facilities. It would, in addition, be free to make any decision it wished about research facilities but in practice would have the negative judgment of an expert committee to consider in cases of unsuccessful applications for federal support.

The only fields in which the Federal Government at present makes a contribution to university buildings are the health fields. In 1966 an Act was passed establishing the Health Resources Fund to assist the provinces in the acquisition, construction and renovation of health training facilities and research institutions; $500 million was appropriated to be available in respect

of costs incurred between 1966 and 1980 inclusive. Under the terms of the Act the Federal Government will pay to a province up to 50 per cent of the cost of facilities for the training of persons in the health professions or occupations associated with the health professions or for the conducting of research in the health fields. The payments are subject to submission by the province to the Minister of National Health and Welfare of a five-year program of development of health training and research facilities.

The existence of this legislation provides evidence that there is no fundamental obstacle to participation of the Federal Government in the provision of buildings for research. But the operation of the Health Resources Fund has indicated the existence of important shortcomings. At the purely administrative level, testimony presented at our hearings stressed a major aggravation in the working of the Health Resources Fund. At present, equipment can qualify for support through the Health Resources Fund for a period beginning with the signing of the general contract for a health research facility and ending 18 months after completion. During that period, the Medical Research Council is not allowed to consider applications for equipment for use in that facility. The result is that for a period of three years or more faculty members are unable to apply to MRC for the usual types of equipment required for their research. At the same time equipment lists for facilities being built with Health Resources Fund support are set early and adhered to rigidly. The resulting delays in research progress have been a source of considerable irritation.

In our view, there are other shortcomings in the Health Resources Fund that are even more serious. First, the Fund begs the question of why research in the field of health should be treated differently by the Federal Government than any other research activity in the universities. Secondly, because the Fund is a shared-cost program under which the Federal Government contributes a flat 50 per cent of approved facilities, it tends to work particular hardships on the poorer provinces and to distort the priority-setting process in all provinces. Thirdly, because the Fund extends support to non-research facilities, it glosses over jurisdictional lines between education and research.

We believe that the recommended research facilities corporation offers a distinct improvement over the Health Resources Fund. The corporation would provide full rather than partial federal cost coverage, thereby avoiding the fiscal disadvantages inherent in shared-cost programs. This coverage would extend to all scientific and scholarly disciplines, thereby avoiding invidious discrimination between health and other fields. At the same time, because the coverage would be clearly limited to research facilities, jurisdictional questions would be clarified. We wish to note that our proposal for a research facilities corporation appears to be entirely consistent with on-going developments in federal-provincial relations whose main thrust, as in the vocational training field, has been to phase-out shared-cost programs in favour

of more clearly defined arrangements that respect the autonomy of the provincial priority-setting process. It is our considered opinion that our proposal for a research facilities corporation merits full consideration by federal and provincial authorities, and *we therefore recommend that:*

**As a matter of urgent priority, a federal-provincial conference be convened to:**

**(a) consider generally the means whereby the Federal Government can make a direct contribution to university buildings or parts of buildings which can be identified clearly as research facilities;**

**(b) consider specifically the establishment of a federal research facilities corporation which would:**

**(i) administer a research facilities fund supported by an annual federal vote having an initial level of $120 million per year;**

**(ii) receive university applications for the support of building projects for research, such applications to have been approved by the president and board of governors, to specify total capital and operating costs, and to certify all contributions from non-federal sources;**

**(iii) adjudicate, through all appropriate means including site visits, these applications on the basis of such criteria as merit and the need for balance among regions and among English and French language universities;**

**(c) consider specifically an appropriate phasing out of the Health Resources Fund in favour of the research facilities corporation.**

**Table 9:1—Bladen Estimates of Capital Requirements for Universities and Colleges to 1975-76**
(Based on allowance of $10,000 per additional full-time student)

| Academic Year | Enrolment | Capital Expenditures | Cumulative Total Expenditures |
|---|---|---|---|
| | '000 | $'000,000 | $'000,000 |
| 1968–69 | 284 | 325 | 325 |
| 1969–70 | 312 | 342 | 667 |
| 1970–71 | 340 | 390 | 1,057 |
| 1971–72 | 371 | 338 | 1,395 |
| 1972–73 | 396 | 315 | 1,710 |
| 1973–74 | 418 | 334 | 2,044 |
| 1974–75 | 440 | 338 | 2,382 |
| 1975–76 | 461 | 357 | 2,739 |

SOURCE: Bladen et al, *Financing Higher Education in Canada,* Association of Universities and Colleges in Canada, 1965.

**Table 9:2—Revised Estimates of Capital Requirements for Universities and Colleges to 1975-76**
(Based on allowance of $10,000 per additional full-time student)

| Academic Year | Enrolment[a] | Capital Expenditures | Cumulative Total Expenditures |
|---|---|---|---|
| | '000 | $'000,000 | $'000,000 |
| 1968–69 | 305 | 370 | 370 |
| 1969–70 | 345 | 420 | 790 |
| 1970–71 | 383 | 419 | 1,209 |
| 1971–72 | 420 | 428 | 1,637 |
| 1972–73 | 455 | 425 | 2,062 |
| 1973–74 | 487 | 408 | 2,470 |
| 1974–75 | 517 | 402 | 2,872 |
| 1975–76 | 540 | 324 | 3,196 |

[a]Enrolment projections from W. M. Illing, and Z. E. Zsigmond. *Enrolment in Schools and Universities 1951–52 to 1975–76*, Economic Council of Canada, 1967.

**Table 9:3—Cost of Building Requirements for Research, Canadian Universities and Colleges, 1964-65 to 1975-76**
(Estimated by the Canadian Association of Graduate Schools[a])

| Category | 1964–65 to 1970–71 | 1970–71 to 1975–76 | Average per year |
|---|---|---|---|
| | $'000,000 | $'000,000 | $'000,000 |
| Social sciences-humanities | 47.0[b] | 20.0 | 5.6 |
| Research libraries | 70.0 | 60.0 | 11.0 |
| Sciences-engineering | 211.3 | 210.0 | 35.0 |
| **Totals** | **328.3** | **290.0** | **51.6** |

[a]*Forecast of the Cost of Research and Graduate Studies in Canadian Universities 1965.*
[b]Based on estimates of six per cent of total enrolment in graduate work in these fields.

**Table 9:4—Capital Requirements for Research in Sciences-Engineering, 1965-66 to 1970-71 and 1975-76**
(Estimated by NRC Forecasting Committee, 1966)

| Academic Year | Major Equipment | Major Installations | Construc-tion | Total |
|---|---|---|---|---|
| | $'000,000 | $'000,000 | $'000,000 | $'000,000 |
| 1965–66 | 11.3 | 7.5 | 27.4 | 46.2 |
| 1966–67 | 15.6 | 9.0 | 49.8 | 74.4 |
| 1967–68 | 15.7 | 12.1 | 39.5 | 67.3 |
| 1968–69 | 17.3 | 15.4 | 36.6 | 69.3 |
| 1969–70 | 17.6 | 11.1 | 30.3 | 59.0 |
| 1970–71 | 20.6 | 12.4 | 26.8 | 59.8 |
| 1975–76 | 32.8 | 20.9 | 69.2 | 122.9 |

**Table 9:5—Forecast of Buildings to be Constructed for Specified Research Functions, 1968-69 to 1974-75**

(57 universities and colleges)

| Function | Area in Net Sq. Ft. | Cost in Current Dollars | Percentage of Total Cost | Average Cost per Year |
|---|---|---|---|---|
| | '000,000 | $'000,000 | | $'000,000 |
| Total New Building Requirements, 1968–69 to 1974–75 | 45.9 | 1,987[a] | 100.0 | 284 |
| Research laboratories for faculty and graduate students | 14.7 | 618 | 31.1 | 88 |
| Graduate student offices and carrels | 1.6 | 61 | 3.0 | 9 |
| Research libraries | 2.6 | 108 | 5.4 | 15 |
| Computing centres | 0.7 | 30 | 1.5 | 4 |
| "Shared" laboratories | 2.7 | 114 | 5.7 | — |

[a]Including $45 million in land costs.

SOURCE: Based on a survey undertaken by the Study Group. No returns from University of Montreal.

## Chapter 10

# SUPPORT OF GRADUATE STUDENTS

The universities share with governments and the private sector the responsibility for the conduct of research in Canada. However, the universities alone, through their graduate training programs must provide the manpower for maintenance and development of research in all three sectors. Within Canada the graduate schools are virtually the sole source of trained manpower. Additional strength has been provided by immigration and has been very much needed in past years because of the limited size of Canadian graduate schools. In the period 1956-57 to 1957-58, 43 per cent of new recruits to the faculty of Canadian universities came from or returned from countries other than Canada.[1] Based on a study by the Economic Council of Canada, it appears that generally, since World War II, Canada has benefited by a net gain in migration of high-level manpower.[2] According to the 1961 Census, 25.5 per cent of the academic community were foreign-born and 17.7 per cent immigrated between 1946 and 1961. In a preliminary study of arts and science faculties in 15 universities, Muehlen found that in 1968, 51 per cent of faculty members holding professorial rank had obtained their first degree abroad.[3]

These figures are sobering when set against current questions about the desirable levels of graduate school productivity in Canada. The numbers of advanced degrees granted in 1965-66 were estimated to be 5,000 master's and license, and 700 doctorates.[4] The projection for 1975-76 is 18,240 master's and license, and 2,500 doctorates. A recent projection by the National Research Council of production of doctorates in the sciences and engineering shows the number in 1969 to be approximately equal to predicted demand from universities, government and industry. The predicted demand in 1975, however, is shown as only about one half the number that are likely to be graduated.[5] Such predictions are extremely hazardous, as pointed out by the President of the Council. They are based on survey techniques and do not take into account the changes in demand resulting from a larger pool of high-level manpower and its stimulating effect on innovation. Canada has

[1] E. F. Sheffield, *University Development: The Past Five Years and the Next Ten,* Canadian Universities Foundation, 1961.

[2] L. Parai, *Immigration and Emigration of Professional and Skilled Manpower During the Post War Period.* Economic Council of Canada, 1965.

[3] Max Von Zur-Muehlen, Economic Council of Canada, personal communication.

[4] Illing and Zsigmond, *op. cit.*

[5] Schneider, *A Nation Plans its Engineering Research,* panel discussion at 1968 Tripartite Chemical Engineering Conference, Montreal, September 23, 1968.

relatively fewer scientists and engineers than the United States[6] and yet the shortage of such persons in the United States is looked upon as being the most critical problem being faced by United States technology.[7] The very fact of larger numbers of scientists and engineers in Canada may move the Canadian economy in the direction of greater emphasis on secondary industry and thereby modify the demand for doctorates in an upward direction.

Figures on production of Ph.D's do not take into consideration the complex interplay of world-wide demands for high-level manpower or the effects of immigration and emigration. Currently, half the doctorate students in sciences and engineering are non-Canadian (see below) and most of them leave Canada after graduation (see Appendix 2). On the other hand, significant numbers of Canadians obtain graduate training elsewhere (especially in the United States) and a large number of them return to Canada for employment (Appendix 2).

These relationships are not well enough understood to justify reaching policy conclusions at the present time. In particular, we wish to warn against the danger of short-term responses by universities or governments to apparent shortages or surfeits of highly qualified manpower. Adjustments to productivity in the graduate schools would not be felt in the labour market for three to five years, perhaps long after temporary imbalance had corrected itself. We are impressed with the consensus of studies such as those undertaken by the Economic Council of Canada examining *The Contribution of Education to Economic Growth*[8] which shows a relationship between high-level manpower and productivity and we see no danger in continuing to provide high-quality training to increasing numbers of Canadians. Nevertheless, in order for universities, governments and individuals to make rational choices about future development, we urge the necessity for sophisticated studies of manpower requirements in all sectors—sciences, engineering, health, social sciences, humanities, etc.

Graduate student support has been growing in Canada as it has in other countries for a number of reasons. Knowledge of the importance of high-level manpower has encouraged governments to provide support. Graduate students are usually independent and many have acquired families; it would be impossible for most of them to pursue their education without support. They contribute to the teaching programs of the universities and deserve remuneration for this important service; and they undertake (as part of their training) tasks as research assistants. This Chapter examines the enrolment and forecasts for Canadian graduate schools, the sources and amounts of support for graduate students (excluding self-employment and other private income outside of the universities) and makes recommendations about future policy.

[6] Economic Council of Canada *Fifth Annual Report.*
[7] R. Howell and S. Savage, Stanford Research Institute, private communication.
[8] G. W. Bertram, Economic Council of Canada, *Staff Study No. 12, 1966.*

**Numbers of Graduate Students**

The numbers of graduate students in Canadian universities have been growing rapidly (Table 10:1).[9] Rates of increase in recent years have been even faster at the graduate level than the very rapid increases at the undergraduate level. In 1956-57 full-time graduate enrolment was 4.5 per cent of total full-time enrolment. By 1966-67 the percentage had risen to nine per cent.

Figures on graduate enrolment, like most of the statistics sought for this report, vary with the source of information. In this case the differences are attributable to differences in definitions of graduate students, differences in lists of institutions included in surveys and differences in completeness of reporting by surveyed institutions. Current figures have been gathered by the Economic Council of Canada, by the Dominion Bureau of Statistics, by the Department of Manpower and Immigration, and by J. B. Hyne for the Canadian Association of Graduate Schools. The DBS data report enrolments from 52 institutions (including constituent units of the Universities of Toronto, Manitoba, Saskatchewan and British Columbia), and record approximately 24,000 full-time students and 11,000 part-time students for 1967-68.[10] Manpower and Immigration published a figure of 20,954 for full-time students in 1966-67 based on a survey of 46 institutions. The data we consider to be most useful are those compiled by J. B. Hyne. They represent returns from only 31 institutions but these institutions include most of those offering graduate programs according to definitions generally accepted by the members of the Canadian Association of Graduate Schools. Such definitions include studies proceeding to an advanced academic degree and customarily include training for research as a component of the program. Professional degrees at the master's level (such as social work and librarianship) are excluded. Nevertheless, the most that can be said for Hyne's data is that they include most but not all of the graduate students according to the above definition. The total of graduate students (both full-time and part-time) from institutions included in the DBS survey but not included in Hyne's survey numbered between 700 and 800 in 1967-68. Thus the difference appears to be small.

Total graduate enrolments by region for 1966-67 and 1967-68 are shown in Table 10:2, according to Hyne. The total for 1967-68 was 28,378, of which almost half were registered in Ontario. The distribution of the graduate enrolment by university for the 31 institutions included in the survey is shown in Table 10:3. Almost 20,000 students in these institutions were pursuing graduate studies on a full-time basis. The five largest graduate schools accounted for slightly more than half the total graduate student body

[9] Illing and Zsigmond, *op. cit.*

[10] A report has not yet been released and the exact figures are therefore not available.

and about 75 per cent of all graduate students were to be found in only nine universities.

The distribution of graduate students by discipline is shown in Tables 10:4 and 10:5. These two tables are drawn from two different sources and consequently the totals do not correspond to the totals in Tables 10:2 and 10:3. In addition, some overlap is likely between the figures in Tables 10:4 and 10:5. For example it seems probable that some students registered in psychology appear in both tables. Similarly, duplications probably have occurred in geography and in planning. Despite these discrepancies, we believe these compilations give a fair representation of the distribution of graduate students in Canadian universities by field. Greater detail is available in respect to the sciences and engineering in the National Research Council publication, *Graduate Students in Canadian Universities in Sciences and Engineering, 1967-68.*

A startlingly large percentage of doctorate students in the sciences and engineering are neither Canadian citizens nor landed immigrants. (Tables 10:6 and 10:7). More than 50 per cent of all doctorate students in these fields in 1967-68 were in this category. Among those who already held master's degrees (3,447), a total of 1,757 were neither Canadians nor landed immigrants. One of every five such doctorate students in engineering came from India. One of every three psychology students was a citizen of the United States. Comparable data on non-Canadian graduate students in the social sciences and humanities are not available.

**Support of Graduate Students**

Support of graduate students (excluding self-employment and other private income outside the universities) comes from the Federal Government, some provincial governments, the general revenues of universities in the form of scholarships, bursaries and teaching assistantships, and from gifts and endowments. Federal Government support in the form of scholarships and bursaries is shown in Table 10.8. This amount, from all departments and agencies of the Federal Government, totalled $15,503,000 in 1967-68, distributed approximately equally between the natural sciences and engineering, and the social sciences and humanities (Table 4:1). In addition, $5,846,000 were allocated to the support of graduate students from research grant funds of the National Research Council and the Medical Research Council. Thus total federal support of graduate students in 1967-68 amounted to $21,399,000.[11]

Direct provincial support of graduate students is shown in Table 10:9. The total is $7,150,000 for the year 1967-68 and the lion's share, $5.2 million, was provided by Ontario. The figures shown in this table are proba-

[11] Student support from grants and contracts in departments and agencies of the Federal Government other than NRC and MRC is not known but would make the total larger.

bly not entirely accurate. We sought information directly from the provinces, unsuccessfully in most cases, because provincial accounts did not lend themselves to determining easily sums which might be spent within the various departments for the support of graduate students. In some instances the relevant information was provided to us by the universities and some uncertainty was expressed about its completeness. For these reasons we believe the actual figure for direct provincial support may be a little larger than that shown.

Support of graduate students from the general revenues of the universities is shown in Table 10:9. The amount allocated as scholarships and bursaries totalled $1,685,000 and the amount through teaching assistantships was $10,610,000. Gifts and endowments administered by the universities totalled $1,704,000.

Support from all sources is summarized in Table 10:10 for 1967-68. The total figure is some $42.5 million, of which the Federal Government provided approximately 50 per cent ($21.4 million). The average support per full-time student (i.e., total support divided by total full-time graduate students) was about $1,720. These figures cannot be compared directly with figures compiled by Hyne from questionnaire responses from 18 universities with total graduate enrolments purported to account for 70 per cent of all graduate students in Canada. Hyne's estimate of full-time enrolment was just under 20,000. We have used the estimate of about 25,000 recorded in Table 10:1. Moreover our estimates of financial support include support of Canadian students in universities outside Canada. The 18 institutions in Hyne's study reported total graduate student aid of $28 million. The total for all graduate students using Hyne's figures can be estimated at $40 million. The average support per full-time graduate student as estimated by Hyne was $1,960. Whatever the best estimate of support per full-time student, it is important to recognize that actual support varies widely. According to Hyne, 16 per cent of full-time students in 1965-67 received no support. Average support per student supported in the same period was almost $1,000 higher in the sciences ($2,575.) than in the social sciences-humanities ($1,600). The prestigious NRC studentships are valued at $3,600 plus travel. Some Canada Council doctoral fellowships are as much as $5,500.

With some $42.5 million being allocated to the support of graduate students, it is apparent that the policy of providing support is generally accepted. Is such support adequate? The answer is that, although many students are adequately supported, total support is inadequate. Many students receive no support; some are dependent on income earned by spouses or continue to be dependent on parents, a humiliating circumstance for young adults; many have become burdened with loans as undergraduate students and must face the prospect of increasing indebtedness with considerable unease. It is not satisfactory that somehow these students get by. The chances are that many students qualified for graduate school choose employ-

ment alternatives because they are not prepared to face the immediate financial stringencies of entering graduate school.

This is not to say that levels of support need be high. Graduate students are aware that their long-term economic prospects are improved through graduate qualifications and most of them are fully prepared to accept very modest support and a limited standard of living during their graduate experience. Nevertheless, Canada also gains by acquiring people with advanced qualifications and it seems important to provide a basic level of support for all full-time bona fide graduate students enrolled in our universities. Basic support will vary with circumstances—more for the married student with children, less for the single student. It seems likely that today the single student can manage without increasing his indebtedness on perhaps $2,500 a year. A man with a family could not easily manage in a respectable way on less than twice that amount. Although we would not wish to see these figures taken too seriously, we suggest that in estimating the average amount required to support all full-time graduate students in 1967-68, the figure currently used for NRC studentships, namely $3,600, would be appropriate. Using a figure of 25,000 full-time students permits an estimate of $90 million as the amount which would have been required in 1967-68 to meet this goal. This figure is roughly double the amount that was actually available.

How might a policy of supporting all full-time graduate students be implemented and to what extent should such a policy be the responsibility of the Federal Government? Several considerations bear on a proper answer to these questions. On the one hand, training for research is part of the cost of research and, viewed in this light, could be considered as a charge against the Federal Government because of its commitment to research in the universities, its interest in strengthening research in the private sector for economic reasons, and its needs for qualified manpower to pursue its own varied research interests. On the other hand, graduate training is "education" and, as such, falls within the provincial domain. Moreover, a substantial share of graduate student support is in the form of teaching assistantships (about 25 per cent of all support in 1967-68), and this constitutes a cost of maintaining university education, again a direct responsibility of the provincial government. Looked at in yet a third way, graduate education serves provincial and national needs. Ph.D's are employed by most provinces in more than twice the numbers of those receiving their Ph.D. degree in the province (Appendix 2). The fraction of graduate degree recipients employed in the province of their graduation is small; only Ontario retains more than half of its Ph.D. recipients. These facts argue for both a federal and a provincial role in the support of graduate students.

We conclude that by reason of all these considerations, the Federal Government and the provincial governments should share in the support of graduate students. As shown above, the Federal Government and the provinces currently contribute about equally to the support of graduate students

and it seems appropriate that this relationship should continue. The arrangement for sharing the cost, however, can be improved. As noted, support of graduate students can be looked upon as an educational cost. It is desirable therefore that, for the majority of students, the basic level of support be essentially a provincial decision. Currently, as described in Chapter 4, the costs of student awards are not allowed as costs in the fiscal transfer arrangements. In other words, expenditures by provincial governments or by universities for student awards are deleted from the total costs of university operations before arriving at the amount of reimbursement which the Federal Government provides to each province to cover 50 per cent of the costs. *We recommend that:*

**The costs of scholarships and bursaries for full-time graduate students, both Canadian and non-Canadian, paid by the provinces or by the universities from their general purpose revenues be recognized as allowable costs in computing the Federal Government's contribution to university education through the fiscal transfer arrangements.**

In making this recommendation, we contemplate a situation where the provinces are providing support for the majority of the full-time graduate students. However, we strongly support the continuation of a national competitive scholarship program like that administered by the National Research Council. It is highly desirable to recognize our outstanding students and the NRC studentships have carried the prestige which makes them a coveted award. If all the councils offered prestige awards to the top 10 per cent of full-time graduate students (at an average value of $3,600), the cost in 1967-68 would have been about $9 million, somewhat less than the total direct expenditures for student awards to students studying in Canada. *We recommend that:*

**Concurrently with arrangements to allow graduate student awards as a cost in computing the fiscal transfer, the research councils adopt a policy of offering competitive scholarships limited to about 10 per cent of the full-time graduate enrolment.**

It can be seen from Table 10:8 that about $6 million from operating grants was used in 1967-68 for the support of graduate students. The policy of permitting grantees to support graduate students, although helpful in providing needed assistance, has had some unfortunate repercussions. Representatives of the Councils and members of review committees referred to the difficulty of discontinuing questionable research when it is known that graduate students are supported through a grant. One can ask the question, is it any favour to the student or to Canadian research to support a student

under the auspices of a research program of questionable quality? In addition, it was drawn to our attention in some universities that certain departments in their desire to build graduate programs have depended heavily on foreign students paid for through grant funds. We do not believe that this haphazard approach to determining the extent to which Canada should import graduate students represents sound policy. *We therefore recommend that:*

> **Concurrently with arrangements to allow graduate student awards as a cost in computing the fiscal transfer, the policy of permitting the support of graduate students through research grants be discontinued except when it can be clearly established that the services of the student are essential to the performance of the research.**

*We further recommend that:*

> **All support of foreign graduate students under the auspices of the Federal Government become a responsibility of the Canadian International Development Agency.**

The latter recommendation will permit the development of a policy about the extent to which Canada wishes to engage in the training of non-Canadians, above and beyond what the universities and the provinces decide to do on their own initiative. Such a policy will have to take into consideration the extent to which Canada wishes to contribute to advanced manpower training for other countries, and also the extent to which the training of non-Canadians adds to and enriches our own human resources. The point is that centralizing support through the appropriate arm of the Federal Government permits the development of a policy. The present system of funding non-Canadian students leads to a de facto situation arrived at in the absence of a policy. We question the wisdom of a program that provides doctorate training in sciences and engineering to as many non-Canadians as Canadians. In implementing a policy, the Canadian International Development Agency will need to devise methods ensuring the selection of students of high quality.

The weight of the above recommendations places an onus on the provinces to adopt policies toward the support of graduate students which will ensure adequate growth of Canadian graduate schools. We are conscious of the fact that, to date, only Ontario and Quebec are showing genuine concern with this issue. These two provinces account for about 70 per cent of graduate students (Table 10:2). We hope that with the advantage of federal participation through fiscal transfer, all provinces will accept a fair share of the responsibility for ensuring that Canadian graduate students are adequately supported.

**Table 10:1—Full-Time Graduate Enrolments and Projections in Canadian Universities, 1951-52 to 1975-76**

| Academic Year | Total Full-Time Enrolment | Graduate Enrolment | Graduate as Percentage of Total Enrolment |
|---|---|---|---|
| | '000 | '000 | '000 |
| 1951–52 | 63.5 | 3.1 | 4.9 |
| 1952–53 | 63.0 | 3.2 | 5.1 |
| 1953–54 | 64.1 | 3.1 | 4.8 |
| 1954–55 | 68.3 | 3.3 | 4.8 |
| 1955–56 | 72.7 | 3.4 | 4.7 |
| 1956–57 | 78.5 | 3.5 | 4.5 |
| 1957–58 | 86.7 | 4.1 | 4.7 |
| 1958–59 | 95.0 | 4.6 | 4.8 |
| 1959–60 | 101.9 | 5.2 | 5.1 |
| 1960–61 | 113.9 | 6.5 | 5.7 |
| 1961–62 | 128.9 | 7.3 | 5.7 |
| 1962–63 | 141.4 | 8.4 | 5.9 |
| 1963–64 | 158.4 | 11.1 | 7.0 |
| 1964–65 | 178.2 | 13.8 | 7.8 |
| 1965–66 | 205.9 | 17.2 | 8.4 |
| 1966–67 | 234.0 | 21.1 | 9.0 |
| 1967–68 | 268.0 | 25.4 | 9.4 |
| 1968–69 | 305.0 | 30.2 | 9.9 |
| 1969–70 | 345.0 | 35.3 | 10.2 |
| 1970–71 | 383.0 | 40.4 | 10.5 |
| 1971–72 | 420.0 | 45.6 | 10.8 |
| 1972–73 | 455.0 | 50.6 | 11.1 |
| 1973–74 | 487.0 | 55.5 | 11.4 |
| 1974–75 | 517.0 | 60.2 | 11.6 |
| 1975–76 | 540.0 | 64.3 | 11.9 |

SOURCE: Illing and Zsigmond, *op. cit.*

**Table 10:2—Graduate Student Enrolment, Regional and National, 1966-67 and 1967-68**

| Region | Universities | Total Enrolment, Part-time and Full-time | | Percentage of Total | | Percentage Increase 1966–67 to 1967–68 |
|---|---|---|---|---|---|---|
| | | 1966–67 | 1967–68 | 1966–67 | 1967–68 | |
| | No. | No. | No. | | | |
| Maritime Provinces | 6 | 1,181 | 1,613 | 5.1 | 5.7 | 36.6 |
| Quebec | 5 | 5,877 | 6,682 | 25.2 | 23.5 | 13.7 |
| Ontario | 12 | 10,364 | 12,849 | 44.5 | 45.3 | 24.0 |
| Western Provinces | 5 | 3,739 | 4,511 | 16.1 | 15.9 | 20.7 |
| British Columbia | 3 | 2,127 | 2,723 | 9.1 | 9.6 | 28.0 |
| **Totals** | **31** | **23,288** | **28,378** | — | — | **21.8** |

SOURCE: J. B. Hyne, and R. W. Martin, *Statistical Report*, Canadian Association of Graduate Schools, 1968.

| University | Total Enrolment Part-Time and Full-Time | | Percentage of Total | | Percentage Increase from 1966–67 to 1967–68 | Total Enrolment 1967–68 | |
|---|---|---|---|---|---|---|---|
| | 1966–67 | 1967–68 | 1966–67 | 1967–68 | | Full-Time | Part-Time |
| | No. | No. | | | | | |
| Alberta | 1,619 | 1,955 | 7.0 | 6.9 | 20.8 | 1,547 | 408 |
| Bishop's | 9 | 16 | — | — | 77.8 | 11 | 5 |
| British Columbia | 1,949 | 2,374 | 8.4 | 8.4 | 21.8 | 1,735 | 639 |
| Calgary | 405 | 618 | 1.7 | 2.2 | 52.6 | 459 | 159 |
| Carleton | 471 | 674 | 2.0 | 2.4 | 43.1 | 367 | 307 |
| Dalhousie | 464 | 635 | 2.0 | 2.2 | 36.9 | 426 | 209 |
| Guelph | 342 | 429 | 1.5 | 1.5 | 25.4 | 358 | 71 |
| Laval | 891 | 1,062 | 3.8 | 3.7 | 19.2 | 561 | 501 |
| McGill | 2,703 | 2,974 | 11.6 | 10.5 | 10.0 | 2,173 | 801 |
| McMaster | 1,041 | 1,176 | 4.5 | 4.1 | 13.0 | 780 | 396 |
| Manitoba | 1,037 | 1,168 | 4.5 | 4.1 | 12.6 | 844 | 324 |
| Memorial | 78 | 177 | 0.3 | 0.6 | 126.9 | 127 | 50 |
| Montreal | 2,241 | 2,493 | 9.6 | 8.8 | 11.3 | 1,227 | 1,266 |
| Nova Scotia Technical | 99 | 124 | 0.4 | 0.4 | 25.3 | 50 | 74 |
| New Brunswick | 423 | 522 | 1.8 | 1.8 | 23.4 | 390 | 132 |
| Ottawa | 1,175 | 1,474 | 5.0 | 5.2 | 25.5 | 765 | 709 |
| Queen's | 765 | 872 | 3.3 | 3.1 | 14.0 | 733 | 139 |
| Saskatchewan | 602 | 660 | 2.6 | 2.3 | 9.6 | 502 | 158 |
| Saskatchewan (Regina) | 76 | 110 | 0.3 | 0.4 | 44.7 | 78 | 32 |
| Simon Fraser | 133 | 257 | 0.6 | 0.9 | 93.2 | 255 | 2 |
| Sir George Williams | 33 | 137 | 0.1 | 0.5 | 315.2 | 35 | 102 |
| St. Francis Xavier | 77 | 81 | 0.3 | 0.3 | 5.2 | 20 | 61 |
| St. Mary's | 40 | 74 | 0.2 | 0.3 | 85.0 | 7 | 67 |
| Toronto | 3,938 | 4,723 | 16.9 | 16.7 | 19.9 | 3,564 | 1,159 |
| Trent | 7 | 4 | — | — | — | 4 | — |
| Victoria | 45 | 92 | 0.2 | 0.3 | 104.4 | 65 | 27 |
| Waterloo | 790 | 983 | 3.4 | 3.5 | 24.4 | 922 | 61 |
| Waterloo Lutheran | 26 | 62 | 0.1 | 0.2 | 138.5 | 40 | 22 |
| Western Ontario | 1,100 | 1,316 | 4.7 | 4.7 | 19.6 | 1,113 | 203 |
| Windsor | 281 | 460 | 1.2 | 1.6 | 63.7 | 273 | 187 |
| York | 428 | 676 | 1.8 | 2.4 | 57.9 | 237 | 439 |
| **Totals** | **23,288** | **28,378** | — | — | **21.8** | **19,668** | **8,710** |

SOURCE: Hyne and Martin, *op. cit.*

**Table 10:4—Graduate Students in Sciences and Engineering, classified by Field of Study, 1966-67**

| Field of Study | Total | Doctorate | Master's |
|---|---|---|---|
| Engineering and architecture | 2,345 | 717 | 1,628 |
| Pure life sciences | 1,906 | 766 | 1,140 |
| Chemistry | 1,274 | 771 | 503 |
| Experimental psychology | 1,022 | 434 | 588 |
| Physics | 903 | 462 | 441 |
| Mathematics | 742 | 295 | 447 |
| Earth sciences | 684 | 271 | 413 |
| Biochemistry | 446 | 246 | 200 |
| Applied life sciences | 219 | 47 | 172 |
| Geography (other than physical) | 181 | 42 | 139 |
| Community and town planning | 119 | — | 119 |
| Pharmacology | 118 | 59 | 59 |
| Biophysics | 92 | 40 | 52 |
| Oceanography | 66 | 44 | 22 |
| Bioengineering | 54 | 22 | 32 |
| Pedology | 46 | 13 | 33 |
| Agricultural and food chemistry | 31 | 6 | 25 |
| Other | 25 | — | 25 |
| **Totals** | **10,273** | **4,235** | **6,038** |

SOURCE: *Graduate Students at Canadian Universities in Science and Engineering*, NRC, 1967.

**Table 10:5—Graduate Students in Humanities and Social Sciences, classified by Field of Study, 1966-67**

| Field of Study | Total | Doctorate | Master's |
|---|---|---|---|
| Commerce | 1,680 | 13 | 1,667[a] |
| English | 1,287 | 300 | 987[b] |
| Education | 1,075 | 207 | 868[c] |
| Psychology | 1,019 | 503 | 516[d] |
| History | 930 | 260 | 670[e] |
| Modern language | 869 | 290 | 579 |
| Philosophy | 644 | 327 | 317[f] |
| Literature | 637 | 137 | 500 |
| Economics | 569 | 149 | 420[g] |
| Social science | 549 | 38 | 511 |
| Political science | 536 | 185 | 351[h] |
| Sociology | 461 | 100 | 361 |
| Geography | 442 | 92 | 350[i] |
| Religion | 263 | 53 | 210 |
| Classics | 153 | 44 | 109[j] |
| Anthropology | 126 | 47 | 79 |
| Music | 90 | 16 | 74 |
| Planning | 82 | — | 82 |
| Romance studies | 77 | 11 | 66 |
| Slavic studies | 77 | 19 | 58 |
| Medieval studies | 76 | 51 | 25 |
| Linguistics | 69 | 29 | 40 |
| Public administration | 47 | — | 47 |
| International affairs | 27 | — | 27 |
| Canadian studies | 26 | — | 26 |
| Fine arts | 24 | 7 | 17 |
| Drama | 23 | 8 | 15[k] |
| Archaeology | 22 | 13 | 9 |
| Near Eastern studies | 19 | 7 | 12 |
| Asian studies | 16 | — | 16 |
| Industrial relations | 11 | — | 11 |
| Accounting | 8 | — | 8[l] |
| Islamic studies | 4 | 2 | 2 |
| **Totals** | **11,038** | **2,908** | **8,130** |

[a]Dalhousie University (53) includes both Master's and Ph.D. degrees; University of Saskatchewan (Saskatoon) includes both Master's and Ph.D. degrees.

[b]Dalhousie University (77) includes both Master's and Ph.D. degrees; Saskatchewan University (Saskatoon) (17) includes both Master's and Ph.D. degrees.

[c]Dalhousie University (45) includes both Master's and Ph.D. degrees; Saskatchewan (Saskatoon) (54) includes both Master's and Ph.D. degrees; Victoria University (24) includes both Master's and Ph.D. degrees.

[d]Dalhousie University (55) includes both Master's and Ph.D. degrees; Saskatchewan University (Saskatoon) includes both Master's and Ph.D. degrees; Victoria University (11) includes both Master's and Ph.D. degrees.

[e]Dalhousie University (35) includes both Master's and Ph.D. degrees; Saskatchewan University (Saskatoon) (14) includes both Master's and Ph.D. degrees; Victoria University (14) includes both Master's and Ph.D. degrees.

[f]Dalhousie University (8) includes both Master's and Ph.D. degrees.

[g]Dalhousie University (36) includes both Master's and Ph.D. degrees. McGill University (83) includes Economics and Political Science. University of Saskatchewan (Saskatoon) (23) includes Economics and Commerce.

[h]Dalhousie University (23) includes both Master's and Ph.D. degrees; Simon Fraser University (MA-20, Ph.D.-12) includes Political Science, Sociology and Anthropology; University of Toronto (MA-111, Ph.D.-89) includes Political Science and Economy.

[i]Saskatchewan University (Saskatoon) (8) includes both Master's and Ph.D. degrees; Victoria University (3) includes both Master's and Ph.D. degrees.

[j]Dalhousie University (9) includes both Master's and Ph.D. degrees.

[k]University of Saskatchewan (Saskatoon) (2) either Master's or Ph.D. degree.

[l]University of Saskatchewan (Saskatoon) includes both Master's and Ph.D. degrees.

SOURCE: J. B. Hyne, and R. W. Martin, *Statistical Report*, Canadian Association of Graduate Schools, 1968.

**Table 10:6—Distribution by Citizenship and Major Disciplines of Master Degree Students Enrolled in Canadian Universities for the Doctorate in Science and Engineering, 1967–68**

| Major Discipline | Total | Canada[a] | United States | United Kingdom | France | Soviet Union | India | Other |
|---|---|---|---|---|---|---|---|---|
| | Number | | | | | | | |
| Physical sciences | 1,582 | 760 | 112 | 129 | 13 | 2 | 182 | 384 |
| Engineering | 699 | 328 | 14 | 30 | 7 | — | 141 | 179 |
| Life sciences | 642 | 300 | 66 | 30 | 3 | — | 81 | 162 |
| Psychology | 455 | 265 | 143 | 13 | 2 | — | 4 | 28 |
| Other | 69 | 37 | 15 | 5 | — | 1 | 2 | 9 |
| **Totals** | **3,447** | **1,690** | **350** | **207** | **25** | **3** | **410** | **762** |
| | Percentage of Total | | | | | | | |
| Physical sciences | 100.0 | 48.0 | 7.1 | 8.2 | 0.8 | 0.1 | 11.5 | 24.3 |
| Engineering | 100.0 | 46.9 | 2.0 | 4.3 | 1.0 | — | 20.2 | 25.6 |
| Life sciences | 100.0 | 46.7 | 10.3 | 4.7 | 0.5 | — | 12.6 | 25.2 |
| Psychology | 100.0 | 58.2 | 31.4 | 2.9 | 0.4 | — | 0.9 | 6.2 |
| Other | 100.0 | 53.6 | 21.7 | 7.2 | — | 1.5 | 3.0 | 13.0 |
| **Totals** | **100.0** | **49.0** | **10.1** | **6.0** | **0.7** | **0.1** | **12.0** | **22.1** |

[a]Includes landed immigrants.

SOURCE: O. H. Levine, *Profiles and Characteristics of Graduate Students Enrolled for the Doctorate in Science and Engineering at Canadian Universities*, NRC, 1968.

**Table 10:7—Distribution by Citizenship and Major Disciplines of Bachelor Degree Students Enrolled in Canadian Universities for the Doctorate in Science and Engineering, 1967–68**

| Major Discipline | Total | Canada[a] | United States | United Kingdom | France | Soviet Union | India | Other |
|---|---|---|---|---|---|---|---|---|
| | Number | | | | | | | |
| Physical sciences | 761 | 452 | 37 | 91 | 8 | 1 | 10 | 162 |
| Engineering | 140 | 68 | 3 | 13 | 5 | — | 19 | 32 |
| Life sciences | 200 | 125 | 14 | 34 | — | — | 1 | 26 |
| Psychology | 78 | 46 | 20 | 5 | — | — | 1 | 6 |
| Other | 13 | 5 | 6 | — | — | — | 0 | 2 |
| **Totals** | **1,192** | **696** | **80** | **143** | **13** | **1** | **31** | **228** |
| | Percentage of Total | | | | | | | |
| Physical sciences | 100.0 | 59.4 | 4.9 | 12.0 | 1.0 | 0.1 | 1.3 | 21.3 |
| Engineering | 100.0 | 48.6 | 2.1 | 9.3 | 3.6 | — | 13.6 | 22.8 |
| Life sciences | 100.0 | 62.5 | 7.0 | 17.0 | — | — | 0.5 | 13.0 |
| Psychology | 100.0 | 59.0 | 25.6 | 6.4 | — | — | 1.3 | 7.7 |
| Other | 100.0 | 38.5 | 46.1 | — | — | — | — | 15.4 |
| **Totals** | **100.0** | **58.4** | **6.7** | **12.0** | **1.1** | **0.1** | **2.6** | **19.1** |

[a]Includes landed immigrants.

SOURCE: O. H. Levine, *Profiles and Characteristics of Graduate Students Enrolled for the Doctorate in Science and Engineering at Canadian Universities*, NRC, 1968.

**Table 10:8—Federal Government Support of Graduate Students, by Agency, 1966-67 and 1967-68**

| Federal Agency | 1966-67 | 1967-68 |
|---|---|---|
| | $'000 | $'000 |
| NRC (scholarships)[a] | 4,054 | 5,480 |
| MRC (fellowships) | 991 | 1,779 |
| Canada Council[b] | 2,931 | 6,477 |
| CMHC | 169 | 258 |
| Labour | 12 | 12 |
| External Affairs | 533 | 568 |
| External Aid (CIDA) | 717 | 808 |
| Emergency Measures Organization | 5 | 5 |
| Indian Affairs and Northern Development | 5 | 15 |
| National Health and Welfare | 146 | 151 |
| NRC—Research Grants | 3,873 | 4,912 |
| MRC—Research Grants | 644 | 934 |
| **Totals** | **14,080** | **21,399** |

[a]A few special scholarships included in these totals were held outside Canada.

[b]In 1966–67 the sum for study outside Canada was $1,870,000; in 1967–68 it was $3,814,000.

**Table 10:9—Provincial and University Support of Graduate Students, 1967-68**

| Province | Direct Provincial Aid[a] | Scholarships and Bursaries from Universities | | Teaching Assistant-ships |
|---|---|---|---|---|
| | | From General Revenues | From Gifts and Endowments | |
| | $'000 | $'000 | $'000 | $'000 |
| Newfoundland | 79 | 46 | 8 | 8 |
| Prince Edward Island | — | — | 2 | — |
| Nova Scotia | — | 172 | 170 | 104 |
| New Brunswick | 266 | 292 | 16 | 30 |
| Quebec | 1,270 | 85 | 306 | 585 |
| Ontario | 5,198 | 242 | 886 | 5,631 |
| Manitoba | — | 247 | 3 | 312 |
| Saskatchewan | 160 | 183 | 51 | 172 |
| Alberta | 177 | 2 | 123 | 1,952 |
| British Columbia | — | 416 | 139 | 1,816 |
| **Totals** | **7,150** | **1,685** | **1,704** | **10,610** |

[a]From enquiries directed to the provinces or in some cases provincial universities.

[b]From a questionnaire administered by the Study Group—58 universities responded.

**Table 10:10—Total Financial Support of Graduate Students in Canada through Scholarships, Bursaries and University Employment, 1967-68**

| Type of Support | Amount |
|---|---|
| | $'000 |
| Federal Government scholarships | 15,553 |
| Federal Government research grants | 5,846 |
| Provincial Government direct support | 7,150 |
| University scholarships through general revenues | 1,685 |
| Gifts and endowments administered by universities | 1,704 |
| Teaching assistantships | 10,610 |
| **Totals** | **42,548** |

SOURCE: See Tables 10:8 and 10:9.

## Chapter 11

# PROPOSED POLICY IN RESPECT OF LIBRARIES FOR RESEARCH

### Studies of Canadian University Libraries

All significant research is in some measure dependent upon library resources (these being taken to mean the storable materials of human communication, whether in traditional printed or written form, in photocopy or microform, in film, record, picture or map, or in the newer methods of publication by tape, disc, or print-out). The degree of dependence varies, but not as much as is often negatively inferred from the truism that the library is the laboratory of the humanist and social scientist: it is a long time since it has been possible to conduct meaningful research in the natural sciences in isolation from the work of others, and not only the origin and design but also the execution and interpretation of laboratory experiments are dependent upon library resources. As for the humanist and social scientist, his dependence upon library resources is virtually continuous.

Despite the growing Canadian interest in research, however, little formal attention was paid to Canadian library resources and services before the present decade. Of the three reports that were published earlier, only the first purported to be general in scope, the other two being limited to the humanities or the humanities and the social sciences. These reports are:

Commission of Enquiry ("Ridington Commission"), *Libraries in Canada: A Study of Library Conditions and Needs* (Toronto: Ryerson Press; and Chicago: American Library Association; 1933).

Watson Kirkconnell and A. S. P. Woodhouse, *The Humanities in Canada* (Ottawa: Humanities Research Council, 1947); Chapter 8, "Academic Libraries".

Royal Commission on National Development in the Arts, Letters and Sciences, 1949-51 ("Massey Commission"), *Report* (Ottawa: King's Printer, 1951).

Since 1962, however, there has been a spate of reports, some national in scope, some provincial, some merely institutional, some covering all fields, some limited to particular subject areas. Those most pertinent to the present study are:

Edwin E. Williams, *Resources of Canadian University Libraries for Research in the Humanities and Social Sciences* (Ottawa: National Conference of Canadian Universities and Colleges, 1962).

Bernard Ostry, *Research in the Humanities and in the Social Sciences in Canada* (Ottawa: The Humanities Research Council and The Social Science Research Council, 1962).

F. E. L. Priestley, *The Humanities in Canada: A Report Prepared for the Humanities Research Council* (Toronto: University of Toronto Press, 1964).

Beatrice V. Simon, *Library Support of Medical Education and Research in Canada* (Ottawa: Association of Canadian Medical Colleges, 1964).

Canadian Association of College and University Libraries, *Forecast of the Cost of Academic Library Services in Canada 1965-1975: A Brief to the Bladen Commission on the Cost of Higher Education* (Waterloo: University of Waterloo Press, 1964).

Commission of the Association of Universities and Colleges of Canada ("Bladen Commission"), *Financing Higher Education in Canada* (Toronto: published for AUCC by University of Toronto Press, 1965).

Francis R. St. John, *A Survey of Libraries in the Province of Ontario* (Toronto: Ontario Library Association, 1965).

George S. Bonn, *Science-Technology Literature Resources in Canada: Report of a Survey for the Associate Committee on Scientific Information of the National Research Council* (Ottawa: NRC, 1966).

Commission to Study the Development of Graduate Programmes in Ontario Universities ("Spinks Commission"), *Report to the Committee on University Affairs and the Committee of Presidents of Provincially Assisted Universities* (Toronto: Government of Ontario, 1966).

Robert B. Downs, *Resources of Canadian Academic and Research Libraries* (Ottawa: Association of Universities and Colleges of Canada, 1967; withdrawn after limited distribution; silently corrected edition issued in 1968, using original front matter).

These reports[1] have a great deal in common. For one thing, all of them emphasize the inadequacy of Canadian library resources and services. The Ridington Commission (1933) found the situation "discouraging, difficult and wellnigh hopeless" (p. 107). The words were used to characterize federal libraries, but they would have served just as well for the Commission's characterization of the public and academic sectors: "four-fifths of Canada's population . . . are utterly without library service of any kind" (p.139); "there are some Canadian universities that . . . recognize the place of the library in higher education" (p. 125). Fourteen years later (1947), Kirkconnell and Woodhouse reported what little quantitative data had been assembled in the interim, explaining that while it is "the most superficial way of judging the adequacy of academic libraries . . . no other approach will reveal so immediately the nakedness of the land" (p. 154). The Massey Commission (1951) attributed the lack of public demand for adequate libraries to "the fact that Canadians are . . . so intellectually undernourished that many of them now feel no hunger" (p. 110), and said that "the want of proper facilities in books and libraries is a symptom and a cause . . . of the weakness in Canadian scholarship" (p. 163).

[1] At the time of writing, a report is being prepared by a Study Group of the Science Secretariat on scientific and technical information in Canada, which will concern itself, *inter alia*, with certain library resources and services. In 1958-59 the Dominion Bureau of Statistics inaugurated an annual Survey of Libraries in two parts, one dealing with public and the other with academic libraries.

The Williams Report (1962) was the first to be based upon analytical survey methods; because of this and because it was specific (perhaps also because the time was auspicious), its complaint of the inadequacy of Canadian library resources had much more influence than did those of its predecessors. It gave the following list of subjects in the humanities and social sciences "for which there are no considerable library resources" in Canada:

> Among European languages and literatures alone, one might list (Scandinavian other than Icelandic), Basque, Celtic, Dutch, Finnish, Hungarian, Portuguese, Rumanian, and Yiddish. Beyond Europe and the Islamic area, one might list everything, with a note that some material is available for research in literature of the United States, Spanish America, and China. In history there is very little for most of the smaller nations of Europe, including Belgium, Denmark, Finland, the Netherlands, Norway, Portugal, Sweden, and Switzerland; there is not much more for Italy and Spain. Beyond Europe and Islam, there are some resources for history of the United States and China, and a beginning has been made for the Commonwealth countries and for Japan. In religion everything beyond Christianity and Islam remains to be collected. Advanced research in music is no longer out of the question, but the fine arts must still be listed as subjects for which there is no genuine research collection (p. 47).

Even in areas where some research could be carried out the resources were mediocre, very narrow, or both:

> Except in Canadian subjects and in mediaeval studies, there are no collections in major fields that are outstanding as a whole... In each of the broader fields one encounters weaknesses, particularly in printed books of earlier centuries and scholarly works in foreign languages. The scholarship... of all countries other than the United States, the United Kingdom, France, and Germany is very poorly represented (p. 48).

By the time the reader has worked his way through this catalogue of negation, he is not surprised to be told that "the foundations" of a Canadian library research capacity "are still, for the most part, in process of construction" (p. 60).

For Ostry, "the greatest single need at the moment for the healthy development of . . . research work in Canada is for adequate library facilities;" the existing ones (1962) he described as "grossly inadequate" (pp. 35-36). Priestley's report is a successor to that of Kirkconnell and Woodhouse, and he notes encouraging improvements in the intervening seventeen years in both buildings and collections; nevertheless, there is still no "balanced, well co-ordinated collection . . . in Canada," and "the deficiency of primary materials (is) at least as serious as of secondary" (pp. 57-59).

Miss Simon found (1964) that there was only one medical library in Canada which came close to the level of holdings becoming recognized as the minimum necessary for the adequate support of medical training and research (pp. 13-14), that although "there is a greater concentration of medical publications in . . . Ontario and Quebec than in any other area, yet the combined holdings . . . in neither province would make one major

medical collection" (p. 16), that only one medical college library receives more than 50 per cent of the subject coverage represented in the list of periodicals indexed in *Index Medicus* while seven (of the twelve in Canada) have less than twenty-five per cent (p. 21), that there is "very poor coverage in most libraries of publications in any language other than English and French" (p. 22), and that there was poor coverage of indexing, abstracting, and reviewing services and publications (pp. 23-24). Her summary conclusion is that:

> The world's output of medical literature has not been collected systematically in Canada, and that present library acquisitions programmes are not keeping pace with accelerating programmes of medical education and research. Important source materials in fields newly opening up are often missing, and there is sometimes little or no coverage in older fields where it might reasonably be expected to find at least the primary source materials. Depression era budgets have, in many cases, caused serious gaps in collections which can now be met only through recourse to inter-library borrowing (p. 86).

The CACUL Brief (1964), relying upon the Williams Report to provide the specific evidence, asserts roundly that "our research collections are largely negligible" (p. 5). The Bladen Report states that "One of the most serious deficiencies in the research equipment of this country lies in the inadequacy of its libraries" (p. 76). The St. John and Spinks Reports deal only with the Province of Ontario, but since there is abundant evidence that library resources in the rest of the country are even weaker than in Ontario it is safe to assume that their strictures would not have been less severe had their commissions been country-wide. St. John (1965) found the public libraries in a "poor state" and "far short of providing the service needed" ("the total picture is dim"); as for the academic libraries, they are "in most cases . . . weak at the present time" (pp. 40 and 112). The Spinks Report (1966), after noting that the largest Canadian university library outside Ontario had fewer than half as many volumes as the largest in Ontario, said "no university in Ontario comes anywhere near adequacy for doctoral study and research across the broad spectrum of learning" (p. 55). It calculated the shortfall in volumes required to meet the needs of existing graduate and research programs in the province as considerably greater than the total existing stock (p. 58).

Bonn (1966) found that only 17 university libraries held as much as half of his checklist of "the treatises and compilations essential to reference and research" in the science and technology disciplines (p. 29), that in journals "the subject coverage of individual libraries . . . presents a rather disheartening picture in all too many subject areas" (p. 37), that there is very poor coverage of indexing and abstracting services (p. 33), and that when the strain caused by the excessive Canadian reliance upon inter-library loan forces curtailment of access to other universities' collections "a large number" of Canadian academic libraries "will not be able to satisfy any but the most elementary needs" (p. 13).

The Downs Report (1967) which, besides being the most recent, is based upon the most comprehensive and ambitious survey yet made in Canada, notes encouraging progress in recent years but finds that by any of the standards now in use among professional librarians, virtually all Canadian academic libraries are deficient in volume holdings (Tables 11:2, 11:3, 11:4, 11:5 and 11:6). From the point of the view of the present study, the most important aspect of this finding is that "the widest discrepancies are in the large universities with extensive doctoral programmes" (pp. 212-213). Similarly, most university libraries are deficient even in current periodical subscriptions, to say nothing of back files, and in reference works (pp. 217-223). On receipt of this Report, the Canada Council, which was one of the sponsors of the study, declared in its brief to the Special Senate Committee on Science Policy that "the present state of our university library collections . . . is the fundamental and most dramatic shortcoming of Canadian research institutions."[2]

In addition to their unanimous testimony that Canadian library resources and services are inadequate, all the published reports (except the two which, because of their terms of reference, restrict themselves to provincial matters) have a second thing in common: they all see the situation as having a national, as well as provincial and local aspects, and they all (even the first, whose "dismal forebodings" have been blamed for discouraging federal involvement)[3] identify a Federal Government responsibility. The Ridington Commission is, indeed, very nervous about provincial jurisdiction [not enough, however, to prevent it from recommending that the Federal Government reduce postal charges on library loans (p. 142)], and is most anxious to disclaim any intention of invoking the Federal Government as a co-ordinating agent (pp. 142-143); nevertheless it urges (but with no expectation of early success) the establishment of a National Library of Canada (pp. 109-112), which it sees as "the only means by which the national government at Ottawa could give to Canada any leadership in library matters" (p. 143).

The succeeding reports are much less inhibited in invoking the Federal Government. "Until some national integration of library knowledge has been secured," say Kirkconnell and Woodhouse, "the Canadian researcher in the humanities will continue, so far as Canadian resources are concerned, to flounder in an undrained swamp," and they therefore urge the Federal Government to establish "the hub of a large-scale Dominion-wide system of library service" (pp. 166-167). Later, one of the authors of this Report, speaking to the National Conference of Canadian Universities, declared: "And if the problem is indeed a national problem and beyond the means of

[2] Senate of Canada, *Proceedings of the Special Committee on Science Policy*, No. 1, Mar. 12, 1968, p. 5.

[3] Jack E. Brown, "Survey Milestones", *Library Journal* (1966), p. 5525.

the individual university, then a national solution must be found."[4] For the Massey Commission, "what is almost a national scandal requires national action" (p. 110). Williams, having pointed out how much easier of access American libraries were for most Canadian libraries than were other Canadian librairies ("if the international boundary were not there Canada would not form a natural region for purposes of North American library planning" (p. 14), concludes by saying that failure to take certain measures in which the Federal Government would have a leading role "would demonstrate that Canada aspires to be no more than a dependency of other countries in graduate study and research in the humanities and social sciences" (p. 60). Ostry wrote that "sustained assistance on the scale required can only come from the State" (p. 36). Priestley, noting that his predecessors, Kirkconnell and Woodhouse, "had hoped for some recognition by the national government of the national importance of the problems," expressed appreciation of the steps that had since been taken, made it clear that further measures of at least equal importance needed to be taken, and called for "a national policy" (pp. 61-62).

Miss Simon, presumably because of the existing federal involvement in her field, assumes a federal responsibility and envisions "a country-wide system of medical library service" centred in the Federal Government and with regional and local libraries receiving federal subventions as well as services (pp. 69-85). The CACUL Brief declares that "the present state of our academic libraries constitutes a national emergency" (p. 1) and puts the following argument for federal assistance:

> All the arguments for federal assistance to universities apply equally to federal assistance to university libraries; in addition, it should be pointed out that the larger libraries of the country (that is, principally, the university libraries) have served the government and the general public for many years as though they formed a composite national library. Indeed, the plans for the National Library which is now being built in Ottawa provide space for only about two million volumes, and library service for many years to come will depend mainly on the resources of university libraries rather than on a massive central research collection such as many countries have in their national libraries. Our libraries are being used by the federal government as a national resource, and should be supported accordingly, particularly since the research which they support is a contribution to the life of the country as a whole (pp. 19-20).

The Bladen Report endorsed this argument (pp. 53-54) and accordingly recommended federal assistance to university libraries (pp. 68-69 and 76).

The St. John and Spinks Reports, being specifically concerned with the responsibilities of the Government of Ontario, do not address themselves to

[4] A. S. P. Woodhouse, "The Humanities", in *Canada's Crisis in Higher Education: Proceedings of a Conference held by the National Conference of Canadian Universities at Ottawa November 12-14, 1956,* ed. C. T. Bissell (Toronto: University of Toronto Press, 1957), p. 138.

the responsibilities of the Federal Government. Bonn, whose recommendations envision an extensive federal involvement, writes:

> Ever since the 1958 International Conference on Scientific Information in Washington there has been a growing conviction among responsible bodies of scientists, engineers and information specialists that *science information is a national resource* and that the development of science information as a national resource is the direct responsibility of the national government. The governments of the USSR, Great Britain, France and, increasingly, the United States have accepted this responsibility, each after its own fashion; but so far Canada has done little about it (p. 40).

The Downs Report argues for an enlarged federal role in a number of ways, most of which will be reported below.

In addition to being unanimous in stressing the inadequacy of library resources and services, and in treating the situation as, at least in part, a national problem involving a Federal Governmental responsibility, the published reports have a great deal in common in respect of the specific proposals they make for federal action. The Ridington Commission urged the establishment of a National Library which, while not removing the departmental libraries from their sites, would co-ordinate all existing federal libraries into a single catalogue, have a building of its own, and develop an important collection (pp. 109-112). Kirkconnell and Woodhouse also recommend a National Library with a large collection, and in addition to its internal functions they propose a whole range of services to other libraries in Canada. For them "the weakest feature of the whole Canadian library situation is the isolated fragmentation of our resources" and therefore "the greatest single need in this field is a Union Catalogue of the holdings of all Canadian libraries". The proposed National Library should develop such a Union Catalogue; it should also produce catalogue cards for Canadian titles not available from the Library of Congress, make its collections freely available to other Canadian libraries through inter-library loan and photocopy, develop a government documents division with the appropriate bibliographical aids, "give leadership to the libraries of Canada in planning a division of responsibility in the acquisition of library materials in special fields", and develop a central "research workshop" with provision for the support of researchers needing to make a prolonged stay in Ottawa (pp. 165-167). Partly as a result of this Report and the continuing work of the Canadian Library Association, Parliament in 1948 approved in principle the establishment of the Canadian Bibliographic Centre as the first step toward a National Library; the Centre came formally into existence in 1950, and was proceeding with the preparation of a National Union Catalogue while the Massey Commission was working. That Commission recommended that the work on the Union Catalogue be expedited, that bibliographies be developed of all Canadian publications, that the National Library be brought into being at once and take over responsibility for the work of the Bibliographic Centre,

that it become a copyright depository, that it develop as complete as possible a collection of Canadiana (in other fields, it "must avoid all unnecessary duplication and aim rather at supplementing existing Canadian collections"), and that it develop exchanges, microfilm service, and "a special department of information on library practice in Canada" (pp. 329-334). It added, regretfully, that although it felt "great sympathy" for proposals of "some form of direct federal aid to local libraries" it felt precluded by its terms of reference from making recommendations on this subject (p. 334).

When Williams wrote, the National Library had been in existence for a decade and the Union Catalogue for three years longer. Williams formed the impression that "the Catalogue is now nearly complete" and recommended that "it be completed as quickly as possible". He also recommended that it develop a union list of serials in the humanities and social sciences comparable to the *Union List of Scientific Serials in Canadian Libraries* which had been begun in 1957, that it develop a comprehensive collection of bibliographical and reference materials and of world government documents, that in its general acquisition policy it emphasize economics, political science and sociology, that when opportunities occurred to acquire special collections for Canada it seize them, and that it establish an Office of Canadian Library Resources which would help Canadian libraries to take other holdings into account in planning the development of their own, and act as their purchasing and reproductions agent. He recommended some division of responsibility between academic libraries for collecting, with direct federal assistance: "Indeed, when one considers resources nationally, taking into account the fact that there is a centralized record in the National Union Catalogue and that lending and filming proceed on a large scale, one can regard the research libraries of the country as units of an auxiliary, decentralized national library." He therefore urged that the few token grants which had been made by the Canada Council to support improvement of library collections in certain fields be extended, arguing that the precedent had in logic been established in the Council's capital grants to universities and "books are a better and more permanent investment for a university than buildings" (pp. 52-60).

Ostry proposed the enlargement of the functions of the National Library and the establishment of "a national centre of research to serve the social sciences and humanities," special grants to the universities to assist particular areas of research, federal grants through the Canada Council of $50 million and $25 million for the support of university library book purchases and capital projects respectively, a capital grant to the National Library to enable it to reproduce research materials for universities, and the designation of a number of university libraries as depositories for government publications (pp. 17-19 and 36-37). Priestley notes with satisfaction that his predecessors' recommendations for a Union Catalogue and a National Library have

been implemented, and notes that the Canada Council capital grants have been an important contribution to university library construction, but complains that "there has been little disposition at the national level to recognize the vital importance of building collections", rebukes the Canada Council for failing to contribute in the development of such a policy, and calls upon it to do so "even now" (pp. 61-62). The CACUL Brief supports Williams' proposal for the establishment of an Office of Library Resources in the National Library to foster co-operation among university libraries on a national scale, recommends that the "token" book funds granted by the Canada Council be increased from the current $40,000 annually to $1 million, and that in other subjects, including science and technology, similar grants totalling $10 million a year should be made to assist the development in university libraries of specialized subject collections which would be designated "national research collections"; all these grants would include an "administrative cost allowance" equal to the amount to be expended on purchases (pp. 20-28). The Bladen Report supports the CACUL Brief, and recommends that the Canada Council distribute $2 million a year "as grants to university libraries for the development of their research collections," and that the National Research Council and the Medical Research Council provide similar assistance to an unspecified amount (pp. 68-69 and 76.)

The context of the Simon and Bonn Reports needs to be briefly sketched. In 1925 the National Research Council set up a library to serve its own scientific staff. In response to requests from persons and organizations outside of NRC it developed during the following years a substantial collection of scientific and technological works. With the passage of the National Library Act in 1952, an agreement was reached between the National Library and the NRC that the latter's library would assume responsibility for national library services in the fields of science and technology. In 1957, a National Science Librarian was appointed and assigned the task of developing the NRC library into the National Science Library of Canada, which was brought formally into being by the 1966 revision of the NRC Act.[5]

When the Simon Report was being written, the National Science Library had not yet been formally established but the division of responsibility between the existing and proposed National Libraries had been spelt out in detail in 1957 and had been confirmed in 1964 by the Secretary of State, who is the Minister responsible for the National Library.[6]

Miss Simon recommends against attempting to create a new medical library in the National Capital, but propounds "a country-wide plan for co-operative medical library service" which will involve the strengthening of medical college libraries, the development of strong regional medical library

[5] National Science Library *Annual Report 1966-67* (Ottawa: NRC, 1967), pp. 1-2, and *Canada Year Book 1967*, p. 377.

[6] National Science Library *Annual Report 1966-67*, p. 2.

systems, and the creation of a national medical information centre which would compile an up-to-date Union Catalogue of medical and bio-medical holdings, provide a central "reservoir" of reference materials, be the Canadian search centre in international undertakings, formulate a plan for decentralized co-operative collecting, and provide a number of information services. She recommends that this organization be partly in Ottawa (for which purpose the National Science Library should be extended into a National Science and Medicine Library)[7] and partly in Toronto and Montreal because the information and bibliographic services could not be set up except on extensive collections of bio-medical materials such as those to be found in the latter cities, but not in Ottawa. She recommends federal aid to the regional systems and to the individual medical libraries (pp. 66-85).

Bonn recommended that "the library of the National Research Council of Canada should be the National Science Library of Canada in fact as well as in name". It should have a "comprehensive" collection and should perform a number of distributive, informative and evaluative services, such as bibliographic, referral, photocopy, translation, reference, etc. In addition, it should organize and direct a national science library service which would consist of a voluntary network of libraries, each with a responsibility for its own region, and receiving grants-in-aid from the National Science Library (pp. 44-51). A particular recommendation was that all federal agencies which give grants in aid of research should add a percentage for "literature support" and all the books, journals, etc., purchased from this money should be the property of the university (pp. 22 and 40-41).

The Downs Report, with a heavier emphasis than its predecessors upon the potentialities of modern data processing and communicating devices, gathers up many of their earlier recommendations for Federal Government action. It recommends that:

> The National Library and the National Science Library should exercise vigorous leadership in such programmes as completion of the National Union Catalogue and national union lists of serials, establishment of a national communications network among research libraries, provision of bibliographical services, and co-ordination of collecting activities. Toward these ends, the creation of an Office of Canadian Library Resources in the National Library, recommended by Williams in 1962, is reiterated here[8]... Adoption of a modified Farmington plan, under the auspices of the proposed office of Canadian Library Resources... is recommended... The selection among universities of areas of strength for research and graduate study and a consequent sharing of library resources on a local, regional, and national basis should be encouraged... Special grants from the Canada

[7] In November 1966, the National Science Library was assigned the additional responsibility of serving as the National Bibliographic Centre for the Medical and Health Sciences; see NSL *Annual Report 1966-67*, pp. 5-6, and *NRC Research News* March-April, 1967, pp. 10-11.

[8] At the AUCC Conference on the Downs Report in April 1968, the National Librarian announced the establishment of an Office of Canadian Library Resources. The September 1968 number of *Canadian Library* (p. 73) announced the appointment of the first director of the new office and stated that its first undertaking would be a "continuing survey" of Canadian library resources.

> Council should be continued and increased for the building up of research collections in university libraries. Such funds should be concentrated in a limited number of institutions, looking toward the co-ordinated growth of a great national resource available to the faculties and students of all universities and colleges... University libraries should receive a reasonable percentage of overhead costs usually allowed in research contracts with government and industry... Libraries which have acquired important and distinctive specialized collections... should be encouraged and assisted in their further development, particularly if these resources can be fitted into an overall national pattern or programme (pp. 6-8).
>
> The National Library's collecting responsibilities should be more specifically defined, and its book budget increased to $1,000,000 per year (p. 182).

The themes, then, have been remarkably constant in a series of reports stretching over some 35 years: Canadian library resources and services are woefully inadequate for the development and support of an acceptable level of Canadian research activity; this constitutes a serious national problem and creates an identifiable federal responsibility; the Federal Government, through its own activity and through financial support of university and college libraries, must find means greatly to increase these resources and services and greatly to enhance their usefulness.

These are the same themes as were sounded during our visits to universities throughout Canada and in many briefs from Canadian organizations and institutions.

**Inadequacy of the National Union Catalogue**

Even if Canadian library resources were several times greater than they are, they would still constitute an inadequate and uncompetitive basis for research unless they were successfully integrated into a national system. University library resources have indeed grown greatly in recent years, and the rate of expenditure continues to grow (Table 11:2), but when compared with the growth in requirements, it would be hard to assert that the resources were more adequate to the demand than a quarter-century ago: demand grows very rapidly when additional graduate (particularly doctoral) and research programs are undertaken. In 1945 there were four Canadian university libraries among the 84 academic libraries on the continent important enough to be generally listed;[9] in 1967 there were three among the leading 70.[10] In 1945 they ranked 36th, 38th, 47th and 74th by volume holdings; in 1967 they ranked 9th, 42nd and 56th. In 1966-67, the median number of accessions among the 70 libraries of the Association of Research Libraries was about 80,000; only three Canadian libraries acquired that number. The median number of holdings was 1,236,000; only one Canadian library had so many. To make the competitive position worse, there are many large research libraries in the United States besides university libraries (two of them are larger than the largest university library), whereas the non-academ-

[9] Kirkconnell and Woodhouse, *op. cit.* pp. 154-156.
[10] Association of Research Libraries, Academic Library Statistics 1966-67.

ic research libraries in Canada are few and small. Furthermore, the system elements in the United States are much more highly developed than in Canada, permitting researchers greater access to the resources of another institution than would be possible here.

It is obvious that the more limited the country's library resources are, the more important it is that they complement and support each other. It is equally obvious that the most efficient use of such resources as the country has will not compensate for the absence of essential research materials. As between the two necessary undertakings, the development of a national research libraries system and the acquisition for it of functional quantities of research materials, there is a logical but not absolute primacy for the Federal Government in the former. Although the wastefulness of duplication may easily be over-emphasized, when there is so much that needs to be acquired it would be a pity if substantial portions of new materials were unnecessarily duplicative, and the only dependable safeguard against such unintended duplication lies in some aspects of the system which anyway needs to be developed for positive ends.

The key to the systematic utilization of library resources is always cataloguing; when these resources are scattered over immense distances, the expedients of familiarity which alleviate dependence upon cataloguing in one's own institution are inoperative, and, from the working researcher's point of view, uncatalogued resources in other institutions might almost as well not be there. Recognition of this fact caused Kirkconnell and Woodhouse to recommend the establishment, and later reports to call for the perfection, of the National Union Catalogue. The more recent reports, and all the universities and learned societies with whom we held discussions, wanted this Catalogue to be machine-readable.

We fully endorse this objective. We feel obligated, however, to warn against its pursuit by means that cannot achieve the goal. We believe that there has been a general misreading, at least so far as the published evidence is concerned, of the feasibility of the present plan (more scepticism about it is revealed in discussion). As we have seen, Williams, writing in 1962, had the impression that "the Catalogue is now nearly complete" and recommended that it "be completed as quickly as possible, and that holdings of which it now has only a microfilm record be incorporated in the regular card file" (p. 52). It is possible that the explanation for this appraisal of the Catalogue may be found in an unrelated passage: "there was time for no more than a glimpse of non-university libraries" (p. 9). Five years later, with more time available, Downs found that "several factors have retarded the growth and usefulness of the Catalogue". He thought, however, that "the generous space provided in its new building should enable the Library to correct any past deficiencies" and recommended that it undertake "a special study . . . to determine what important libraries or collections are unrepresented or inade-

quately represented . . . . A systematic programme should then be undertaken to add entries for these holdings to the Catalogue, probably by some rapid method of photographic reproduction" (p. 175).

The sad fact is that the National Union Catalogue never merited Williams' description, and does so even less now than when he wrote. Information about the stock of books in Canadian libraries is incomplete, but the data below and in Table 11:1 are enough to enforce this pessimistic appraisal.

In 1963, the National Union Catalogue had 5,000,000 entries, representing 8,300,000 volumes in 203 reporting libraries;[11] i.e., the entries "covered" 23 per cent of the stock of 36,000,000 volumes included in the DBS *Survey*. In 1965, it had 5,900,000 entries, representing 9,500,000 volumes,[11] i.e., the "coverage" had dropped to 20.5 per cent of the stock of 46,000,000 volumes, a decline of 2½ percentage points of the stock, or almost 11 per cent of the coverage, in two years.

No more recent figures are available for the total stock but something about it may be deduced from the more recent figures available for the university and college sector. In 1966-67, according to a DBS "Preliminary Release" dated January 1968, 1,753,000 volumes were added in this sector, bringing its total to 13,836,000. In 1963, this sector had accounted for 25 per cent of the total, and in 1965 for 22 per cent (11,100,000 of the 12,200,000 shown for all post-secondary institutions). Assuming for 1967 the average of these earlier proportions (23.5 per cent), the increase to the whole stock would be about 7,460,000 volumes. In 1967 the *Report* of the National Librarian stopped giving the total number of entries in the National Union Catalogue, but it gave the number of accessions for the year as 764,000 (p. 6). This would appear to be about 10 per cent of the total growth. When this is compared to the 20.5 per cent of coverage in 1965 and the 23 per cent in 1963, it seems clear that the decline in coverage is now much more rapid than between 1963 and 1965.

Even more disconcerting than the fact that the already limited coverage of the National Union Catalogue continues to shrink, is the realization of what its entries are. The Catalogue was originally based upon the microfilming in 1954 of the card catalogues of the participating libraries. These microfilm rolls, with the exception of those pertaining to the University of Toronto and McGill University, were subsequently printed out; most of them were then cut to form card entries. The explanation given at the National Library for the failure to incorporate the catalogues of the two largest research collections in the country is the magnitude of the undertaking, supported by the compassionate consideration that the burden of inter-library loan already falls most heavily upon these institutions, and the absence from the National Union Catalogue of the record of most of their holdings will

[11] *Report of the National Librarian* (Ottawa: Queen's Printer) 1963, 1965.

prevent that burden from growing even more disproportionate! In addition to the unprinted and virtually unusable Toronto and McGill microfilms, there are a large number (probably over a million) of "entries" from other filmed catalogues which have been printed but are still uncut and stored in wrapped reels in another section of the National Library.

Since the original microfilming, the National Union Catalogue has depended upon the reporting by participating libraries of accessions. Some libraries carry out their commitments faithfully, while others—including some of the most important—report fitfully when they report at all. The reporting cards, moreover, come in every form conceivable, often so as not to permit confident identification even of the work, let alone the edition. The state of the information, therefore, would make it virtually impossible for the National Library to convert its material into entries in a genuine union catalogue, that is, author fully identified with his life dates, full title, place and date of publication and name of publisher, bibliographical analysis, and locations in Canada, all on one card. (Fully to exploit the potentialities of automated cataloguing, of course, the input should be much more analytical.) It is partly for this reason, no doubt, that the National Library has made very little progress in "unionizing" its Catalogue. Professor Gordon R. Elliot estimates that "at most only 5 per cent" of the cards are consolidated.[12] Explaining the frustrations he experienced in attempting to work in the National Union Catalogue, he describes the portion of the material which is accessible as follows:

> We have, then, a "union catalogue" which is not a union catalogue. We have instead a collection of catalogues: "union", cut cards, accessions, listed books, National Library. Omitting the National Library catalogue, five catalogues comprise the "union catalogue", and within that section designated "union catalogue" there are really, by average, seven catalogues, and within accessions, three. A total of thirteen catalogues where we expect to find one, a union catalogue.

It would contribute greatly to clarity of thought on this crucial problem if the so-called National Union Catalogue were given a correct name, which would be something like "National Selective Locations Searching Service". For such information as it is able to provide, it depends upon a large and growing corps of workers, and even to maintain its present percentage of coverage it will require endless expansions of both personnel and space, and can scarcely avoid steadily diminishing accuracy of materials. It is not, in its present state, capable of being converted into a genuine union catalogue, and the upgrading of its present supply of materials would be far more difficult than beginning again on a different basis. As for an automated catalogue, the materials in the National Union Catalogue are not susceptible of being converted into the data base.

[12] *Humanities Research Council of Canada Annual Report 1966-67*, pp. 18-19.

All this is by no means to write off the development of a machine-readable National Union Catalogue; as was said above, this is the indispensable basis for any national research libraries system. It is simply necessary to recognize that it cannot be developed from the present finding service in the National Library, and to propose a feasible alternative. In the interim, while the new system is being developed, the current service, which, for all its limitations, is very useful, should be maintained until the new one goes into operation.

**Proposals for Developing a National Union Catalogue**

To develop a genuine national union catalogue—one capable of serving as the nucleus of a national system of research libraries—would appear to require a fresh start, this time on a feasible basis.

The magnitude of the undertaking must cause some hesitation, particularly as it may seem difficult to be sure, until a number of years have passed, that the new scheme will be more feasible than the old. Fortunately, however, the capabilities of modern technology make it possible to devise a plan which would produce immediate and permanent dividends for each component of the investment, while such successes of the parts of the system would guarantee the functional nature of the whole.

Even for internal reasons alone it is rapidly becoming necessary for important research libraries to achieve machine-readable catalogues. The Downs Report (pp. 150-155) gives some account of Canadian developments in this and related fields; since the Report was written there have been further developments, some of very great importance. To the extent that Canadian research libraries achieve automated cataloguing, and assuming compatibility, the problem of a functional data base is, in effect, solved. The tapes or discs from each institution, or from each group of institutions, could be passed on to the national union catalogue in Ottawa, where they could be readily integrated and constantly updated.

Furthermore, the degree of bibliographical control would be much more intensive and powerful than is possible for a manual catalogue, since access to the information file could be programmed not only through author's name but also through title and whatever descriptive and thematic bibliographic elements had been built into the programming. In the first phase of development, such analytic cataloguing ought to be limited to what is now technologically feasible, e.g., author, title, place of publication, language, date, etc., but more ambitious analysis should be allowed for from the outset, since this will determine the information-retrieval capability of the system.

The fundamental requisite for this mode of developing a national union catalogue is compatibility between the catalogues of the participating libraries. Here the determining factor must unquestionably be the standards recently established by the United States Library of Congress for bibliographic data

recording in machine-readable form. During its first phase, the Library of Congress MARC project became the basis for experimentation and development in Canada, and in the revised (MARC II) format (which will certainly be the basis for widely used international communication) we have at hand what seems the inevitable framework for a Canadian format, the exact specifications of which should be worked out as quickly as possible.

We believe that the best, and indeed the only feasible, way to develop a true national union catalogue is to commit ourselves to machine-readability, after which the Federal Government, through the National Library, should take the following steps: it should organize and finance a catalogue planning and development conference, under the auspices of the National Library, at which the research resources and catalogue condition of Canadian libraries would be analyzed, their progress toward catalogue automation determined, and present co-operative (e.g., inter-institutional) and group (e.g., provincial) plans and undertakings recorded. On the basis of this information, the National Library should propound a program to support, expedite and extend catalogue automation in selected institutions and regional centres in such a manner that the first phase would bring the largest possible proportion of the country's research stock under automated control for the smallest investment consistent with the full development of the country's potentialities. These federal payments, made through the National Library, should be predicated upon (a) the acceptance by all participants of a common format, (b) their agreement to deliver to the National Library for use as input to the national union catalogue copies of all tapes, discs, etc., containing catalogue information, and (c) their committing themselves to the systematic maintenance of catalogue automation and the transmission of the resultant information to the national union catalogue for a specified period of years. When this initial program has been negotiated and implemented, the National Library should prepare a second program for the gradual enlargement of participation by institutions not included in the first but with an important research capacity that could, at reasonable cost, be brought into the system.

The immediate result of action along these lines would be the stimulation and co-ordination of developments that are vital to the continued health of Canadian universities (and other research institutions) but that are now inhibited by the absence of an over-all plan into which each institution could fit, as well as by the fear of incurring heavy costs which will turn out to be simply duplicative of similar expenditure elsewhere. Within a very few years—such is the present state of the art and of developments in some large Canadian universities—a genuinely functional nucleus of a machine-readable bibliographic data base can be established. Since accessions will, in many cases, come with pre-adapted catalogue information, the additions to this nucleus will be much more rapid and inexpensive than the original core, while that too will be extended steadily as the participating institutions convert their catalogues to machine-readability. Thus, in the process of

developing a truly functional national union catalogue, one capable of serving as the hub of a national system of research libraries, the Federal Government will have enabled the universities greatly to enhance their own research capacities.

The second result will be that the national union catalogue will cease to be dependent upon the sporadic and uneven voluntary co-operation of participating institutions, and will become the contractual focus of a systematic, organized, coherent, and compatible flow of information. The fact that this information will be integrated by machine will rescue the National Library from what has hitherto been the inescapable dilemma of trying to keep up with accessions or attempting to consolidate information. Thus freed from daily defeat by overwhelming drudgery, the National Library could concentrate on the task of making the automated national union catalogue as comprehensive and as useful as possible. *Accordingly, we recommend that:*

**The Federal Government, through the National Library, adopt as a firm objective a machine-readable national union catalogue.**

**The National Library organize, finance, and conduct a catalogue planning and development conference at which the research resources and catalogue condition of Canadian libraries are analyzed, their progress toward catalogue automation determined, and present co-operative (e.g., inter-institutional) and group (e.g., provincial) plans and undertakings recorded.**

**On the basis of this information the National Library propound a program to support, expedite, and extend catalogue automation in selected institutions and regional centres in such a manner that the first phase would bring the largest possible proportion of the country's research stock under automated control for the smallest investment consistent with the full development of the country's potentialities. These federal payments, made through the National Library, should be predicated upon:**

**(a) the acceptance by all participants of a common format,**

**(b) their agreement to deliver to the National Library, for use as input to the national union catalogue, copies of all tapes, discs, etc., containing catalogue information, and**

**(c) their committing themselves to the systematic maintenance of catalogue automation, and the transmission of the resultant information to the national union catalogue, for a specified period of years.**

**When this initial program has been negotiated and implemented, the National Library prepare a second program for the gradual enlargement of participation by institutions not included in the first but with an important research capacity that could, at reasonable cost, be brought into the system.**

**Need for National System of Information Transferral**

A machine-readable catalogue will provide the programmed degree of bibliographical control of Canadian library resources to Canadian researchers. To accompany this there should be the economically and technologically feasible degree of access to content. We do not join the "blue-sky" thinkers who confidently predict unlimited retrieval and transmission of information by means of computer, telefacsimile, and microform; complex bodies of thought or of knowledge are not easily manipulable by the computer. But data of limited unit size are. Machine storage and retrieval of highly used specialized data, particularly in non-alphabetical languages, has begun and may be expected to grow, as will original publication in certain fields (retrospective conversion of texts to machine-readable form is unlikely to any considerable degree, and in most fields original publication and distribution by simple printing and sale will continue as long as their efficiency, economy and convenience remain so overwhelmingly superior to alternative methods). Facsimile transmission of text over distance, with printout, is now technologically feasible and may be expected to improve. The costs, however, are at present prohibitive, whether transmission is by cable or microwave, and even if the development of communication satellites reduces such costs the lack of a national switching system would interpose another great barrier. Nevertheless, a limited amount of such transmission of particularly urgent text may be expected to develop. Microform technology will presumably improve to the point where the present limitations on the feasibility of photocopy services will be substantially expanded.[13]

Once again, as with the national union catalogue, the indications would appear to be that a national system of information transferral, to be effective, would have to be organized as a national network of regional centres. A query could be directed to the national union catalogue; it would be intercepted by the regional centre and if it could be answered from that unit's resources a location could be returned to the researcher, who might then find that he was in the neighbourhood of the holding institution and could either go to the text or have it sent to him, or alternatively, have a specific portion of it transmitted to him. If the location were not in the regional centre's control, the query would go on to Ottawa, where it would be serviced if the item were in Canada, or searched on the international network if it were not. Loan or photocopy by mail would often be feasible; other forms of content retrieval over distance would usually be precluded by cost, at least for some years.

Where a number of participating institutions with automated catalogues are politically linked, i.e., are within a single province and thus dependent upon a single provincial budgetary source, it may be assumed that regional

[13] Educational Facilities Laboratories, *The Impact of Technology on the Library Building* (New York: 1967), pp. 9-15.

bibliographic control must in any case come, since it is the key to efficiency in many forms of expenditure. Indeed, in the two largest provinces there has been considerable preparation for the development of such bibliographic centres. In other parts of Canada there has been less preparation, but testimony at our hearings indicated that in these areas advances toward catalogue automation would lead toward the formation of such centres. These developments would make it relatively easy to provide a first-level switching capability, that is, between Ottawa and the provincial or regional centres, and directly between the latter. A second-level switching capability, that is, between the headquarters and the participating members within each province or region, would seem a natural responsibility of the province or, in the case of a region which involved more than one province, an inter-provincial responsibility.

The existence of such centres and the concomitant switching capability would make the transmission of content incomparably more economical and efficient than would otherwise be possible.

The parallelism between our conceptions of a national union catalogue derived from a national network of automated institutional catalogues and a national system of information transferral derived from a national network of regional centres might seem to call for a recommendation that the planning and development program recommended for the former be broadened to include the latter. We do not make this recommendation because we are aware that it would be uneconomical to plan a communication system for library information purposes alone, and it would be unstrategic to make such a plan in the expectation that it could subsequently be integrated into a more general communication system. It seems clear that there are many pressures which will, in the near future, make for increased governmental interest in the development of a modern communication system. We therefore limit ourselves *to recommending that:*

> **The Federal Government ensure that the information transferral needs of Canadian research libraries be a part of the specifications for any national communications system which it may develop or support, and that in the meantime it reserve a number of prime channels in all broad-band transmission systems developed in Canada sufficient to serve these needs.**

No estimate of expenditure is being offered for the development of a machine-readable national union catalogue because it is quite feasible to adapt the rate of expenditure to decisions about the rate of development. Whether this rate is fast or slow, the total cost will be substantial (and will be heavier if the rate is slow).

Similar considerations have caused us to refrain from estimating the rate of expenditure for the development of a communication system linking the national union catalogue and the participating regional or provincial biblio-

graphic centres, with the additional consideration, as explained above, that it is unlikely that a communication system will be developed solely for this purpose. It seems much more likely that a general communications system will be developed, perhaps in the form of a subsidized common carrier, and many decisions would have to be made before an estimate of cost for creating the capacity here called for could be reasonably made.

**Federal Role in Library Acquisitions**

The most predictable recommendation made to us during our visits to universities was for greatly increased federal aid for the strengthening of existing library research collections or the development of new ones—no university failed to make this demand. It was also the recommendation most frequently repeated in meetings with learned societies. Reference was very often made to the Bladen Commission's recommendation that $2 million a year be available for this purpose through the Canada Council for acquisitions and administrative costs thereof, and a further unspecified amount for similar assistance through the National Research Council and the Medical Research Council (see above, p. 221).

It might seem that federal support for this purpose had been incorporated in the fiscal transfer arrangements to assist the provinces in the support of post-secondary education, since, as was pointed out in Chapter 4, the purchase of library materials is calculated as an eligible operating cost and is therefore recoverable to the extent of 50 per cent when provinces choose that option. Although this provision is of immense importance, it does not in fact eliminate the need for specific and direct assistance to the libraries. For one thing, the incentive under the formula for the provincial governments to increase library appropriations is limited: although research materials come at half-price to the provincial treasury, they still appear to be very expensive when the province's primary concern may appear to be education rather than research. A similar amount of money spent on library materials supporting undergraduate, or indeed, community college, instruction would draw the same rebate and would make a much greater immediate visible impact in the provincial government's primary area of concern. So far as the university budgetary authorities are concerned, they are inhibited by the lack of a direct relationship between the province's 50 per cent rebate from the Federal Government and their own provincial grant; what they "earn" for the province may be spent elsewhere. (Of course, unless it is spent within the post-secondary system the next rebate will be reduced by that amount, but there is extremely vigorous competition for provincial funds within the post-secondary educational system.) Even when the rebate is reflected in the individual university's next grant, there is usually unrestrained internal competition for every dollar, and the continuing research needs of the library are unlikely to be given top priority. Within the library itself it is characteristic for nearly all funds to be locked up in support of existing teaching and research programs,

so that the development of new fields of research collecting is very difficult without external support.

**For all these reasons, the federal interest in strengthening the research capacity of Canadian libraries requires that direct assistance for this purpose, through the Canada Council and other agencies, be continued, despite the fiscal transfer arrangements, and indeed substantially increased.**

The Canada Council's own statement on this matter to the Special Senate Committee on Science Policy is most pertinent:

> Unfortunately the Council is still unable to provide more than $1 million a year (towards the building up of research collections), while the NRC and MRC are able to devote some $12 million to the tooling of university research facilities in their own fields.... If Canada does not want its universities to slip quickly by international standards to the level of glorified high schools, it will have to double its university library collections and resort to extensive use of all proven technological facilities. This will call for real co-operation and self-discipline among universities, and for quite substantial expenditures by governments. It is easily a $200 million operation.[14]

From the federal point of view it should be noted that in the provinces which have chosen the 50-per-cent-of-operating-costs option, and which represent the bulk of actual and potential research expenditure, the cost of direct grants to university libraries is only 50 per cent greater than the cost involved in the fiscal transfer if the purchases are made in the ordinary university budget; this is true both for the cost of purchase and for the administrative cost allowance, if that comes to be included. In return for this additional 50 per cent there are very important advantages. Grants would presumably continue to be made, as they now are, through the Canada Council, in response to applications from universities stating the field of research and the nature of the research material which it was proposed to acquire. This would enable the granting agency to satisfy itself that it was contributing to the acquisition of genuine research material which would add to Canadian research capacity. It would also make it possible for the granting agency to discourage really unnecessary and unproductive duplication of research collections. It could not, of course, prevent a university from pursuing such collections through its own resources, but since such resources are always much more limited than the valid demand, the long-term consequence would be that universities would tend to emphasize those collecting fields which displayed an ability to attract federal support. A further important advantage from the Federal Government's point of view would be that it could support and promote undertakings in new fields (or neglected ones, for that matter) of particular significance to the country.

Some indication of the level at which direct federal assistance to university libraries for the development of research strength should be pitched

[14] Senate of Canada, *Proceedings of the Committee on Science Policy*, No. 1, Mar. 12, 1968, pp. 5-6.

may be gathered from the recent experience of the Canada Council. Its total support for Canadian university libraries has been frozen for some time at $1 million a year; the applications in the current year total well over four times that amount. These are applications which have already gone through the universities' internal competitive processes; it may be safely assumed that the total of valid proposals, including those which the universities thought were of a lower order of priority, is much greater. It should be noted that the $4 million plus of screened and competitive requests reaching Canada Council are for book costs only; there is at present no provision for an administrative cost allowance.

Although it is not suggested that the Canda Council, or the successor humanities and social sciences council recommended in Chapter 4, should be enabled to meet every valid request that is made to it for the acquisition of library research materials, it is clear that the support it is able to give is far too small even as a proportion of present requests. The urgent necessity for developing graduate study and research in Canada guarantees that the level of requests will escalate rapidly, and therefore the amount needed even to maintain the present proportion of support for new requests would have to increase at a similar rate. Without attempting to calculate the appropriate rate of expenditure farther forward than two years, we deem it highly desirable that for the next two years at any rate the contributions of the Canada Council (or the humanities and social sciences council) to the purchase of research materials double each year, to which should be added the special administrative cost allowance of 100 per cent for book acquisition grants recommended in Chapter 6.

Accordingly *we recommend that:*

**In fiscal 1970 the Humanities and Social Sciences Council distribute to Canadian universities not less than $2 million in support of the purchase of library research materials, to which should be added 100 per cent in consideration of administrative costs, and that in fiscal 1971 the amount be not less than $4 million, to which should be added the administrative cost allowance.**

There are many circumstances in which selective library support, detached from project support, would greatly enhance the scientific or medical research capacity of an institution or a whole region. Such a strengthening of research capacity would, in our opinion, be as germane to the terms of reference of the NRC and the proposed Health Sciences Council as its counterpart is to the Canada Council (or the Humanities and Social Sciences Council).

Accordingly *we recommend that:*

**The National Research Council and the Health Sciences Council entertain applications from universities for support of especially**

**appropriate strengthening or development of library research capacity in science, engineering, and health fields respectively.**

We do not attempt to set a beginning budget figure for such library support by NRC and MRC because, until experience shows the level of useful demand, such a figure could not be better than a guess.

### Proposed Acquisitions Policy for the National Science Library

The Federal Government's own library collecting responsibilities should be redefined in the light of the proposed national system of research libraries based upon an automated national union catalogue and a network of participating regional bibliographic centres and individual institutions.

In the fields of science and technology the report of the Science Secretariat Study Group under Mr. J.P.I. Tyas will presumably be making detailed recommendations, and the present discussion may therefore be confined to general policy lines.

Here the most important single factor is the acquisitions policy of the National Science Library. This is set out in the *Annual Report* 1966-67 (p. 4):

> The NSL's acquisitions policy is one of ensuring that all publications (including non-printed forms—e.g., microfiche, microfilms, magnetic tapes, edge-notched and punched cards) which will contribute to the development of science and technology in Canada, are readily available either in its own collection or elsewhere in Ottawa. As noted above, this policy is not carried out in a vacuum and takes into account the resources of other federal libraries in Ottawa.

However well this policy may have served in the past, it does not seem a feasible policy for the future. To begin with, it would be a gross misallocation of public funds. The Report states that the collection "is growing at the rate of 10% per year or doubling in size every 10 years" (p. 4). Even this rate of growth has meant that the acquisitions budget has been multiplied 6.4 times in the decade from 1956-57 ($53,000) to 1966-67 ($340,000) (Table II, p. 22). A similar increase during the next decade would bring the acquisitions budget to $2.17 million for 1976-77. However, the rate of increase has been accelerating very rapidly, as may be seen by Figure 11:1 (taken from p. 23 of the Report). If this curve were projected at its present rate the book budget in 1976-77 would be many millions of dollars. However, even this rate of increase would not produce the defined goal, since there are four additional factors which would require a great intensification of acquisitions: the present coverage of the National Science Library is understandably very incomplete and immense additions would be necessary to its holdings to achieve a startline correspondent to its policy; the rate of the development of new knowledge and publication in science and technology is accelerating; cost of publication is increasing; the National Science Library

has just accepted responsibility for medicine, which represents a very large and very rapidly increasing field of publication. When all these factors are taken into account, the economic consequences of continuing the policy "of ensuring that all publications . . . which will contribute to the development of science and technology in Canada are readily available . . . in Ottawa" stagger the imagination.

The policy is in any case literally impracticable on other grounds besides the economic. A good deal of out-of-print material is no longer available, and despite the heedless opinion to the contrary of many researchers, such material is often necessary for the full exploitation of more recent publication. A good deal of such material, often in very productive grouping, is held by Canadian university libraries. Even more decisive is the limitlessness of the NSL goal. It requires an unmanageable leap of faith to believe that *all* publications which may contribute to the development of science and technology can be acquired either in Ottawa or throughout Canada as a whole. Some selection will certainly take place, even if no formal selective criteria are adopted. If the present policy is pursued such selection will be accidental, or budgetary, or consequent upon the limitations of the NSL staff, rather than reflective of agreed goals.

In addition to being unfeasible, the proposed policy would involve a great deal of unnecessary duplication, since much of the material that would be acquired under it would be simultaneously acquired or already held by one or several university libraries in the country. This brings us to the unsuitability as well as the impracticality of the present NSL policy for the future. In a national system of research libraries, with proper bibliographical control of resources and good transmission facilities, there is no more reason for wanting to make Ottawa self-sufficient and all-encompassing as a source of materials than there is a possibility of doing so. The policy which will enable the greatest increase of our research capacity, and at the same time optimize its utilization, is to relate NSL's acquisitions, and indeed the acquisitions of all federal agencies, to Canadian resources as a whole, not only to those in Ottawa.

This is not meant to place such a limit upon government collections as to handicap the work of any department or agency. It is obvious that a certain amount of duplication of resources is unavoidable for the sake of efficiency and convenience. Beyond that, some duplication is desirable to guard against destruction and loss. So long as duplicate purchases are made knowingly, and as a result of a decision that they are desirable despite the fact that the material is readily available elsewhere in the system, the situation is satisfactory. What would be untenable would be the simultaneous—and expensive—development of a nation-wide system and the impracticable pursuit of comprehensiveness and self-sufficiency in its headquarters. The National Science Library's acquisitions policy ought to be that, in addition to materials in such frequent use as to be required in its own stacks or in those

of other federal libraries, it should develop in collaboration with Canadian university libraries a co-operative acquisitions program which, taken as a whole, will give the system its richest potential.

Accordingly *we recommend that:*

> **The National Science Library revise its acquisitions policy by recognizing that it is neither possible nor desirable to bring together in Ottawa all publications capable of contributing to the development of science, technology, and medicine in Canada, and that instead it develop, in collaboration with Canadian university libraries, proposals for a co-operative acquisitions program which, taken as a whole and in the context of the national system of research libraries proposed above, will make available within Canada the optimum library support for research and development in science, technology, and medicine.**

**Proposed Acquisitions Policy for the National Library**

The National Library, in contrast with the National Science Library, appears not to have a stated acquisitions policy. Two features of the National Library Act determine, or at any rate ensure, one aspect of policy: Section 11 makes the National Library an official depository for all books published in Canada, and Section 10 (c) requires it to "compile and publish a national bibliography in which books produced in Canada, written or prepared by Canadians, or of special interest or significance to Canada may be noted and described". The National Library does attempt comprehensiveness in its collection of such Canadiana, and this policy should be continued.

In the fields of the humanities and social sciences generally, the integration of the National Library's acquisitions policy with those of the other participants in the recommended nation-wide system of research libraries is even more obviously necessary than in the fields of science and technology. The scale on which library materials are required for research in these fields is such as to make the very notion of self-sufficiency in Ottawa inconceivable, even if the problem of unavailable materials (many times larger and infinitely more important than in the sciences) did not exist. It is here that the inescapability of decentralization is most manifest, the only question being whether the decentralization will be systematized or haphazard.

Assuming the national system of bibliographical control and transmission of information postulated above, the National Library should, within an integrated national acquisitions program, assume primary responsibility for certain clearly defined fields. Some of these fields might be defined in terms of source of publication; the most important example would be government publications (all publications of all national governments and of the more important provincial and municipal governments), but other very important examples would be publications of all international bodies (whether inter-

governmental or other), all learned societies and conferences, etc. Other fields might be defined in terms of subject matter, and here the most obvious examples are in the areas in which interaction with government is greatest, e.g., economics, political science, sociology, communications, law, etc.

A special need, much discussed in recent years but ill-defined, is for so-called data banks. In the social sciences such repositories of information are bound to grow more important with the further development of quantitative methods. It does not seem possible to predict securely the future evolution of such resources, but the vast scale on which they are being projected and the huge expenditures involved would appear to make this an especially appropriate field for a primary federal commitment, particularly since the exploitation of such data banks must depend heavily upon bibliographical control. Another suitable, and indeed a necessary, field for collection by the National Library is in bibliography and library science and practices. (Indeed, it would be an important contribution to the country's capacity to manage the materials of research if the National Library were to offer programs of specialized instruction to professional librarians, with a view to bringing them abreast of new techniques as they are developed.)

There are vast fields of collecting, however, which the National Library should enter only in planned supplementation to the acquisitions programs of other participants in the system. In all the major fields of the humanities, and in those fields of the social sciences in which traditional materials are a dominant factor, the research collections should be where the researchers are concentrated and research workers are being trained, that is, in universities. Thus, except for such Canadian materials as would be embraced by the comprehensive collection of Canadiana discussed above, the National Library should not collect in the great fields of language, literature, history, philosophy, religion, art, music, education, etc., except in those defined areas which are not being pursued in universities. For example, if, as at present, no Canadian university offers a program of Korean studies, and it is judged (as it should be) in the national interest that materials pertinent to Korea be available in Canada (perhaps against the time when some institution will make a start in this area), the National Library would then undertake such collecting. Limited concessions to local convenience and some recognition of the inter-connectedness of research would justify the acquisition of certain classes of materials in areas in which the National Library had no system responsibility; for example, the texts of standard English and French authors might be necessary as background in the pursuit of research in Canadian writing. But such material should be strictly limited to overt working tools; the National Library should not develop a research capacity for local convenience which is not required for the national system. On the contrary, in the great collecting fields here described the role of the Federal Government should be assistance to the universities in forming and developing their

collections; these should be the fields in which the Humanities and Social Sciences Council supports most vigorously the research ambitions of the university libraries. *We recommend that:*

**The National Library formulate an explicit acquisitions policy. One aspect of this policy be the development of a comprehensive collection of Canadiana.**

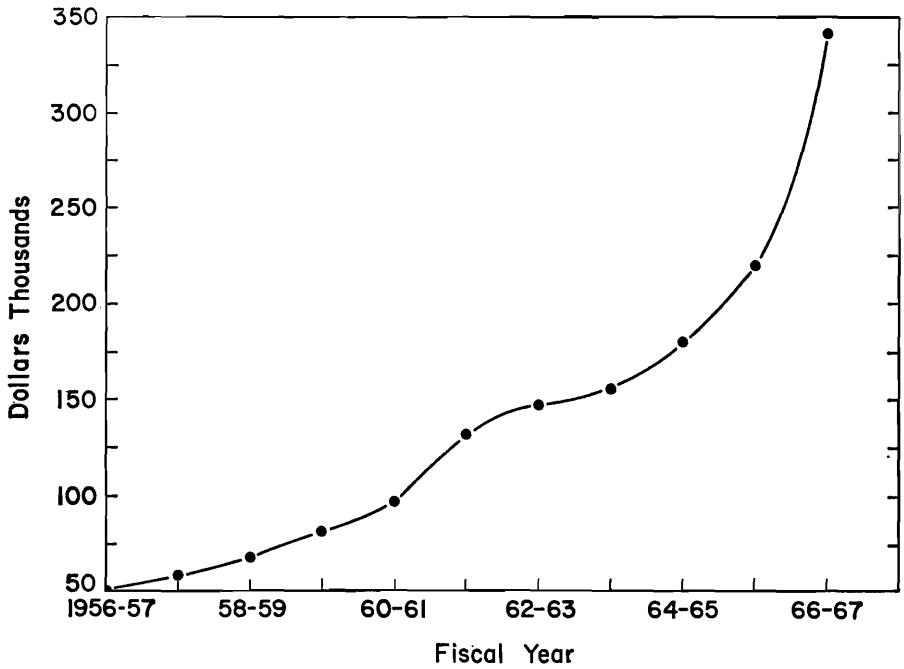
**The National Library formulate its other collecting responsibilities in the context of the nation-wide system of research libraries recommended above and after consultation with the other participants, with a view to assuming primary responsibility within this system for government documents, publications of international bodies, data banks, bibliography and library science, and certain agreed subject fields in which interaction with government is greatest, such as economics, political science, sociology, communications, law, etc.**

**The chief responsibility in the Canadian research library system for collecting the materials of research and research training in the humanities and the traditional social sciences remain in the universities, and that the National Library collect in these fields only by way of planned supplementation to the acquisitions programs of other participants in the system.**

**The National Library not develop a research capacity for local convenience which is not required for the national system.**

**Figure 11:1**

**EXPENDITURE BY THE NATIONAL SCIENCE LIBRARY FOR PURCHASE OF BOOKS AND PERIODICALS 1956-57 TO 1966-67**




SOURCE: *Annual Report of the National Science Library, 1966-67.*

## Table 11:1—Canadian Libraries and Holdings, 1963 and 1965

| Type of Library | Libraries | | Holdings | |
|---|---|---|---|---|
| | 1963[a] | 1965[b] | 1963[a] | 1965[b] |
| | | | '000 | '000 |
| Public | 874[c] | 889[f] | 15,580[c] | 18,981[f] |
| University, college, other post-secondary | 73[d] | 225[g] | 9,085[d] | 12,278[g] |
| Centralized school | 2,067[d] | 2,595[g] | 6,084[d] | 7,920[g] |
| Government and special | 580[e] | 580[h] | 5,613[e] | 5,613[h]<br>7,128[i] |
| **Totals** | **3,594** | **4,289** | **36,362** | **44,792**<br>**46,307** |

[a]As given in DBS *Survey of Libraries, Part I: Public Libraries*, 1963; some of the statistics are for 1961, some or 1962, some for 1962–63.

[b]As given in the *Survey*, 1965; some of the statistics are for 1964, some for 1964–65, and the "Government and special" are still those of 1961.

[c]*Survey, 1963*, p. 28.

[d]*Ibid.*, p. 53.

[e]*Ibid.*, p. 54.

[f]*Survey, 1965*, p. 14.

[g]*Ibid.*, p. 39.

[h]*Ibid.*, p. 40.

[i]To get a reasonable total for 1965, the "Government and special" figure is calculated at the same rate of increase since 1963 as was shown by the remaining sectors taken as a whole (27 per cent).

**Table 11:2—Holdings and Growth of Canadian University Libraries, 1961-66**

| Institution | Volumes July 1, 1966 | Volumes Added 1961–66 | Volumes Added 1965–66 | Periodical Subscriptions |
|---|---|---|---|---|
| | No. | Av. No. | No. | No. |
| Acadia | 138,300 | 4,428 | 6,725 | 700 |
| Alberta | 668,839 | 51,869 | 77,438 | 7,226 |
| Bishop's | 43,456 | 3,734 | 5,084 | 388 |
| Brandon | 48,770 | 9,000 | 11,970 | 586 |
| British Columbia | 782,695 | 48,793 | 66,095 | 8,730 |
| Brock | 42,000 | 21,500 | 23,500 | 998 |
| Calgary | 153,000 | 20,548 | 30,092 | 2,283 |
| Carleton | 193,386 | 19,516 | 35,834 | 1,781 |
| Dalhousie | 264,295 | 16,665 | 19,836 | 3,642 |
| Guelph | 148,200 | 4,455 | 10,000 | 3,850 |
| Lakehead | 51,652 | 8,720 | 6,043 | 650 |
| Laurentian | 64,796 | 8,498 | 10,789 | 1,522 |
| Laval | 525,950 | 37,923 | 50,288 | 5,767 |
| McGill | 1,026,248 | 36,199 | 47,680 | 13,754 |
| McMaster | 284,747 | 17,094 | 29,890 | 3,182 |
| Manitoba | 434,778 | 21,051 | 28,233 | 3,067 |
| Moncton | 51,500 | 7,752 | 9,881 | 350 |
| Montréal | 550,000 | 48,824 | 64,215 | 7,009 |
| Mount Allison | 135,000 | 6,320 | 9,000 | 1,500 |
| Mt. St. Vincent | 64,517 | 2,161 | 3,400 | 500 |
| New Brunswick | 166,068 | 11,169 | 17,409 | 1,524 |
| Newfoundland | 137,579 | 10,241 | 13,714 | 1,900 |
| Notre Dame | 19,795 | 2,492 | 4,795 | 580 |
| Nova Scotia Technical College | 32,560 | 1,779 | 2,908 | 748 |
| Ottawa | 250,000 | 21,555 | 28,000 | 3,640 |
| Prince of Wales | 10,000 | — | — | 104 |
| Queen's | 500,000 | 20,545 | 31,462 | 7,854 |
| St. Dunstan's | 29,006 | 2,038 | 2,000 | — |
| St. Francis Xavier | 96,729 | 5,305 | 5,952 | 750 |
| St. Mary's | 62,992 | 2,680 | 2,560 | 634 |
| Saskatchewan | 326,000 | 25,306 | 30,247 | 4,300 |
| Saskatchewan (Regina) | 92,297 | 10,096 | 14,259 | 1,317 |
| Sherbrooke | 150,000 | 16,345 | 22,224 | 2,500 |
| Simon Fraser | 55,000 | — | 43,458 | 3,004 |
| Sir George Williams | 110,000 | 13,082 | 26,760 | 1,903 |
| Toronto | 2,034,934 | 134,641 | 202,579 | 23,256 |
| Trent | 48,375 | 15,248 | 21,950 | 800 |
| Victoria | 222,453 | 28,646 | 40,601 | 2,482 |
| Waterloo | 149,058 | 25,004 | 39,565 | 2,969 |
| Waterloo Lutheran | 79,061 | 9,694 | 13,610 | 1,387 |
| Western Ontario | 446,426 | 32,616 | 59,983 | 4,300 |
| Windsor | 240,370 | 25,196 | 45,547 | 2,710 |
| York | 143,952 | 27,905 | 54,718 | 1,805 |

SOURCE: Robert B. Downs, *Resources of Canadian Academic and Research Libraries 1968.*

**Table 11:3—Canadian University Libraries, Volumes Added and Current Periodical Subscriptions, 1966-67**

| Institution | Volumes Added 1966-67 (estimated) | Current Periodical Subscriptions 1966-67 |
|---|---|---|
| | No. | No. |
| Acadia | 12,000 | 650 |
| Alberta | 102,133 | 7,353 |
| Bishop's | 12,000 | 600 |
| Brandon | 6,203 | 651 |
| British Columbia | 103,631 | 8,813 |
| Calgary | 49,524 | 3,419 |
| Carleton | 40,000 | 2,025 |
| Dalhousie | 39,000 | 4,800 |
| Lakehead | 18,000 | 1,007 |
| Laurentian | 20,000 | 2,000 |
| Laval | 80,000 | 9,700 |
| McGill | 50,000 | 15,000 |
| McMaster | 40,000 | 3,730 |
| Manitoba | 40,000 | 4,500 |
| Moncton | 16,000 | 800 |
| Montréal | 50,000[a] | 7,000 |
| Mt. St. Vincent | 4,000 | 650 |
| New Brunswick | 20,000 | 1,880 |
| Newfoundland | 12,689 | 2,038 |
| Notre Dame | 5,656 | 625 |
| Ottawa | 32,000 | 4,920 |
| Prince of Wales | 5,500 | 420 |
| Queen's | 34,041 | 3,597 |
| St. Francis Xavier | 7,000 | 806 |
| St. Mary's | 5,600 | 834 |
| Saskatchewan | 35,000 | 5,200 |
| Saskatchewan (Regina) | 20,500 | 1,834 |
| Simon Fraser | 50,000 | 3,500 |
| Sir George Williams | 35,000 | 2,003 |
| Toronto | 211,300 | 24,943 |
| Trent | 24,000 | 870 |
| Victoria | 50,151 | 2,965 |
| Waterloo | 48,000 | 3,381 |
| Waterloo Lutheran | 16,000 | 2,600 |
| Western Ontario | 120,000 | 5,000 |
| Windsor | 37,300 | 3,560 |
| York | 62,000 | 3,400 |

[a]Central library.

SOURCE: Robert B. Downs, *Resources of Canadian Academic and Research Libraries 1968.*

**Table 11:4—Library and Institutional Expenditures, 42 Universities, 1961-66**

| Institution | Av. Annual Library Expenditure 1961-66 | Av. Annual Expenditure for Books, etc. 1961-66 | Av. Annual Institutional Expenditure 1961-66 | Percentage Received by Library 1961-66 |
|---|---|---|---|---|
| | $ | $ | $ | |
| Acadia | 56,604 | 24,629 | 1,515,613 | 3.7 |
| Alberta | 985,772 | 460,047 | 19,956,400 | 4.9 |
| Bishop's | 50,352 | 21,183 | 856,458 | 5.9 |
| Brandon | 62,280 | 30,430 | [b] | — |
| British Columbia | 1,356,662 | 665,126 | 20,094,329 | 6.8 |
| Brock | 189,578 | 124,420 | 760,276 | 24.9 |
| Calgary | 381,649 | 185,891 | 3,924,800 | 9.7 |
| Carleton | 300,867 | 118,969 | 3,833,434 | 7.8 |
| Dalhousie | 353,332 | 164,249 | 5,692,967 | 6.2 |
| Guelph | 264,000 | 96,500 | 12,200,000 | 2.2 |
| Lakehead | 131,098 | 77,600 | 721,870 | 18.2 |
| Laurentian | 122,964 | 57,287 | 1,067,496 | 11.5 |
| Laval | 673,309 | 256,434 | 12,555,852 | 5.4 |
| McGill | 1,002,617 | 295,638 | 23,796,366 | 4.2 |
| McMaster | 540,983 | 250,467 | 7,084,177 | 7.6 |
| Manitoba | 541,876 | 182,389 | 11,379,216 | 4.8 |
| Moncton | 67,766 | 43,333 | 706,283 | 9.6 |
| Montréal | 733,609 | 324,291 | 11,491,975 | 6.4 |
| Mount Allison | 144,823 | 72,500 | 1,575,672 | 9.2 |
| Mt. St. Vincent | 40,244 | [b] | 661,832 | 6.1 |
| New Brunswick | 196,598 | 89,513 | 3,719,200 | 5.3 |
| Newfoundland | 165,849 | 92,087 | 2,454,638 | 6.8 |
| Notre Dame | 46,573 | 18,805 | 556,596 | 8.4 |
| Nova Scotia Technical College | 46,139 | 21,472 | 1,018,647 | 4.5 |
| Ottawa | 259,680 | 135,600 | [c] | — |
| Queen's | 456,654 | 185,828 | 7,695,800 | 5.9 |
| St. Dunstan's | 26,538 | 15,835 | 352,007 | 7.5 |
| St. Francis Xavier | 73,511 | 44,185 | 2,084,765 | 3.5 |
| St. Mary's | 52,498 | 21,618 | 796,707 | 6.6 |
| Saskatchewan | 506,483 | 217,607 | 11,684,424 | 4.3 |
| Saskatchewan (Regina) | 159,877 | 88,658 | 1,903,968 | 8.4 |
| Sherbrooke | 278,400 | 164,400 | 3,304,400 | 8.4 |
| Simon Fraser | 399,920 | 264,558 | 2,108,696 | 19.0 |
| Sir George Williams | 367,600 | 145,139 | 3,788,021 | 9.7 |
| Toronto | 2,339,616 | 800,757 | 33,014,412 | 7.1 |
| Trent | 179,000 | 114,000 | 889,427 | 20.1 |
| Victoria | 469,254 | 252,287 | 3,144,562 | 14.9 |
| Waterloo | 360,631 | 190,203 | 4,872,793 | 7.4 |
| Waterloo Lutheran | 95,605 | 43,576 | 1,190,469 | 8.0 |
| Western Ontario | 575,442 | 268,068 | 10,905,541 | 5.3 |
| Windsor | 365,336 | 212,957 | 3,453,166 | 10.6 |
| York | 374,442 | 173,915 | 2,181,271 | 17.2 |

[a]Average for 42 universities was 6.4 p.c.

[b]Not reported.

[c]Not available.

SOURCE: Robert B. Downs, *Resources of Canadian Academic and Research Libraries, 1968.*

**Table 11:5—Library and Institutional Expenditures, 41 Universities, 1965-66**

| Institution | Total Library Expenditure 1965–66 | Expenditure for Books, etc. 1965–66 | Total Institutional Expenditure 1965–66 | Percentage Received by Library 1965–66 |
|---|---|---|---|---|
| | $ | $ | $ | |
| Acadia | 84,420 | 45,000 | 1,930,377 | 4.4 |
| Alberta | 1,469,861 | 708,437 | 30,330,000 | 4.8 |
| Bishop's | 76,731 | 32,896 | 1,142,455 | 6.7 |
| British Columbia | 1,768,358 | 1,706,119 | 24,698,725 | 11.2 |
| Brock | 229,157 | 134,867 | 1,063,586 | 21.5 |
| Calgary | 602,247 | 263,225 | 7,210,000 | 8.4 |
| Carleton | 535,975 | 215,442 | 6,158,294 | 8.7 |
| Dalhousie | 589,372 | 320,920 | 7,883,639 | 7.5 |
| Guelph | 264,600 | 96,500 | 12,200,000 | 2.2 |
| Lakehead | 112,027 | 49,429 | 1,019,065 | 11.0 |
| Laurentian | 183,839 | 77,877 | 1,764,389 | 10.4 |
| Laval | 1,000,000 | 338,700 | 19,516,924 | 5.1 |
| McGill | 1,489,805 | 507,055 | 31,639,116 | 4.7 |
| McMaster | 850,055 | 415,063 | 10,447,885 | 8.1 |
| Manitoba | 738,194 | 281,816 | 14,831,374 | 5.0 |
| Moncton | 91,002 | 50,000 | 1,031,778 | 8.8 |
| Montréal | 1,007,305 | 465,265 | 17,794,715 | 5.7 |
| Mount Allison | 199,721 | 110,774 | 2,119,327 | 9.4 |
| Mt. St. Vincent | 58,020 | 21,500 | 966,600 | 6.0 |
| New Brunswick | 306,542 | 142,244 | 5,208,000 | 5.9 |
| Newfoundland | 233,980 | 127,989 | 3,218,443 | 7.3 |
| Notre Dame | 85,202 | 44,494 | 884,983 | 9.6 |
| Nova Scotia Technical College | 56,684 | 25,788 | 1,316,890 | 4.3 |
| Ottawa | 409,400 | 234,000 | 12,809,684 | 3.2 |
| Queen's | 861,270 | 377,289 | 10,325,000 | 8.3 |
| St. Dunstan's | 49,090 | 25,415 | 622,393 | 7.9 |
| St. Francis Xavier | 143,781 | 82,991 | 2,966,735 | 4.8 |
| St. Mary's | 89,403 | 37,739 | 1,052,368 | 8.5 |
| Saskatchewan | 769,000 | 327,600 | 16,138,424 | 4.8 |
| Saskatchewan (Regina) | 284,063 | 174,100 | 3,715,607 | 7.6 |
| Sherbrooke | 488,000 | 300,000 | 4,767,000 | 10.2 |
| Simon Fraser | 689,462 | 446,294 | 3,917,513 | 17.6 |
| Sir George Williams | 584,928 | 248,280 | 5,088,489 | 11.5 |
| Toronto | 3,807,576 | 1,444,724 | 48,022,000 | 7.9 |
| Trent | 231,000 | 140,000 | 1,520,572 | 15.2 |
| Victoria | 781,003 | 432,723 | 5,280,544 | 14.8 |
| Waterloo | 716,604 | 403,480 | 9,623,799 | 7.4 |
| Waterloo Lutheran | 156,887 | 71,146 | 1,904,574 | 8.2 |
| Western Ontario | 912,804 | 393,614 | 14,762,364 | 6.2 |
| Windsor | 606,920 | 374,190 | 4,811,466 | 12.6 |
| York | 681,168 | 295,437 | 5,024,277 | 13.6 |
| **Totals** | **25,295,456** | **11,990,422** | **356,729,374** | **7.1** |

SOURCE: Robert B. Downs, *Resources of Canadian Academic and Research Libraries, 1968.*

**Table 11:6—Estimated Library Expenditures and Budgets, 37 Universities, 1966-68**

| Institution | Total Library Expenditure 1966–67 | Expenditure for Books, etc. 1966–67 | Library Budget 1967–68 | Budget for Books 1967–68 |
|---|---|---|---|---|
| | $ | $ | $ | $ |
| Acadia | 138,110 | 55,000 | 173,700 | 64,000 |
| Alberta | 2,200,000 | 1,086,000 | 2,764,360 | 1,333,000 |
| Bishop's | 210,000 | 142,000 | 180,000 | 110,000 |
| Brandon | 131,000 | — | 150,400 | 66,450 |
| British Columbia | 3,018,386 | 1,580,726 | 3,264,386 | 1,318,761 |
| Calgary | 1,173,314 | 742,378 | 1,486,241 | 758,000 |
| Carleton | 829,447 | 334,000 | 1,154,493 | 445,000 |
| Dalhousie | 931,235 | 457,605 | 1,200,000 | 600,000 |
| Lakehead | 300,750 | 183,100 | 410,320 | 203,000 |
| Laurentian | 354,000 | 205,000 | 447,000 | 245,000 |
| Laval | 1,600,000 | 480,000 | 2,032,000 | 625,000 |
| McGill | 1,868,460 | 615,000 | 2,125,000 | 710,000 |
| McMaster | 1,078,000 | 524,000 | 1,400,000 | 750,000 |
| Manitoba | 850,000 | 375,000 | 1,166,083 | 427,300 |
| Moncton | 170,000 | 76,500 | 226,000 | 86,500 |
| Mt. St. Vincent | 64,600 | 22,500 | 70,000 | 25,000 |
| New Brunswick | 447,531 | 217,331 | 764,000 | 311,000 |
| Newfoundland | 446,000 | 238,314 | 600,000 | 340,000 |
| Notre Dame | 98,028 | 42,000 | 140,000 | 53,653 |
| Nova Scotia Technical College | 70,808 | 30,822 | 80,685 | 35,000 |
| Ottawa | 629,245 | 335,000 | 1,088,803 | 472,306 |
| Prince of Wales | 130,000 | 80,000 | [a] | [a] |
| Queen's | 1,003,700 | 430,000 | 1,250,000 | 412,400 |
| St. Francis Xavier | 153,000 | 76,500 | [a] | [a] |
| St. Mary's | 108,000 | 43,000 | 166,900 | 75,000 |
| Saskatchewan | 900,000 | 390,000 | 1,120,000 | 460,000 |
| Saskatchewan (Regina) | 435,902 | 216,500 | 661,771 | 296,200 |
| Simon Fraser | 1,373,690 | 740,153 | 1,429,528 | 624,000 |
| Sir Geo. Williams | 840,000 | 358,000 | 1,089,000 | 398,000 |
| Toronto | 4,855,400 | 1,639,600 | 6,115,800 | 1,927,000 |
| Trent | 281,750 | 195,000 | 493,000 | 302,000 |
| Victoria | 980,000 | 500,000 | 1,340,000 | 600,000 |
| Waterloo | 1,016,845 | 525,000 | 1,155,788 | 550,000 |
| Waterloo Lutheran | 187,000 | 80,000 | 225,000 | 98,300 |
| Western Ontario | 1,210,000 | 463,650 | 2,200,000 | 1,000,000 |
| Windsor | 754,000 | 425,000 | 873,000 | 476,000 |
| York | 1,077,595 | 530,000 | 1,400,000 | 700,000 |
| **Totals** | **31,945,796** | **14,434,679** | **40,443,258** | **16,897,870** |

[a]Not available.

SOURCE: Robert B. Downs, *Resources of Canadian Academic and Research Libraries, 1968.*

# APPENDICES 1 - 10

## Appendix 1

# DESCRIPTIONS OF ACTIVITIES OF FEDERAL AGENCIES AND DEPARTMENTS IN RELATION TO UNIVERSITY RESEARCH

The following notes are based upon meetings with and material received from various federal departments/agencies. Information was gathered in collaboration with the Education Support Branch of the Department of the Secretary of State. That Branch was also conducting a series of surveys concerned with federal expenditures, on research, post-secondary education, and post-secondary educational and research training support for public service staff. Their first report dealing with research expenditures (Ottawa, 1968) contains material directly relevant to this section.

Some of the notes and comments are not dissimilar to the text of the Education Support Branch's first report. When this is the case, the title or caption is marked with an asterisk to indicate reference to that report. Variations in expenditure figures between the Branch's report and this one are accounted for by differences in definition and terms of reference. The University Study Group has reported only expenditures in Canadian universities and university affiliated hospitals, unless otherwise indicated.

Notes concerning the Canada Council, Medical Research Council and National Research Council appear separately at the end of this Appendix. Scholarships and fellowships awarded by all three Councils are held abroad and in Canada.

Information concerning expenditures for university research is included in the section relating to individual departments or agencies.

### Canada Department of Agriculture

The Canada Department of Agriculture (CDA) started an extramural research program (EMR) in 1954, which included work in forestry; in 1966 a research grant program was introduced. The former has been continued under an EMR contract grants program, which is regarded as an extension of in-house research. For each project there is a departmental liaison officer who has a special interest in the work because it covers a special aspect of his own program. The newer grants program, on the other hand, is restricted only in the sense that proposals must have implications for agriculture and be put forward by members of agricultural faculties. The second restriction is imposed because of limited funds.

Applications for grants are reviewed by a research sub-committee of the Canadian Agricultural Services Co-ordinating Committee; the Committee itself includes the deputy ministers of provincial agricultural provinces, deans of agricultural faculties and colleges, as well as other federal and provincial experts. The sub-committee consists of representatives of the deans of agricultural faculties, CDA representatives, and a representative of the

National Research Council, agricultural economics and rural sociology, agricultural engineering—in fact any subject for research related to agriculture may be supported. Less than 10 per cent of the available funds is used for work in the social sciences. CDA grant and contract grant administrative procedures are similar to those of NRC. In passing, it may be noted that CDA is a co-sponsor of the Canadian Agricultural Economics Research Council, with the provinces and agro-business.

CDA operates a number of regional establishments, many of them located near or on university grounds. Relations with university scientists and staff members vary. In some locations collaboration is easy and relations are quite good; in others they are difficult. Collaboration includes accommodation and supervision of graduate students, as well as lectures by CDA staff. Collaboration between CDA, NRC, and universities, particularly in Western Canada, has gone on since the early 1920s. A number of associate committees, e.g., Rust Research and Grain Research, have served both as co-ordinating and granting bodies until recent years when CDA funds for support of agricultural research became available and NRC introduced Grant Selection Committees for a variety of disciplines.

**Canada Department of Agriculture Research Support, 1966-67 and 1967-68**

| Institution | Research Contract Grants | | Operating Grants | | Total | |
|---|---|---|---|---|---|---|
| | 1966–67 | 1967–68 | 1966–67 | 1967–68 | 1966–67 | 1967–68 |
| | $ | $ | $ | $ | $ | $ |
| Victoria | — | 1,000 | — | — | — | 1,000 |
| British Columbia[a] | 20,200 | 22,700 | 27,000 | 35,200 | 47,200 | 57,900 |
| Alberta | 3,500 | — | 50,940 | 59,600 | 54,440 | 59,600 |
| Saskatchewan[a] | 30,900 | 15,500 | 53,550 | 74,160 | 84,450 | 89,660 |
| Manitoba[a] | 3,000 | 3,000 | 44,500 | 75,000 | 47,500 | 78,000 |
| Guelph[a] | 7,000 | 13,000 | 55,670 | 114,325 | 62,670 | 127,325 |
| Western Ontario | 2,800 | 7,000 | — | — | 2,800 | 7,000 |
| Toronto | 17,140 | 15,880 | — | — | 17,140 | 15,880 |
| Queen's | — | 8,000 | — | — | — | 8,000 |
| Carleton | 8,450 | 19,000 | — | — | 8,450 | 19,000 |
| Ottawa | 7,910 | 9,900 | — | — | 7,910 | 9,900 |
| Macdonald[a] | 28,200 | 9,300 | 41,700 | 84,385 | 69,900 | 93,685 |
| Laval | — | — | 23,300 | 29,300 | 23,300 | 29,300 |
| St. Hyacinthe | — | — | 8,000 | 8,000 | 8,000 | 8,000 |
| St. Dunstans | — | 8,500 | — | — | — | 8,500 |
| **Totals Universities** | **129,100** | **132,780** | **304,660** | **479,970** | **433,760** | **612,750** |
| Saskatchewan Research Council | 11,650 | 4,000 | — | — | 11,650 | 4,000 |
| British Columbia Research Council | — | 8,000 | — | — | — | 8,000 |
| **Totals All Institutions** | **140,750** | **144,780** | **304,660** | **479,970** | **445,410** | **624,750** |

[a]Includes support for agricultural economics.

**Canada Department of Agriculture Research Support in the Social Sciences, 1966-67 and 1967-68**

(Agricultural economics and farm management)

| Support | 1966–67 | 1967–68 |
|---|---|---|
| | $ | $ |
| Grants | 18,700 | 42,500 |
| Contracts | 11,000 | 9,350 |
| **Totals** | **29,700** | **51,850** |

## Air Canada

When the need arises, Air Canada contracts with universities or faculty members for special studies. Expenditures amounted to $37,600 in 1966-67 and $3,900 in 1967-68.

## Atlantic Development Board*

The Atlantic Development Board has assisted the provinces by providing capital facilities for applied research; grants have been made to the Nova Scotia Research Foundation and the New Brunswick Research and Productivity Council toward the cost of buildings and research facilities located on campuses of the University of New Brunswick and Nova Scotia Technical College. During the fiscal year 1966-67, the Board authorized grants of $2 million to Dalhousie University toward the capital cost of an aquatron, and $1.5 million to the University of New Brunswick to aid in the cost of research buildings.

The Board contracts with individual university faculty members to carry out studies dealing with the Atlantic Provinces' social and economic problems; the planning division commissions projects to meet the Board's requirements.

**Atlantic Development Board Research Contracts,[a] 1966-67 and 1967-68**

| Institution of Affiliation | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Contracts | Amount | Contracts | Amount |
| | No. | $ | No. | $ |
| New Brunswick | 2 | 31,879 | 6 | 64,425 |
| Sir George Williams | 1 | 1,321 | 1 | 5,000 |
| McGill | 2 | 10,863 | 1 | 3,158 |
| Montréal | | — | 1 | 4,000 |
| Queen's | 1 | 3,499 | — | — |
| Calgary | 1 | 17,037 | 1 | 7,623 |
| **Totals** | — | **64,589** | — | **84,206** |

[a]With individual faculty members.

## Atomic Energy of Canada Limited

Atomic Energy of Canada Limited (AECL) originally operated as a Division of the National Research Council; it was established as an agency corporation of the Federal Government in 1952 and has operated independently since then.

AECL does not make grants for support of research in universities but it supports some work by means of contracts or research agreements. The work to be performed is (usually) related to the work in the company's laboratories, or projected developments of its own programs. Mutually beneficial relations with university scientists and engineers and their graduate students are encouraged by means of these agreements. Visiting scientists and post-doctorate fellows from Canadian universities and from abroad are accommodated in the company's laboratories. Summer employment also is available to some science and engineering students and graduates; exchanges of staff with universities can be arranged and for special lecture series in universities by company employees as well.

Contracts and agreements with university scientists and engineers and other qualified individuals or groups are used by the Commercial Products Division of AECL, to discover and promote commercial uses of radio active isotopes produced in the Chalk River reactors.

**Atomic Energy of Canada Limited Research Contracts, 1966-67 and 1967-68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Contracts | Amount | Contracts | Amount |
| | No. | $ | No. | $ |
| Victoria | 1 | 18,000 | — | — |
| British Columbia | 2 | 48,545 | 2 | 27,700 |
| Simon Fraser | 1 | 3,500 | 1 | 10,500 |
| Alberta | 1 | 14,250 | 3 | 42,966 |
| Calgary | | — | 1 | 6,375 |
| Saskatchewan | 4 | 44,600 | 4 | 30,325 |
| Windsor | — | — | 1 | 20,800 |
| Waterloo | 2 | 18,297 | 2 | 24,175 |
| Western Ontario | 3 | 48,379 | 2 | 16,124 |
| McMaster | 2 | 21,305 | 2 | 12,605 |
| Toronto | 3 | 34,625 | 3 | 71,525 |
| Queen's | 3 | 17,092 | 3 | 36,371 |
| Ottawa | 2 | 17,692 | 2 | 20,200 |
| McGill | 2 | 19,125 | 3 | 24,675 |
| Montreal | 7 | 87,050 | 9 | 89,350 |
| École Polytechnique | 1 | 4,799 | 1 | 14,396 |
| Laval | — | — | 1 | 4,800 |
| **Totals** | — | **397,259** | — | **452,887** |

AECL Commercial Products Division Research Contracts, 1966-67 and 1967-68

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Contracts | Amount | Contracts | Amount |
| | No. | $ | No. | $ |
| Guelph | 2 | 8,840 | 2 | 5,808 |
| Waterloo | 1 | 5,162 | 1 | 12,850 |
| Queen's | 1 | 8,388 | 1 | 6,151 |
| Carleton | 1 | 2,325 | 1 | 2,475 |
| McGill | 3 | 17,500 | 2 | 14,885 |
| Montreal | 6 | 21,584 | 7 | 23,535 |
| **Totals** | — | **63,799** | — | **65,704** |

## Atomic Energy Control Board

The Atomic Energy Control Act 1946 established the Atomic Energy Control Board (AECB) to advise the Privy Council Committee on Scientific and Industrial Research "on all matters relating to atomic energy, which, in the opinion of the Board, may affect the public interest". It may "undertake or cause to be undertaken researches and investigations with respect to atomic energy". It may also "establish through the Honorary Advisory Council for Scientific and Industrial Research . . . or otherwise, scholarships and grants in aid for research and investigations with respect to atomic energy, or for the education or training of persons to qualify them to engage in such research and investigations". Under the terms of the Act, the President of the National Research Council is a member of the AECB.

AECB has provided a limited number of grants for research in nuclear physics, radio chemistry and related subjects. These grants have been administered on behalf of the Board by NRC since 1947. At the present time the Nuclear Physics Grants Selection Committee of NRC and AECB collaborate in allocating funds available to them for research. In general, the Board makes fewer but much larger grants, which include funds for equipment, large installations and operating costs.

The first AECB grants, described as Consolidated Grants,[1] were made to support groups at five universities. In the late 1940s and early 1950s these grants were considered appropriate for the development of centres for research with respect to atomic energy and the research training of graduate students. They were forerunners of Negotiated Development Grants and Block Terms Grants which are used or have been used by NRC. Centres

[1] Consolidated Grants were made in the name of an individual who enjoyed a considerable reputation in the field of research covered by the grant; colleagues sharing the grant were not permitted to apply directly for support. The grants were flexible and, at the time, quite successful.

for medical research were also assisted by means of Consolidated Grants for medical research were also assisted by means of Consolidated Grants. The term is no longer used; although most of the original features of these grants have been retained in the AECB grants, the amounts have been adjusted annually, rather than being set for term periods.

AECB now supports projects at 10 universities. Amounts of the grants range from over $400,000 per year to $23,000. There is now some overlapping in support by NRC of individuals using the large AECB-supported facilities.

**Atomic Energy Control Board Research Grants, 1966-67 and 1967-68**

| University | 1966–67 | 1967–68 |
|---|---|---|
| | $'000 | $'000 |
| Alberta | 160.0 | 254.0 |
| British Columbia | 414.4 | 421.0 |
| Laval | 270.0 | 362.0 |
| Manitoba | 250.0 | 298.0 |
| McGill | 200.0 | 234.0 |
| McMaster | 200.0 | 226.0 |
| Montréal | — | — |
| Ottawa | — | 81.0 |
| Queen's | 69.0 | 120.0 |
| Saskatchewan | 431.0 | 481.0 |
| Toronto | — | 23.0 |
| Victoria | 5.6 | — |
| **Totals** | **2,000.0** | **2,500.0** |

### Bank of Canada*

Relations of the Bank of Canada with universities and faculty members include employment of consultants and provision of data, library facilities, etc. During the years 1966-67 and 1967-68, fees amounting to $22,580 and $28,700 were paid to university consultants.

### Canada Emergency Measures Organization

One of the functions of the Emergency Measures Organization is the co-ordination and planning of investigations related to disaster problems. Support for work done in universities may be provided by government departments or agencies for projects of special interest to them. It also has a contingency fund of its own for research contracts and equipment grants. A fellowship of $5,000 is offered annually for postgraduate study of sociological effects of natural disasters at the Disaster Research Centre, Ohio State University. Some grants are also made for the purchase of equipment.

Canada Emergency Measures Organization Research Support, 1966-67 and 1967-68

| Expenditure Category | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Contracts | Amount | Contracts | Amount |
| | No. | $ | No. | $ |
| Fellowships | 1 | 5,000 | 1 | 5,000 |
| Grants— | | | | |
| Equipment— | | | | |
| Calgary | — | — | 1 | 15,050 |
| McMaster | — | — | 1 | 4,400 |
| Contracts— | | | | |
| Laval | 1 | 3,000 | — | — |
| McGill | 4 | 36,513 | 4 | 30,750 |
| McMaster | 1 | 1,827 | 2 | 33,543 |
| Toronto | 1 | 5,781 | 1 | 11,994 |
| Calgary | — | — | 1 | 6,600 |
| **Totals** | — | **47,121** | — | **82,887** |

**Canadian National Railways***

The Canadian National Railways (CNR) is a proprietary corporation. It has contracted with a university for studies of organization development of the Great Lakes region. The cost in 1966-67 was $11,700 and in 1967-68, $20,000; in addition $4,000 was paid in each year for consulting fees to university faculty members. The CNR collaborates with Federal Government laboratories and agencies in special studies of interest to universities.

**Central Mortgage and Housing Corporation**

Under Part V of the National Housing Act, 1954, the Central Mortgage and Housing Corporation (CMHC) makes funds available to support a variety of programs that concern universities. Two announcements are circulated annually to appropriate university departments; one is entitled "Grants[2] for research and study under the National Housing Act (1954)", and the other, "Fellowships in Urban Affairs", also under the Act. In general, emphasis in these programs has been on urban studies and planning, but studies of some design and technical problems have also been supported at universities. (Amounts for the latter were insignificant in the years 1966-67 and 1967-68.)

In addition to the graduate Fellowships and Research Grants, CMHC provides a limited number of Travelling Scholarships for architectural students at the undergraduate level and Senior Awards to professional architects for study leave and research. Special grants have been made for the develop-

[2] CMHC grants are actually contracts or agreements negotiated with individuals or groups.

ment of schools of planning, and to encourage training and research in urban studies, planning, etc. A financial summary and brief statements describing CMHC programs appear below.

**Central Mortgage and Housing Corporation Research Support, 1966 and 1967**

| Expenditure Category | 1966 | | 1967 | |
|---|---|---|---|---|
| | Fellowships or Grants | Amount | Fellowships or Grants | Amount |
| | No. | $ | No. | $ |
| Graduate Fellowships— | | | | |
| British Columbia | — | 35,200 | — | 45,000 |
| Alberta | — | — | — | 9,000 |
| Saskatchewan | — | — | — | 4,000 |
| Manitoba | — | 13,000 | — | 21,000 |
| Ontario | — | 69,000 | — | 122,000 |
| Quebec | — | 51,900 | — | 57,000 |
| **Totals, Fellowships** | — | **169,100** | — | **258,000** |
| Research Grants— | | | | |
| British Columbia | | | | |
| Manitoba | 1 | 4,600 | 2 | 10,000 |
| Carleton | 1 | 17,500 | 3 | 124,300 |
| Toronto | 1 | 28,000 | | |
| Waterloo | 3 | 26,500 | 2 | 116,025 |
| York | — | — | 1 | 96,000 |
| Laval | — | — | 1 | 26,000 |
| McGill | 2 | 31,000 | — | — |
| Montréal | — | — | 2 | 13,000 |
| Nova Scotia Technical College | 1 | 25,000 | 5 | 134,190 |
| | 1 | 8,400 | — | — |
| **Totals, Grants** | **10** | **141,000** | **16** | **519,415** |

**Graduate Fellowships**

CMHC Fellowships are offered for full-time graduate study leading to master's or doctoral degrees. Each year approximately 50 new Fellowships are made available for study at Canadian universities and 10 Fellowships for study elsewhere. Professional fields of study for which Fellowships are tenable include: urban and regional planning; urban, civic and landscape design; housing; urban renewal; housing design; community facilities planning; urban engineering; urban transportation; law of planning and development; urban administration and finance; real estate finance and management. Appropriate fields of study in the social and behavioural sciences include: urban economics; urban geography; urban sociology and anthropology; urban demography; local government; regional science.

**Travelling Scholarships**

CMHC Travelling Scholarships are awarded annually in the schools of architecture in Canada to an undergraduate in each school who is entering his final year. The recipients travel as a group in Canada and the United States

for a period of approximately four weeks, under the leadership of a member of the staff of one of the schools, to study examples of residential environment and housing design. Following the tour the students are employed at the Head Office of CMHC for approximately eight weeks, in order to gain further knowledge and experience in housing. Each student is expected to submit a paper, to the satisfaction of his school, on the summer's tour and work.

**Research Grants**

Research Grants are made to qualified individuals, other than enrolled students, and to organizations, either for specific projects of investigation or for continuing programs. Studies done by individuals are normally carried out within universities or other public or private institutions that can provide a suitable place to work and can administer research funds. Research Grants may be used to cover salaries of researchers and assistants, costs of necessary travel, clerical services, data processing, equipment, and the publication of research results.

**Study Grants**

Direct financial support may be given to unusually well-qualified individuals in appropriate fields of endeavour who wish temporarily to detach themselves from their regular responsibilities and either to undertake a period of full-time study which does not necessarily lead to a degree, or to carry on a period of personal research which is not part of a regular continuing program. One objective of this program is to provide assistance to persons of established reputation outside of universities, since opportunities are relatively rare for them to detach themselves from their regular duties. (Recipients of these awards may hold them at Canadian universities.)

## Department of Consumer and Corporate Affairs *

The Department of Consumer and Corporate Affairs (formerly Registrar General) was established officially in December 1967. During 1967-68, contracts were made for two task forces which were directed by members of university faculties. A Securities Task Force costing $56,828 involved a member of the staff of the University of Toronto; the other, directed by a member of the University of British Columbia faculty, involved $152,400 for a study of the Canadian Corporation Act.

## The Defence Research Board

The Defence Research Board of Canada (DRB) was established in 1947, largely because the rapid technological advances during and following World War II had shown the need for a scientific organization to undertake research for the Armed Forces.[3] Under the National Defence Act, as amended, DRB carries out such duties in connection with research relating to the defence of Canada and development of, or improvement in, equipment as the Minister of National Defence may assign to it, and advises the Minister on all matters relating to scientific, technical and other research and development that, in its opinion, may affect national defence. The Act in effect authorized the Board to establish a scientific organization for defence

[3] The NRC had provided scientific and technological services during the war; the nucleus of the staff of DRB transferred from NRC.

research and, subject to the approval of the Minister of National Defence, to direct the operations of this organization and to provide facilities for its work.

DRB consists of a chairman and vice-chairman, a number of members appointed by the Governor in Council for three-year terms, and certain ex-officio members representing the Armed Forces, the Deputy Minister of National Defence, and the National Research Council. The general membership is drawn from universities, industry and other research interests. The work of the Board is carried on at its headquarters in Ottawa and at its various research establishments located in Nova Scotia, Quebec, Ontario, Saskatchewan, Alberta and British Columbia. The terms of the National Defence Act have also permitted the Board to extend its efforts beyond its own facilities by means of grants to universities and contracts with universities and with industry.

The Board is served by a number of advisory committees and panels, among them a Standing Committee on Extramural Research. Details about these committees, including membership, are included in the report on DRB activities for 1966,[4] which was issued in May 1967. This report is the first of a series of annual reports which will describe DRB activities that can be discussed publicly. Details of support of research in universities and teaching hospitals are included with summaries by research field and by institution.

The purposes of the Board in providing funds for basic research in universities are: (1) to acquire new scientific knowledge that may prove applicable to the solution of technical defence problems; (2) to develop and support in the university community an interest in defence science, which may contribute to the long-term maintenance of a Canadian defence research capability; and (3) to assist in recruiting young scientists for employment with the Board.

Applications for support of research proposals are invited by the Board. They are reviewed first by advisory committees of experts who assess their scientific merit; those that qualify in this respect are then examined by Defence Board scientists and representatives of the Armed Forces to assess defence applications of the proposals. Those supported are related to headquarters directorates and listed by research field in the annual report and classified by research field.

While most of the work supported by DRB is in the sciences, some of the projects have been classified in the social or behavioural science area. The amount involved is less than seven per cent of the total.

In addition to its grants program, the Board contracted with universities for research projects amounting to $373,000 in 1966-67 and $608,000 in 1967-68.

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[4] Defence Research Board of Canada, *Annual Report 1966*.

**Defence Research Board Grants in Aid of Research, by University and Field of Interest, 1966-67 and 1967-68**

| University or Field of Interest | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Grants | Amount | Grants | Amount |
| | No. | $ | No. | $ |
| **University** | | | | |
| Acadia | 1 | 6,000 | 1 | 6,000 |
| Alberta | 9 | 51,200 | 20 | 133,925 |
| Brandon | — | — | 1 | 3,475 |
| British Columbia | 21 | 178,975 | 21 | 214,675 |
| Calgary | 6 | 26,025 | 12 | 78,875 |
| Carleton | 4 | 19,700 | 6 | 27,200 |
| Collège Militaire Royal[a] | 5 | 53,590 | 6 | 27,850 |
| Dalhousie | 11 | 74,026 | 6 | 45,800 |
| École Polytechnique | 1 | 6,000 | 2 | 15,400 |
| Guelph | 1 | 4,475 | 2 | 16,050 |
| Laval | 15 | 94,125 | 18 | 132,200 |
| Loyola College | 1 | 1,000 | 1 | 7,500 |
| Manitoba | 9 | 63,175 | 14 | 92,025 |
| McGill | 35 | 351,950 | 35 | 359,650 |
| McMaster | 17 | 111,950 | 21 | 143,050 |
| Memorial | — | — | 1 | 5,000 |
| Moncton | 1 | 3,000 | 1 | 3,000 |
| Montréal | 8 | 60,850 | 10 | 83,850 |
| Mount Allison | 1 | 7,800 | — | — |
| New Brunswick | 3 | 26,900 | 4 | 28,700 |
| Nova Scotia Technical College | 3 | 10,000 | 2 | 6,200 |
| Ontario Agricultural College | — | — | — | — |
| Ontario Research Foundation | 1 | 5,800 | — | — |
| Ontario Veterinary College | — | — | — | — |
| Ottawa | 12 | 67,400 | 8 | 56,900 |
| Queen's | 11 | 74,400 | 13 | 91,250 |
| Royal Military College[a] | 16 | 122,850 | 19 | 240,965 |
| Royal Roads[a] | 6 | 17,900 | 3 | 20,325 |
| Saskatchewan | 13 | 120,575 | 14 | 123,500 |
| Saskatchewan (Regina) | — | — | 1 | 5,000 |
| St. Francis Xavier | 1 | 13,500 | — | — |
| Sherbrooke | 4 | 22,200 | 5 | 36,100 |
| Simon Fraser | 3 | 21,000 | 6 | 40,300 |
| Toronto | 36 | 465,400 | 37 | 391,725 |
| Victoria | 3 | 58,900 | 5 | 43,300 |
| Waterloo | 19 | 87,850 | 23 | 105,950 |
| Western Ontario | 18 | 128,875 | 16 | 130,100 |
| Windsor | 6 | 41,200 | 7 | 43,950 |
| York | 2 | 21,000 | 5 | 26,000 |
| Miscellaneous institutions | 4 | 36,225 | 4 | 35,550 |
| **Totals** | **307** | **2,455,816** | **350** | **2,821,340** |

[a] Canadian Services College.

**Defence Research Board Grants in Aid of Research, by University and Field of Interest, 1966-67 and 1967-68 (continued)**

| University or Field of Interest | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Grants | Amount | Grants | Amount |
| | No. | $ | No. | $ |
| **Directorate/Establishment and Field of Interest** | | | | |
| **DAR—** | | | | |
| Atomic warfare research | 12 | 118,450 | 11 | 87,125 |
| Biological warfare research | 6 | 34,800 | 4 | 46,900 |
| Chemical warfare research | 22 | 97,500 | — | — |
| Civil defence | — | — | — | — |
| Electrical power sources | 8 | 37,400 | 12 | 70,200 |
| **DBR (EF)—** | | | | |
| Clothing and general stores | 4 | 29,575 | 4 | 27,050 |
| Entomological research | 10 | 61,325 | 10 | 58,150 |
| **DBR (HRR)—** | | | | |
| Human resources research | 24 | 151,025 | 22 | 122,525 |
| **DBR (MED)** | **49** | **456,251** | **55** | **473,525** |
| Arctic medical research | 8 | 64,475 | 5 | 37,500 |
| Auditory and vestibular | 4 | 38,401 | 3 | 32,500 |
| Aviation and underwater physiology | 12 | 141,450 | 12 | 146,250 |
| Blood and plasma expanders | 6 | 51,725 | 4 | 25,600 |
| Blood and related problems | — | — | — | — |
| Food technology | — | — | — | — |
| Infection and immunity | 4 | 33,450 | 4 | 23,700 |
| Management of burns and wounds | — | — | — | — |
| Naval medical research | — | — | — | — |
| Nutrition and metabolism | 1 | 15,175 | 1 | 13,250 |
| Psychiatric research | — | — | — | — |
| Radiation protection and treatment | 3 | 31,450 | 9 | 83,275 |
| Shock and plasma expanders | — | — | — | — |
| Toxicology | 5 | 31,500 | 10 | 61,100 |
| Trauma and shock | 4 | 41,975 | 5 | 37,850 |
| Visual problems | 2 | 6,650 | 2 | 12,500 |
| **DIR—** | | | | |
| Gas dynamics and plasma | 16 | 294,450 | 18 | 253,850 |
| Structures and materials | 31 | 212,400 | 35 | 286,500 |
| **DMR—** | | | | |
| Oceanographic research | 7 | 105,900 | 9 | 102,850 |
| **D PHYS R—** | | | | |
| Geophysics research | 18 | 126,150 | 19 | 137,500 |
| Physics research | 57 | 497,565 | 73 | 654,050 |
| **DSI—** | | | | |
| Scientific intelligence | — | — | — | — |
| **DWER—** | | | | |
| Engineering research | 10 | 38,650 | 16 | 102,400 |
| Explosives and propellants | 30 | 180,300 | — | — |

**Defence Research Board Grants in Aid of Research, by University and Field of Interest, 1966-67 and 1967-68 (concluded)**

| University or Field of Interest | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Grants | Amount | Grants | Amount |
| | No. | $ | No. | $ |
| **Directorate/Establishment and Field of Interest—concluded** | | | | |
| C Sc— | | | | |
| Operational research | 3 | 14,075 | 6 | 25,850 |
| CARDE— | | | | |
| Chemical research | — | — | 32 | 228,750 |
| DCBRE— | | | | |
| Chemical research | — | — | 7 | 36,200 |
| DRES— | | | | |
| Chemical research | — | — | 17 | 107,915 |
| **Totals** | **307** | **2,455,816** | **350** | **2,821,340** |

During the period DRB has been established, it has provided general support for four institutes and one major installation. At the present time this type of support has been discontinued except for the Aviation Medicine Research Unit at McGill University. Individual members of Institute staff still continue to apply to DRB for grants in support of specific proposals.

**DRB Institute Support, 1959-69**

| University | Name of Institute | Period of General Support | Amount |
|---|---|---|---|
| | | | $ |
| McGill | Aviation Medicine Research Unit (current support 1968–69, $50,000) | 1959 | 356,950 |
| McGill | Eaton Electronics Laboratory | 1951–1968 | 716,320 |
| Saskatchewan | Institute of Upper Atmospheric Research | 1956–1968 | 449,254 |
| Toronto | Institute of Aerospace Studies | 1951–1968 | 1,929,877 |
| McMaster | Nuclear Reactor | 1957–1968 | 580,000 |

## Dominion Bureau of Statistics*

The Bureau contracts with university faculty members to carry out research projects. In 1966-67, $49,430 was expanded for 19 contracts, and $35,122 for 14 contracts in the following year. Graduate student and other students are employed during the summer months.

**Dominion Coal Board***

During 1968, the Dominion Coal Board was discontinued. It was authorized to promote and encourage research and development related to coal and most of the funds available for research were spent in federal, provincial and industrial laboratories. The only university expenditure was for a project at the University of Waterloo Water Resources Research Institute on the use of coal for sewage treatment. In 1966-67, the amount provided by the Board was $2,700 and a similar amount in the following year.

**The Economic Council of Canada***

The Economic Council is authorized to use outside experts by means of temporary appointments of specialists to the Council's staff, or by means of contracts for special studies. Contracts are usually arranged with individuals and include fees for the principal investigator, funds for research and other assistants, travel expenses, computer time, books, etc. In some cases the university or institution at which the work is being done may charge an overhead fee, but this is not a uniform practice.

A list of the Canadian universities at which faculty members held contracts to carry on investigations for the Economic Council during 1966-67 and 1967-68 follows. Contracts may have extended over more than one fiscal year but the amounts shown include only expenditures during the years involved. Other contracts for work done by private consultants and at United States universities are not included in this tabulation.

**Economic Council Contracts for Research and Special Studies, 1966-67 and 1967-68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Contracts | Amount | Contracts | Amount |
| | No. | $ | No. | $ |
| British Columbia | — | — | 1 | 12,200 |
| Alberta | 1 | 2,343 | 1 | 20,850 |
| Saskatchewan | 1 | 24,750 | 1 | 5,000 |
| Manitoba | — | — | 1 | 30,000 |
| Royal Military College | — | — | 1 | 16,750 |
| Western Ontario | 3 | 36,950 | 1 | 15,000 |
| Toronto | — | — | 1 | 10,040 |
| Queen's | 3 | 16,141 | — | — |
| Ottawa | — | — | 1 | 25,068 |
| Carleton | 1 | 2,450 | 1 | 15,950 |
| McGill | — | — | 2 | 26,329 |
| Laval | 1 | 7,700 | — | — |
| **Totals** | **10** | **90,324** | **11** | **177,187** |

## Eldorado Mining and Refining Ltd.

Eldorado Mining and Refining Ltd. (now Eldorado Nuclear Limited) took over financial support of research in the field of uranium metallurgy in 1955. Projects at Alberta, British Columbia and Queen's had been supported for two years by grants from the Atomic Energy Control Board. The object of these grants was to make improvements in the processing of uranium ores and to provide training for engineers and scientists in uranium technology.

Between 1955 and 1967, grants made by Eldorado for metallurgical research on a contract basis amounted to $720,000; other grants for research scholarships and of material amounted to an additional sum of $230,000.

**Eldorado Mining and Refining Ltd. Research Support, 1966-67 and 1967-68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Contracts | Amount | Contracts | Amount |
| | No. | $ | No. | $ |
| British Columbia | 2 | 28,000 | 1 | 15,000 |
| Queen's | 1 | 29,300 | 1 | 20,000 |
| McGill | 1 | 10,060 | 1 | 10,000 |
| **Totals, Contracts** | **4** | **67,360** | **3** | **45,000** |
| | Grant for Scholarships | | | |
| McGill | — | 10,000 | — | — |

## Department of Energy, Mines and Resources

Several Branches of the Department of Energy, Mines and Resources (EMR) sponsor grants programs. The Geological Survey began a small program in 1950-51 and the new Water Resources Branch offered grants officially in 1968. Each grants program in this Department is conducted under the aegis of a national advisory committee, of which there are six at present:

National Advisory Committee on Astronomy
National Advisory Committee on Control Surveys and Mapping
National Advisory Committee on Research in the Geological Services
National Advisory Committee on Geographical Research
National Advisory Committee on Mining and Metallurgical Research
National Advisory Committee on Water Resources Research.

Each Committee is required to advise the Minister of EMR, to co-ordinate research in Canada and to review and make recommendations concerning grants in aid of research.

Amounts of money for support of research in the universities vary from about $10,000 in the case of astronomy to $500,000 (1968-69) for water resources research. The total amount for the Department now approaches $1 million.

The responsibilities of the EMR are varied and widespread, involving land, sea and air operations. Because these operations are often seasonal, and with the example of the Geological Survey of Canada (which traditionally has maintained very close liaison with university geologists), the Department has made facilities such as ships' time, transportation in the North, local laboratory facilities, etc., available to university scientists during summer months. As with the Departments of Agriculture and Forestry and the Fisheries Research Board, collaboration between the staffs of regional establishments and the local universities is encouraged but depends to a large extent on local relations.

**National Advisory Committee on Astronomy**—This Committee was established by Order in Council May 4, 1965, amended May 2, 1968 to reflect a change in the method of appointing the Chairman and to change references to the Minister of Mines and Technical Surveys to the Minister of Energy, Mines and Resources (EMR). The Committee is to advise the Minister of EMR in:

(a) all aspects of astronomical research within the department, particularly as they relate to the establishment of a major research centre on Mount Kobau, B.C.,

(b) co-ordination of the federal astronomical (including radio astronomy) research program with that in the several Canadian universities, and

(c) methods by which astronomical research and teaching may be stimulated within the Canadian universities.

The Science Secretariat Special Study No. 2, *Physics in Canada, a Survey and Outlook,* on page 120, refers to the Committee (NACA) as one of three scientific committees "that consider various aspects of astronomical activity in Canada", and states further that "it was created primarily to deal with problems related to the establishment of the Mount Kobau observatory, but discusses and advises upon other astronomical matters as well". No reference is made to the small sums of money provided from the appropriation of the Observatories Branch of EMR, but the distribution of funds to various universities for research in astronomy in 1965-66 and 1966-67, is shown on page 98 of the Report. Part of the funds available in the first year

were allotted for support of geophysical research. The grants have been quite small and mainly for minor items of equipment, i.e., $2,500 or less until 1967-68.

Applications for grants for 1968-69 were invited by a form letter circulated to all university presidents, heads of university departments of astronomy, physics, geophysics, geology, etc., and to selected individuals who are known to be interested in astronomy or geophysics and related subject areas. Application forms were enclosed with the letter and the deadline for 1968-69 awards was set at June 15, 1968, with notices of awards to be mailed as soon as possible. The following statement was included in the letter: "since there are more numerous sources of funding in geophysics than in astronomy, preference will be given to astronomical projects". The amount of money available is $21,000 (not an astronomical sum). Awards for 1967-68 were not announced until March, and separate cheques were mailed to each grantee.

For purposes of comparison, grants recommended by this Committee are shown in the following table, together with data regarding grants made to the same individuals by NRC, during 1965-66 and 1967-68.

It is of interest to note that the terms of reference of this Committee and those of the Advisory Committee on Control Surveys and Mapping include a reference to teaching by the first and education by the second.

**EMR Grants for Research Astronomy, 1966-67 and 1967-68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Grants | Amount | Grants | Amount |
| | No. | $ | No. | $ |
| British Columbia | 1 | 2,050 | 1 | 6,000 |
| Alberta | — | — | 1 | 1,000 |
| Calgary | 1 | 500 | — | — |
| Saskatchewan | — | — | 1 | 5,000 |
| Toronto | 1 | 2,900 | — | — |
| Waterloo | 1 | 1,800 | 1 | 2,000 |
| Western Ontario | 1 | 1,250 | 1 | 5,000 |
| York | 1 | 1,500 | 1 | 1,000 |
| Laval | — | — | 1 | 5,000 |
| **Totals** | **6** | **10,000** | **7** | **25,000** |

**National Advisory Committee on Control Surveys and Mapping**—This Committee was established by an Order in Council dated Oct. 9, 1964, amended May 2, 1968. The terms of reference remain unchanged but sections dealing with the appointment of the Committee Chairman and

Committee membership have been revised slightly because of the reorganization of the Department. The Committee is to advise the Minister of EMR in:

(a) the co-ordination of federal surveying and mapping programs, and

(b) the promotion and co-ordination of related research and educational programs, including sponsoring worthy research programs.

Members are drawn from the Department of National Defence and three additional departments and agencies of the Government of Canada and two each from the provinces, Canadian universities and industry.

The Committee reports that "the universities at which research in the field of Surveying and Mapping is being carried out" are well known to it, and announcements are sent to appropriate faculty deans, along with instructions and conditions governing grants. The 1968-69 covering letter (to faculty deans) from the Chairman of the Committee stated that $25,000 had been included in the estimates for the Surveys and Mapping Branch of the Department. Deans were advised that "should any member of your faculty be planning research which could be implemented with modest support, . . ." applications should be submitted to the Committee before Apr. 10, 1968. Large-scale projects and expensive equipment are obviously ruled out by the limited amount of money involved.

**EMR Grants for Research Control Surveys and Mapping, 1966-67 and 1967-68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Grants | Amount | Grants | Amount |
| | No. | $ | No. | $ |
| Saskatchewan | 1 | 6,000 | 1 | 2,000 |
| Toronto | 1 | 3,000 | 1 | 3,600 |
| Laval | — | — | 2 | 5,600 |
| New Brunswick | 1 | 3,000 | 3 | 8,800 |
| **Totals** | **3** | **12,000** | **7** | **20,000** |

**National Advisory Committee on Research in the Geological Sciences**—The National Advisory Committee on Research in the Geological Sciences was established in 1949. Its purposes are "to stimulate and coordinate geological research in Canada; to suggest research projects that should receive attention; and to aid in having these projects undertaken". The Secretariat is provided by the Geological Survey of Canada, EMR. It publishes an annual report, which includes reports of seven subcommittees, and a list of research grants awarded for the following year (i.e., in the report for 1966-67 the grant list is for 1967-68). The subcommittees are: (1) on Geophysical Methods Applied to Geological Problems, (2) on Mineral Deposits, (3) on

Mineralogy, Geochemistry and Petrology, (4) on Quarternary Geology, (5) on Stratigraphy, Paleontology and Sedimentation, (6) on Structural Geology, and (7) on Scholarship and Research Training. In addition, a Project Subcommittee makes recommendation for research grants in the universities.

The Committee also publishes as a separate volume, *A survey of Current Research in the Geological Sciences in Canada* (GSC paper 67-58) and other current publications including a report of a *Symposium on Geochemical Prospecting* (GSC paper 66-54) and the final report of the Ad Hoc Committee on Storage and Retrieval of Geological Data in Canada, *A National System for the Storage and Retrieval of Geological Data in Canada*, April, 1967.

As a result of the recommendations of the Ad Hoc Committee, a Standing Committee on the Storage and Retrieval of Geological Data in Canada was established; a sum of $50,000 was included in the estimates for 1968-69 of EMR for special grants for research in the development of computer-processable files of geological data, and applications have been invited for the current year.

Research grants were introduced in 1951 on the recommendation of the National Advisory Committee (NAC). Close liaison has been maintained with National Research Council grants selection committees since the beginning of this program by exchange of information and common membership of the grants committees of each organization. A summary of requests and amounts awarded by the Geological Survey of Canada for 1966-67 and 1967-68 is attached, together with data concerning grants made by NRC to the same individuals in those years. The data in these tables substantiate the statements in NAC reports that NRC support is on a more substantial scale. The report of the Subcommittee on Geophysical Methods Applied to Geological Problems for 1966-67 (page 13) refers to a "gap in geophysical and geological research in Canada", and suggests that:

> the subcommittee should appoint ad hoc members to meet and report on gaps . . . . . and make recommendations as to how these deficiencies may be corrected. These recommendations should be considered by some group that has funds to make possible their implementation if they are considered to have merit and warrant priorities. One way this might be accomplished would be to change the policy of making Geological Survey grants and 'support centres of excellence' at geological and geophysical centres of research rather than large numbers of unrelated and uncoordinated research projects.

The Subcommittees on Mineralogy, Geochemistry and Petrology (pages 40-41) and on Stratigraphy, Paleontology and Sedimentation (page 72) refer to refereeing and assessment of grant applications. Both feel that current practices could be improved; the former by using NSF methods, and the latter by greater use of the members of subcommittees who would be asked to complete "standard rating forms".

**EMR Geological Research Grants, 1966-67 and 1967-68**

| Item | | 1966–67 | 1967–68 | Increase | |
|---|---|---|---|---|---|
| Monies requested | $ | 309,272 | 370,377 | 61,105 | 19.7% |
| Applications | No. | 98 | 100 | 2 | |
| Average request | $ | 3,156 | 3,704 | 548 | 17.3% |
| Total allotted | $ | 150,000 | 185,000 | 35,000 | 23.3% |
| Supported | No. | 85 | 90 | 5 | |
| Average grant | $ | 1,765 | 2,056 | 291 | 16.4% |
| Percentage Approved— | | | | | |
| Amount | | 48.5 | 49.9 | | |
| No. | | 86.7 | 90.0 | | |

**EMR Geological Research Grants, by Institution, 1966-67 and 1967-68**

| University | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Grantees | Total Grants | Grantees | Total Grants |
| | No. | $ | No. | $ |
| British Columbia | 3 | 3,550 | 6 | 9,110 |
| Alberta | 6 | 13,450 | 9 | 20,020 |
| Calgary | 3 | 5,000 | 3 | 5,660 |
| Saskatchewan | 1 | 2,000 | 3 | 10,160 |
| Manitoba | 5 | 6,800 | 4 | 7,880 |
| Carleton | 4 | 6,100 | 6 | 10,780 |
| Guelph | — | — | 1 | 600 |
| McMaster | 7 | 10,400 | 8 | 17,340 |
| Ottawa | 5 | 6,810 | 4 | 8,280 |
| Queen's | 4 | 9,513 | 5 | 14,610 |
| Toronto | 6 | 13,500 | 10 | 22,800 |
| Waterloo | 1 | 6,000 | 2 | 6,400 |
| Western Ontario | 9 | 12,700 | 2 | 3,460 |
| École Polytechnique | 4 | 8,000 | 2 | 3,520 |
| Montreal | 3 | 5,187 | — | — |
| Laval | 2 | 4,050 | 3 | 2,800 |
| McGill | 7 | 13,500 | 6 | 9,800 |
| New Brunswick | 7 | 8,240 | 4 | 8,520 |
| Acadia | — | — | 3 | 9,480 |
| Dalhousie | 4 | 8,400 | 4 | 6,620 |
| Nova Scotia Technical College | — | — | 1 | 1,500 |
| St. Francis Xavier | 1 | 1,800 | — | — |
| Memorial | 3 | 5,000 | 4 | 5,660 |
| **Totals** | **85** | **150,000** | **90** | **185,000** |

Concern was expressed by the Scholarships and Research Training Subcommittee regarding post-doctorate fellowships and funds for support of promising students of second-class standing.

Several subcommittees referred to relations with the NRC Associate Committee on Geodesy and Geophysics and its various subcommittees. The Subcommittee on Quarternary Research commented that the newly established Associate Committee on Quarternary Research of NRC would be helpful in promoting inter-disciplinary research in "the fields of botany, zoology, geology, geography, archaeology, paleoclimatology, pedology and geocryology". However, "the more specialized geological research in the Quarternary should continue as the prime responsibility of the present subcommittee". This subcommittee includes urban geology in its scope, and is concerned about the lack of progress being made because of jurisdictional problems.

**National Advisory Committee on Geographical Research**—The National Advisory Committee on Geographical Research (NACGR) was established by Order in Council on Apr. 14, 1965. This action followed a recommendation that came from a special conference of government and university scientists and administrators, held in Ottawa, Nov. 26 and 27, 1964, "to discuss the current status and possible future role of the Geographical Branch, and advise the Minister of the Department of Mines and Technical Surveys on its findings".

Although some changes have been introduced since the Department of Energy, Mines and Resources was formed with the new Water Resources Branch, the Committee has continued to function under its original terms of reference, namely (a) to assist in the co-ordination of geographic research in Canada and (b) promote the development of geographic research through the recommendation of grants-in-aid. (Revisions are being considered to bring the Committee activities in line with the revised organization within the new Department. The Geography Branch will be part of the Resources Research Division of the Policy Planning Branch.)

The first grants were made for the fiscal year 1966-67; 23 were approved ranging from $200 to $2,000, amounting to $25,000 in all. The upper limit has since been increased to $3,000. A summary of requests and awards follows:

| Year | Applications | Total Requested | Awards | Total Awarded |
|---|---|---|---|---|
| | No. | $ | No. | $ |
| 1966–67 | 43 | 70,000 | 23 | 25,000 |
| 1967–68 | 52 | 127,000 | 21 | 35,000 |
| 1968–69 | 72 | 140,000 | 34 | 47,000 |

**EMR Grants for Geographical Research, 1966-67 and 1967-68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Grants | Amount | Grants | Amount |
| | No. | $ | No. | $ |
| British Columbia | 5 | 4,955 | 1 | 650 |
| Calgary | 3 | 1,400 | 3 | 4,250 |
| Manitoba | — | — | 1 | 800 |
| Brock | — | — | 1 | 2,800 |
| Carleton | 1 | 500 | 1 | 1,200 |
| McMaster | 3 | 2,745 | 1 | 2,860 |
| Toronto | 1 | 2,000 | 2 | 3,320 |
| Waterloo Lutheran | — | — | 2 | 3,200 |
| Western Ontario | 1 | 800 | 3 | 4,000 |
| York | 1 | 1,250 | — | — |
| Bishop's | 1 | 500 | — | — |
| Laval | 1 | 1,000 | 2 | 4,470 |
| McGill | 1 | 1,650 | 1 | 2,000 |
| Montreal | 4 | 6,200 | 2 | 3,850 |
| Sherbrooke | 1 | 2,000 | — | — |
| Memorial | — | — | 1 | 1,600 |
| **Totals** | **23** | **25,000** | **21** | **35,000** |

Geography might be labelled a "catch-all" field for research. An examination of the research topics of study being supported by the Advisory Committee include: the Canadian herring fisheries; Appalachian settlements in New Brunswick-Nova Scotia; the relationship between man and landscape when driving for pleasure; human adjustments to snow hazard; geographical variations in snow-creep behaviour in southern British Columbia; and part-time farming in Welland County, Ontario.

Some of the individuals receiving support under this program also receive grants from the National Research Council, the Meteorological Service, the Canada Emergency Measures Organization, the Central Mortgage and Housing Corporation, and the Canada Council. Presumably some of the projects would qualify for Canada Department of Agriculture grants if these were available to members of non-agricultural faculties. There is some overlapping of membership of this Advisory Committee and the NRC Associate Committee on Quarternary Research, and no doubt liaison is maintained with the National Advisory Committee on Research in the Geological Sciences.

An Order in Council dated May 2, 1968, revoked the earlier Order of Apr. 14, 1965, and reconstituted the Advisory Committee on Geographical Research. The duties and functions of the Committee are: (a) to provide continuing advice to the Minister of Energy, Mines and Resources on needs and priorities for geographical research in Canada; (b) to assist in the co-ordination of geographical research in Canada, and (c), to promote the devel-

opment of geographical research and review and make recommendations on applications for grants in aid of such research. Membership includes representatives of federal and provincial government departments (up to six), Canadian universities (up to 10), and Canadian business and industrial establishments (up to four). The Committee is required to establish a subcommittee to review and make recommendations on applications for grants-in-aid of research. Other subcommittees can be named as well.

**National Advisory Committee on Mining and Metallurgical Research**—The program of support of university research in mining sciences was introduced by the Mines Branch of the Department of Mines and Technical Surveys in 1962, when "grants amounting to $10,000 were awarded to three universities for graduate research work in rock mechanics", according to a press release dated July 25, 1962. The grants to Queen's, McGill and Alberta were "intended to encourage the development of a corps of specialists with postgraduate degrees in this branch of engineering, and to advance the science of mine design and bring about added efficiency and safety in the extraction of minerals". By 1965 the amount involved had been increased to $50,000, and awards had been made for research projects to be carried out at eight universities (British Columbia, Alberta, McMaster, Toronto, Waterloo, Queen's, McGill and Laval). These projects included seven related directly to the "development of improved mining practices", and the remainder to the "development of improved and cheaper methods of extracting and processing ores and minerals". In 1966-67 the amount was doubled, and $100,000 was shared by 11 universities with the amount divided between mining ($72,200) and mineral processing ($27,800). In that year, the press announcement stated that "applications are reviewed annually by advisers from industry and the universities who make recommendations to the Mines Branch Director for approval". In 1967-68 the same amount of money was awarded with about the same division between mining and mineral processing projects.

Authority to establish a National Advisory Committee on Mining and Metallurgical Research was provided Feb. 1, 1968 (PC 1968-4/185). This Committee is to advise the Minister of Energy, Mines and Resources on: (a) mining (all areas of underground and open pit mining of all solid material) and metallurgical (all areas of mineral processing and extraction metallurgy) research in Canada; (b) co-ordination of federal research programs with others; and (c) sponsorship of university and other research programs and projects. Establishment of this Committee had been under consideration for some time. Difficulties were experienced because of the scope and diversity of the materials and products.

The Chairman of the National Advisory Committee on Mining and Metallurgical Research is the Deputy Minister; the Vice-chairman is the Director of the Mines Branch. Membership of the Committee is stipulated as

follows: up to (a) six representatives of the Canadian mining and metallurgical industries, (b) three representatives of provincial government or research agencies, (c) three from Canadian universities, (d) two from other federal departments or agencies, and (e) individual scientists or engineers who may be designated by the Minister because of special circumstances for periods to be stipulated by the Minister. Appropriate geographic distribution, industry, university and government representation is to be observed. The Director of the Mines Branch recommends names of members to the Minister. Provision is made for the Chairman to name chairmen of subcommittees who must be members of the Advisory Committee.

**EMR Mining and Mineral Processing Research Grants, 1966-67 and 1967-68**

| Institution | 1966–67 | | | 1967–68 | | |
|---|---|---|---|---|---|---|
| | Mining | Mineral Processing | Total | Mining | Mineral Processing | Total |
| | $ | $ | $ | $ | $ | $ |
| British Columbia | 4,500 | 3,000 | 7,500 | 13,000 | 6,000 | 19,000 |
| Alberta | 3,000 | 3,000 | 6,000 | 5,500 | 2,500 | 8,000 |
| Saskatchewan | 6,700 | — | 6,700 | 5,800 | — | 5,800 |
| Carleton | — | — | — | 1,500 | — | 1,500 |
| McMaster | 3,500 | — | 3,500 | 2,000 | — | 2,000 |
| Queen's | 22,900 | 6,200 | 29,100 | 10,900 | 6,000 | 16,900 |
| Toronto | 600 | | 600 | | | |
| Waterloo | — | 7,000 | 7,000 | — | 6,500 | 6,500 |
| École Polytechnique | 4,000 | 3,500 | 7,500 | — | 3,000 | 3,000 |
| Laval | 8,000 | 3,650 | 11,650 | 9,300 | 3,500 | 12,800 |
| McGill | 17,000 | 1,450 | 18,450 | 16,500 | 2,500 | 19,000 |
| New Brunswick | 2,000 | — | 2,000 | 2,500 | — | 2,500 |
| Nova Scotia Technical College | — | — | — | 3,000 | — | 3,000 |
| **Totals** | **72,200** | **27,800** | **100,000** | **70,000** | **30,000** | **100,000** |

**National Advisory Committee on Water Resources Research**—This Committee was established by Order in Council dated Sept. 28, 1967 to: provide continuing advice to the Minister of EMR on needs and priorities for research on water resources; assist in the co-ordination of water resources research in Canada; and review and make recommendations on applications for grants in aid of research from EMR. The Committee is to be made up of (a) the Assistant Deputy Minister (Water) of EMR and the Directors of the Policy and Planning and Inland Waters Branches of the Department; (b) up to 10 members from other federal agencies; and (c) up to 10 members from Canadian universities, provincial and other bodies. The total shall not be less than 12 or more than 23 members. A senior officer of the Department will be named chairman by the Minister on advice of the Deputy Minister. The

Committee is required to name two subcommittees to review and make recommendations on applications for grants in aid of research; directors of the Branches referred to above are the chairmen.

Meetings of the Committee and subcommittees were held on Mar. 5-7, 1968. At that time eight grants in the amount of $112,167, all in the natural science area, were approved and payments made from funds allocated for 1967-68. Seven additional applications were deferred, rejected or transferred to other agencies suggested. No applications had been invited, but had been referred to the Committee by other agencies including the National Research Council and the Department of National Health and Welfare.

The Committee circulated an Information Guide and invitation to apply for grants for 1968-69. Applications for research grants (operating grants) were considered in June 1968 but applications for development grants will not be considered until February 1969. Although the Information Guide appears to have been based on NRC procedures, there are some useful innovations designed to facilitate co-ordination of activities with other granting agencies, such as:

1. A list of categories of research which will be considered by the committees is included as a guide. Code numbers are given for each category as well. (These are based on a Canadian modification of those developed by the United States Committee on Water Resources Research of the Federal Council on Science and Technology.)
2. A list of other federal agencies with funds available for the support of certain categories of water resources research is included with the notation that, "where the proposed research programs related specifically, or more or less exclusively to the interest of one of these agencies, applications will be considered in consultation with the agency concerned", when appropriate applications will be exchanged for processing.
3. Applicants for grants are invited to nominate a liaison officer, who "should be chosen on the basis of his interest in, or association with, the applicants' research". If a nomination is not made by the applicant, the Department may choose a liaison officer "mutually acceptable to both parties".

In addition to operating grants, the Department plans to provide development grants (mentioned above) "for the purpose of assisting selected universities or educational institutes in initiating, developing or intensifying research programs in water and related resources fields. Grants may be provided to support inter-disciplinary research within and between the natural and social sciences; to encourage research on the application of existing knowledge in the social and natural sciences related to water and related resource problems; and re direction of emphasis in existing programmes to

focus research effort on water resource problems." Support for inter-departmental and inter-university co-operation is feasible as well as for "inter-disciplinary research within an educational institute". (The requirements and conditions for these grants should be compared with those for NRC negotiated development grants. See pages 5 and 6 of brochure.)

Administrative services for the grants-in-aid program are provided by the Policy and Planning Branch of the Department (see page 2 of brochure). The Advisory Committee Secretariat is to "assist the Committee and its subcommittees in achieving their aims, specifically by recommending on policy; implementing action programs; administering program funds and providing the necessary services to the Committee and subcommittees. In respect of grants-in-aid applications, the Secretariat would be responsible for setting up a mechanism through which grants-in-aid applications relating to water could be co-ordinated among the various Federal Government departments and agencies concerned. (Reference has been made above to the list of agencies and statements included in the Information Guide.)

**EMR Water Resources Research Grants and Contracts, 1966-67 and 1967-68**

| University | 1966–67 | | 1967–68[b] | |
|---|---|---|---|---|
| | No. | $ | No. | $ |
| | Grants | | | |
| British Columbia | — | — | 1 | 5,500 |
| Manitoba[a] | 1 | 38,000 | 1 | 40,000 |
| Guelph | — | — | 1 | 13,800 |
| Toronto | — | — | 1 | 20,117 |
| Waterloo | — | — | 2 | 49,300 |
| Western Ontario | — | — | 1 | 5,000 |
| Montreal | — | — | 1 | 5,550 |
| New Brunswick | — | — | 1 | 12,900 |
| **Totals Grants** | — | **38,000** | — | **152,167** |
| | Contracts | | | |
| Alberta | 3 | 6,125 | 3 | 9,546 |
| Saskatchewan | 4 | 21,716 | 4 | 77,202 |
| Toronto (GLI) | 5 | 47,500 | 5 | 22,500 |
| **Totals, Contracts** | — | **75,341** | — | **109,248** |

[a]Inter-disciplinary Study: Water Sciences and Water Management; expenditure in social sciences in 1966–67 estimated to be about one third of total; in 1967–78 approximately two thirds of total.

[b]Three additional grants amounting to $40,000 were made to the University of Toronto in 1967–68 from funds provided by NRC under a financial encumbrance.

The Advisory Committee and subcommittees discussed questions of 'overhead' and stipend payments from grants at their joint meetings held on

Mar. 5-7. No decisions were made regarding these questions, pending the completion of, and subsequent policy generated by, the Science Secretariat study on federal-university relations.

On the second question (stipends from grant funds), subcommittees differed. The Natural Sciences group accepted the NRC practice of no payments from a grant to the grantee or members of his family, but the Social Sciences group pointed out that, "those in the social sciences have ample opportunity to conduct research in areas other than water resources . . . that most of the important work published in economics in Canada and the U.S.A. was conducted by those working under contract or receiving stipends from research funds . . . research in the water resources field would not be competitive with other areas of research if provision of stipend to the grantee was not made."

**External Affairs and External Aid Office***[5]

The Department of External Affairs negotiates cultural agreements and exchanges on behalf of the Government of Canada with the governments of other countries. It does not make grants or other awards but funds are provided in its annual budgets for exchanges with six Western European countries. The Canada Council serves as the administrative agent for these programs, which include postgraduate and post-doctorate awards and visiting professorships. The amounts expended in 1966-67 and 1967-68 were $532,-592 and $567,739, respectively (Table 4.2). (An arbitrary division between the natural sciences and humanities and social sciences has been made on a 60:40 basis, in Table 4:7.) Expenditures for contracted research studies amounted to approximately $66,000 in 1966-67 and $17,000 in the following year.

**External Aid Office** [5]—The External Aid office is the administrative agent of the Government of Canada for its participation in international develment schemes and programs of assistance to developing countries. Expenditures in Canadian universities for research training for postgraduate students (candidates for Ph.D's) amounted to $716,885 in 1966-67 and $808,304 in 1967-68; expenditures for post-doctorate fellowships amounted to $28,703 and $45,121, respectively, for the same year, making total expenditures of $745,588 and $853,425, respectively.

**Department of Finance**

Expenditures of the Department of Finance for research and special studies carried out by university faculty members amounted to $98,000 in 1966-67 and $130,000 in 1967-68.

[5] Now the Canadian International Development Agency.

## Department of Fisheries*

The activities of the Department of Fisheries in support of university research are limited. The use of non-departmental or neutral specialists for certain studies is regarded as an advantage and some projects can be expedited by making use of contract arrangements. In "program budgeting", contracts offer an alternative means of achieving departmental objective, which is regarded as an advantage in the Department.

Expenditures for "contract grants" in 1966-67 amounted to $17,652 and to $15,418 in the following year. Two of the contracts, at Dalhousie and British Columbia, supported students working toward master's degrees in economics.

**Department of Fisheries Research Contracts, 1966-67 and 1967-68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Contracts | Amount | Contracts | Amount |
| | No. | $ | No. | $ |
| British Columbia | — | — | 1 | 5,000 |
| Alberta | 1 | 3,093 | 1 | 918 |
| Dalhousie | 2 | 9,562 | 2 | 9,500 |
| Memorial | 1 | 5,000 | — | — |
| **Totals** | **4** | **17,655** | **4** | **15,418** |

## Fisheries Research Board

Under Fisheries Research Board Act (1937), the Fisheries Research Board (FRB) has charge of all federal fishery research stations in Canada, and has the conduct and control of investigations of practical and economic problems connected with marine and freshwater fisheries, flora and fauna, and such other work as may be assigned to it by the Minister of Fisheries. It is the agency in Canada having the responsibility and technical background to develop the whole field of fisheries research, including collaboration with provincial and international agencies.

Relations between the Board as a Federal Government agency and universities in Canada are unique in their historial aspects and current developments.[6] The Biological Board of Canada, as the FRB was known until 1924, was created in 1898 and is the oldest government-supported independent scientific board in North America. It maintained Marine Biological Stations at St. Andrews, N.B., and Nanaimo, B.C., where research topics which it approved were carried out "exclusively by Canadian university professors, their students and an occasional outsider". During the first 25 years,

[6] *Past, Present and Future Relations Between the Fisheries Research Board and the Universities,* Fisheries Research Board Paper, Aug. 31, 1967.

all operations were in summer and persons accommodated at the stations were reimbursed for transportation costs to and from the universities and board and lodging only were provided. Students were allowed to use the results of their work as thesis material. "Board and university relations were close and cordial although there were no formal agreements and no direct grants. Perhaps the main lesson from these early days was that in the field of environmental and resource science the provision of working opportunities is of prime importance."[7]

The Board-university partnership began to break up after World War I, when full-time staff was employed by FRB, year-round operation of the establishments introduced and the work broadened to include technology. In the 1930s the Board's appropriations were cut and university summer workers could never again be accepted under the old arrangements; consequently new relationships have had to be considered.

FRB does not operate laboratories in Ottawa; it considers decentralization "essential for a proper research environment, which in turn determines whether FRB can attract and hold good scientists". Several FRB stations are located near universities or on university grounds but relations between them have tended to deteriorate, "as government complacency is matched by faculty irritation".[7]

The FRB consists of a full-time chairman and 18 honorary members appointed by the Minister. The Board requires that a majority of the members be university scientists and that the remainder represent industry and the Department of Fisheries. The membership is divided into three Regional Advisory Committees, which meet with the directors of regional establishments and of the Department to set up national priorities; national policies are developed by the full Board.

The Board has given a great deal of thought and attention to relations between its establishments and universities, and has developed with them a set of "conditions for a durable alliance between a university and the FRB."[7] From the standpoint of the Board, strengthening its association with universities is expected to result in:

1. an increase in the supply of high-quality graduate students oriented toward FRB activities and aware of the material and intellectual possibilities of employment by the Board;
2. an increase within the universities of active research in fields of interest of the Board;
3. intellectual stimulus arising out of specialist consultation; and
4. direct co-operation on research projects between Board and university or graduate students.

[7] *Past, Present and Future Relations Between the Fisheries Research Board and the Universities,* Fisheries Research Board Paper, Aug. 31, 1967.

An elaboration of its university policy is contained in the FRB paper of Aug. 31, 1967, under the following headings: (a) Location of Laboratories, (b) General Accommodation and Co-operation, (c) Contracts, (d) Grants, (e) Special Relations with Certain Universities, including Ship-time and Teaching. These are reproduced below. The section on grants is of particular interest as it contrasts FRB and NRC activities and plans in this area. Because the amount of FRB funds for grants is very small in relation to support available from NRC, the Board expresses the view, "that more will be achieved by identifying a limited number of proposals relevant to fisheries and offering adequate support to these. In resource science, assistance in kind (ship-time, etc.) is often more valuable than the cash part of a grant. Hence proximity to a FRB establishment and intent to make joint use of manpower and facilities may be a determining factor in awards."

(*a*) *Location of Laboratories*

The establishment by the Federal Government of relatively expensive research facilities in close juxtaposition to certain universities, and the extent to which other universities should be consulted, presents a sensitive and difficult problem for the Board. The primary obligation of the Board is that of providing physical facilities and personnel in the most suitable places to carry out its mandate as established by Parliament. Although there is much to be said for establishing laboratories in proximity to universities it cannot be regarded as an imperative.

According to the FRB Act, a majority of its Board members must be scientists who are, in practice, chosen from the universities. This brings the university point of view automatically into consideration when discussing new installations.

(*b*) *General Accommodation and Co-operation*

As policy the FRB welcomes visiting scientists and graduate students and offers them whatever accommodation, equipment and vessel time is available. In current practice there is considerable variability between establishments. For the future the Board is ready to explore with university colleagues, proposals leading towards a restoration of the historical position, when Board laboratories were, in effect, national assets of the scientific community.

(*c*) *Contracts*

Contracts are initiated by directors of FRB establishments. Their purpose is to get work done in areas where the FRB does not have full-time staff or competence. Some of these contracts are made with universities or university personnel, and there may be academic value attached. These contracts are not, however, designed as part of a university support programme and are mentioned here only because some other Federal agencies have different arrangements under which contracts are considered to be university support.

(*d*) *Grants*

The major portion of National Research Council support for university research is provided through the mechanism of operating grants to individual staff members and presumably will continue to be for the future. The Council's judgment is of men rather than of areas of science or geographical location. In addition to this general support the Government has decided, from time to time, that certain areas of science are to be developed and applied, health for example, or fisheries or pollution. Such decisions call for provision of personnel, obtainable by development of appropriate areas within universities. New scientific directions require new responses from graduate schools, which must be encouraged by the appropriate federal agency.

The university support funds of the FRB are of the order of one per cent of the NRC grants. Such a small sum spread over the academic community as individual awards, would be lost. More will be achieved by identifying a limited number of proposals relevant to fisheries and offering adequate support to these. In resource science, assistance in kind (ship time etc.) is often more valuable than the cash part of a grant. Hence proximity to an FRB establishment and intent to make joint use of manpower and facilities may be a determining factor in awards.

It would be a national misfortune if every major university in Canada specialized in aquatic science, and a national fraud if all pretended to do so. As with the newer branches of emergent science, the study of water and its organisms is so costly, both of manpower and equipment, that it must develop in a few centers of excellence. The support and encouragement of these is a legitimate aim of the FRB.

Grant applications are judged by a Board committee of FRB with a majority of university scientists. Applications are not judged on the basis of whether they will directly forward the programme of a particular FRB establishment.

(*e*) *Special Relations with Certain Universities*

It is unlikely that, in an era of science planning, the country will feel able to duplicate many large centers for particular researches. The example of places like Chalk River will doubtless spread to other sciences. If the impact of all branches of emergent science is to become available to graduate students some co-operation with universities must be sought.

Again, by analogy with the newer sciences, it is unlikely that a large number of small, scattered installations can offer adequate research opportunities. This point of view, so obvious in physics and astronomy, is not always recognized in biology, where a teaching field laboratory is occasionally confused with a research installation.

Where a university is in proximity to one of its establishments, the Board is interested in developing a special relationship the nature of which will depend upon local circumstances, and is likely to change with time. Where the Board is setting up unique equipment, for example a marine station with holding tanks for live animals, this will be built, if possible, sufficiently in excess of FRB needs to provide for university workers. The Board will act as a housekeeper for the facility either alone (comparable to Naples or Plymouth) or, following an agreement, in symbiosis with a university (comparable to Friday Harbour).

*Ship-time*—The FRB endorses the proposals for allotment of ship-time to selected universities, as adopted by the Canadian Committee on Oceanography, Apr. 20, 1967, and circulated as attachment 10 of the minutes. Since research requirements vary from small craft to the largest ice-breakers, the FRB believes it would be inefficient to encourage ownership by each university of a one-ship fleet. The FRB will join other members of the CCO in attempting to provide a national pool of vessel-time to be divided among users on some fair and agreed basis of scientific need. The FRB will join other members of the CCO in making representations to the appropriate Federal authorities concerning the needs of selected universities.

*Teaching*—No member of the FRB staff is under an obligation to teach. Those who elect to do so, by arrangement with a designated university, should lecture or conduct seminars or group discussions with graduate students. The normal maximum load is one half-course per year or one full course every second year by each FRB scientist involved. Lecturing will be taken into consideration in assessing scientists for pay action and promotion. Lectures and student supervision during regular working hours should be regarded as normal duty and no additional remuneration should be necessary.

With the concurrence of the laboratory director, facilities for research by university staff and graduate students will be made available, whether or not the student is a present or potential employee of the FRB. The director of the laboratory concerned has authority and responsibility for such negotiations.

FRB scientists may enter into joint or complete supervision of graduate student theses, under conditions mutually agreeable to the university and the director. Where graduate students are doing their theses on Board premises the university is authorized to pay them at the going university rate and claim reimbursement from the Board. University claims may be arranged with the Awards Officer, FRB, Ottawa. These students will fulfill any departmental requirements such as demonstrating, participation in seminars, etc.

The FRB does not favour long-term secondment of its staff to university departments specifically to meet teaching needs. Universities should be staffed to carry out their primary function and government should assist financially, where necessary, to help them achieve this competence. The FRB can probably make its best continuing contribution by providing graduate training in its unique areas of specialty, and by supervising graduate students in the atmosphere of its multi-disciplined laboratories.

FRB provided some money for scholarships for a few years. These funds ($25,000 per year) were administered by the NRC Awards Office. The plan was discontinued in favour of the idea of "adequate support" for selected projects.

**Fisheries Research Board Operating Grants, 1966-67 and 1967-68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Grants | Amount | Grants | Amount |
| | No. | $ | No. | $ |
| Victoria | — | — | 1 | 2,400 |
| British Columbia | 8 | 79,630 | 10 | 90,200 |
| Manitoba | 1 | 55,940 | 1 | 82,000 |
| Carleton | 1 | 5,000 | 1 | 5,000 |
| Guelph | 2 | 6,500 | 2 | 6,500 |
| Ottawa | — | — | 1 | 3,500 |
| Queen's | 1 | 3,030 | — | — |
| Toronto | 6 | 30,750 | 6 | 38,660 |
| Great Lakes Institute | 1 | 26,000 | 1 | 26,000 |
| McGill | 4 | 19,200 | 3 | 7,700 |
| Dalhousie | 1 | 3,000 | 4 | 56,700 |
| Acadia | 1 | 2,450 | 1 | 100 |
| New Brunswick | 1 | 3,500 | 2 | 6,000 |
| Memorial | 1 | 15,000 | 2 | 64,740 |
| **Totals** | — | **250,000** | — | **389,500** |
| Contracts | — | 30,000 | — | 38,000 |

## Department of Forestry and Rural Development

The Department of Forestry and Rural Development provides support for university research in subject areas of interest to the Department, and in which university faculty members have special competence. Objects of the support programs are to create an interest in forestry problems, to obtain

essential information that complements departmental research endeavours, to encourage and promote an enlarged program of postgraduate training and research in forestry research.

Grants and contracts or agreements are used to promote collaboration between the Department and universities. The Rural Development Branch makes more extensive use of contracts than the Forestry Branch, probably because the latter has extensive in-house research facilities and does not require extensive extramural services. Problems of the Rural Development Branch require specialized knowledge in the social sciences.

**Forestry Branch**—The Department of Forestry and Rural Development extramural research grants started in the 1950s when certain aspects of the research program were under the Department of Agriculture. These research grant projects were an extension of in-house activity and were designed to make use of facilities and special abilities of staff in the universities. Support was provided initially for three years; financial and progress reviews were made. Until 1966 initiative in starting research projects was with the Department and procedures more closely resembled a contract arrangement than a grants program. Most of the early research grant projects were at universities having forestry faculties and originated in government establishments.

The program was changed in 1966 and broadened. Proposals for projects now can be originated by university scientists interested in such areas as tree physiology, soil research, engineering, silviculture, forest economics and management, etc. Projects can still be proposed by establishment personnel but members of university and research institute staffs are now invited "to apply for grants in aid of research related to the Department's interests". A manual on extramural research grants was prepared in 1966 as a guide for applicants. In the foreword to it, the Deputy Minister states that,

> The primary purpose of such grants is to support the Department's program by acquiring new scientific knowledge that may prove applicable to the solution of problems in forest management or the utilization of forest products. Subsidiary objectives include the development and support in the scientific community of an interest in forestry sciences that will have a potential value for a long term development of forestry in Canada; it is also anticipated that this program will assist in staffing the various establishments of the Department with promising young scientists.

In response to this announcement, applications in excess of $300,000 were received for 1967-68. Funds for research grant projects were increased to $180,000. The Department keeps in close touch with each grantee by assigning "liaison and scientific responsibility" for each grant to a member of the staff of one of its research establishments. Applications for grants are assessed by a Departmental Committee.

A new program of grants in forestry schools was introduced in 1967-68 after a survey of research being carried on in them. This program is intended to increase the amount of research at the postgraduate level in Canadian forestry schools. Equal amounts ($40,000) have been assigned to the faculties at New Brunswick, Laval, Toronto and British Columbia to be administered by faculty Deans. Each school was asked to identify its interests, areas of current strength and areas in which the Deans thought interest could be stimulated. Attempts have been made to avoid duplication at the various schools but guidelines only have been established. Progress reports will be required and accomplishments will be reviewed. The Department hopes to increase this type of support substantially over a four or five year period, but an even distribution between faculties is not anticipated. These grants are intended to make it possible to produce Ph.D's in Forestry in Canadian schools.

**Forestry Branch Extramural Research and Development Grants, 1966-67 and 1967-68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Grants | Amount | Grants | Amount |
| | Research Grants | | | |
| | No. | $ | No. | $ |
| Victoria | 1 | 4,000 | 1 | 4,000 |
| British Columbia | — | — | 3 | 12,500 |
| Simon Fraser | 1 | 9,000 | 1 | 9,000 |
| Alberta | 1 | 4,640 | 2 | 14,350 |
| Calgary | 1 | 5,000 | 1 | 4,750 |
| Saskatchewan | 1 | 4,000 | 1 | 4,000 |
| Manitoba | 1 | 4,500 | 1 | 3,400 |
| Guelph | 1 | 5,500 | 1 | 5,500 |
| McMaster | 1 | 5,500 | — | — |
| Queen's | 1 | 5,000 | 2 | 14,800 |
| Toronto | 1 | 7,700 | 2 | 10,700 |
| Waterloo | — | — | 1 | 5,000 |
| York | — | — | 1 | 3,200 |
| Laval | 1 | 4,500 | 1 | 9,900 |
| McGill | 2 | 16,000 | 4 | 30,800 |
| New Brunswick | 3 | 13,400 | 5 | 29,650 |
| Nova Scotia Technical College | — | — | 2 | 13,450 |
| **Totals, Research Grants** | **16** | **88,740** | **29** | **175,000** |
| | Development Grants | | | |
| British Columbia | — | — | — | 40,000 |
| Toronto | — | — | — | 40,000 |
| Laval | — | — | — | 40,000 |
| New Brunswick | — | — | — | 40,000 |
| **Totals, Development Grants** | — | — | — | **160,000** |

Staff members of departmental establishments on university grounds are not encouraged to cover undergraduate courses; these are limited to emergency cases, or important courses. Academic involvement is limited to particular students, supervision of their research programs and theses. Laboratory facilities are made available, and guidelines for participation have been established.

The Forestry Branch has a large in-house research program, which is carried on at centres located across Canada, many of them located on university land, as a matter of policy. Current plans call for an extension of existing and new facilities which will include office and laboratory space for visiting scientists.

Seven regional offices and institutes provide a large degree of decentralization. Each regional office is responsible for development of comprehensive research and survey programs. Departmental committees include one on Policy and Planning to advise the Deputy Minister, and a Program Planning Committee (Forestry) which reviews and recommends allotment of funds and staff to regions and institutes, in relation to the development of programs.

Several National Advisory Committees also serve the Branch, i.e., the Committee on Forest Land and on Forest Products. To co-ordinate regional programs, Advisory Committees on which representatives of governments, industry and universities serve, help the Regional Director plan and execute programs to meet area needs, both long-term and immediate. These Committees meet annually, prior to the annual meeting of the Departmental Program Committee (in February). Guidelines for Regional Committees have been established, and terms of reference are assigned to them.

**Rural Development Branch***—The Rural Development Branch is concerned with the administration of the Agricultural and Rural Development Act (ARDA), Fund for Economic Development (FRED), Maritime Marsh and Rehabilitation Act (MRA). Expenditures in universities for special studies and research under these Acts represent a small fraction of the total amount available.

Under ARDA and the agreements related to it, a large part of the expenditures concern the Canada Land Inventory. University involvement in the collection and compilation of data is not as extensive as that of federal and provincial governments but nevertheless it is important; some are afforded financial support while receiving training and experience in methods of investigation and research.

During the fiscal years 1966-67 and 1967-68 contracts for work done by university-affiliated individuals amounted to $154,116 and $175,912, respectively.

**Rural Development Branch Research Contracts, 1966-67 and 1967-68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Contracts | Amount | Contracts | Amount |
| | No. | $ | No. | $ |
| Simon Fraser | — | — | 1 | 7,000 |
| Alberta | 2 | 54,063 | 2 | 47,060 |
| Calgary | 1 | 485 | — | — |
| Saskatchewan | 2 | 31,327 | 3 | 29,079 |
| Carleton | — | — | 1 | 5,496 |
| Guelph | — | — | 1 | 3,520 |
| McMaster | — | — | 1 | 5,405 |
| McGill | 1 | 25,767 | 2 | 64,188 |
| Montréal | 1 | 12,247 | 1 | 9,741 |
| New Brunswick | 1 | 4,453 | 1 | 825 |
| Moncton | 1 | 1,874 | — | — |
| St. Francis Xavier | 3 | 23,900 | 1 | 3,600 |
| **Totals** | **12** | **154,116** | **14** | **175,912** |

## Department of Indian Affairs and Northern Development

Several Branches of this Department have made funds available to university investigators to carry out special studies or research projects that are related to the requirements of their missions. Contracts are used in most cases, but special studies may be undertaken by departmental employees on study leave. There are one or two small scholarship programs which are related to recruiting problems.

**Indian Affairs Branch**—This Branch uses contracts on an *ad hoc* basis to obtain expert assistance regarding problems related to its work. Some suggestions for projects are received from academic sources and some originate within the Branch.

**Indian Affairs Branch Research Contracts, 1966-67 and 1967-68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Contracts | Amount | Contracts | Amount |
| | No. | $ | No. | $ |
| British Columbia | 2 | 41,455 | 4 | 32,400 |
| Carleton | 1 | 1,500 | — | — |
| Toronto | — | — | 1 | 2,000 |
| Waterloo | — | — | 1 | 4,900 |
| Laval | 2 | 9,795 | — | — |
| Individual | 1 | 2,600 | 1 | 1,900 |
| **Totals** | **6** | **55,350** | **7** | **41,200** |

A research committee of the Branch advises the Director of Policy and Planning. The need for a more extensive program and assistance of an advisory committee is being considered.

**Northern Co-ordination**—Under the Government Reorganization Act of 1966, special responsibilities were vested in the Minister of Indian Affairs and Northern Development for further development of the North. A Northern Scientific Research Group conducts research on northern subjects and encourages research by non-government agencies; through the Office of the Northern Scientific Adviser, it is involved in co-ordination of departmental and interdepartmental research. Private, university and government scientists can be accommodated in the Inuvik Scientific Research Laboratory, operated by the Northern Scientific Research Group.

A program was introduced in 1962 designed to encourage northern research by universities and to train scientists with specialized interests and commitments to northern work. Grants are available to university institutes or presidential committees for northern studies. A committee of government and university scientists examines proposals for northern research programs at university centres; when approved by the Minister, grants can be used in the whole field of the sciences. Awards are made to centres or institutes in addition to which contracts and summer employment are used for special studies and research projects. These may be with private individuals or individuals with university affiliations.

**Northern Co-ordination Research Grants, Contracts and Summer Employment, 1966-67 and 1967-68**

| Institution and Item | 1966–67 | 1967–68 |
|---|---|---|
| | $ | $ |
| Grants— | | |
| British Columbia | 22,500 | 27,000 |
| Alberta | 7,000 | 11,000 |
| Saskatchewan | 24,000 | 27,000 |
| Manitoba | 16,000 | 20,000 |
| Lakehead | 3,000 | 4,000 |
| Ottawa (St. Pauls) | 20,000 | 8,000 |
| Toronto | — | 19,500 |
| Laval | 25,000 | 27,000 |
| McGill | 10,000 | 11,000 |
| Montréal | 10,000 | 10,000 |
| Memorial | 12,500 | 17,000 |
| **Totals, Institutions** | **150,000** | **181,500** |
| Expeditions and conferences | 50,000 | 68,500 |
| **Totals, Institutions, Expeditions and Conferences** | **200,000** | **250,000** |
| Contracts[a] | 8,171 | 1,704 |
| Summer employment | 17,260 | 9,160 |

[a]Contracts numbered seven.

**Northern Administration Branch**—The Education Division of the Northern Administration Branch expended $1,000 in 1967-68 at Dalhousie for an anthropological study of the relocation of Eskimos at centres of employment.

**Canadian Wildlife Service**—The Canadian Wildlife Service is responsible for matters relating to migratory birds, wildlife in the national parks and species threatened by extinction. It is involved in co-operation with the provinces which have jurisdiction over all other matters concerning wildlife within their boundaries. Liaison with university geologists and other scientists having interests in wildlife problems are maintained from the Service Headquarters in Ottawa, and from regional establishments which are often associated with or located on university grounds. Proposals for research projects may be originated by the Wildlife Service or university scientists or both. Most contracts are with individuals at Canadian universities but some are at United States institutions. Expenditures for contracts in Canada during 1966-67 amounted to $81,484 and in 1967-68 to $143,812.

The Wildlife Service offers a limited number of postgraduate scholarships intended for students in research related to wildlife problems. These awards have an annual value of $1,200 for the academic term.

**Canadian Wildlife Service Research Contracts, 1966-67 and 1967-68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Contracts | Amount | Contracts | Amount |
| | No. | $ | No. | $ |
| British Columbia | 1 | 267 | 2 | 1,925 |
| Simon Fraser | — | — | 1 | 3,700 |
| Alberta | 4 | 6,500 | 10 | 5,142 |
| Calgary | — | — | 1 | 9,250 |
| Saskatchewan | 8 | 10,050 | 5 | 9,820 |
| Carleton | 1 | 3,000 | 2 | 3,855 |
| Guelph | 1 | 25,000 | 5 | 38,075 |
| McMaster | 1 | 1,000 | 3 | 6,100 |
| Ottawa | 2 | 4,300 | 2 | 5,200 |
| Toronto | 1 | 12,000 | 2 | 19,900 |
| York | 2 | 6,530 | 5 | 11,145 |
| Western | 1 | 5,000 | 1 | 12,000 |
| Laval | 1 | 2,000 | 1 | 4,500 |
| McGill | 1 | 2,400 | 1 | 5,000 |
| New Brunswick | 1 | 612 | — | — |
| Mount Allison | — | — | 2 | 4,050 |
| Acadia | — | — | 1 | 1,550 |
| Dalhousie | — | — | 1 | 1,000 |
| St. Dunstans | 1 | 525 | 1 | 525 |
| Memorial | 2 | 3,300 | 1 | 1,075 |
| **Totals** | **28** | **82,484** | **47** | **143,812** |

**National and Historic Parks Branch**—This Branch supports special studies and research of an applied nature required by the Research Division of the Historic Sites Service and the Planning and Operations Divisions of the National Parks Service. In addition to contracts with personnel of Canadian universities, there is a small scholarship program for the support of post-graduate students in fields related to the management and planning of national parks.

**National and Historic Parks Research Contracts, 1966-67 and 1967-68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Contracts | Amount | Contracts | Amount |
| | No. | $ | No. | $ |
| **Architectural Inventory** | **4** | **6,500** | **4** | **6,500** |
| Toronto | 1 | 1,500 | 1 | 1,500 |
| McGill | 1 | 1,500 | 1 | 1,500 |
| Montréal | 1 | 1,500 | 1 | 1,500 |
| Laval | 1 | 2,000 | 1 | 2,000 |
| **Archaeological** | **7** | **80,750** | **5** | **30,750** |
| Calgary | 2 | 11,300 | 1 | 3,600 |
| Manitoba | 2 | 54,850 | 3 | 19,650 |
| Toronto | 2 | 14,000 | — | — |
| Trent | 1 | 600 | 1 | 7,500 |
| **Historical** | **9** | **30,000** | **15** | **28,500** |
| École Polytechnique | 1 | 15,500 | — | — |
| Research historians | 8 | 14,500 | 15 | 28,500 |
| **National Parks** | **3** | **4,400** | **3** | **19,560** |
| British Columbia | — | — | 1 | 2,000 |
| Calgary | — | — | 2 | 12,900 |
| Saskatchewan | 1 | 500 | — | — |
| McMaster | 1 | 3,000 | — | — |
| Ottawa | 1 | 900 | — | 3,160 |
| Waterloo | — | — | — | 1,500 |
| Contracts with students | 10 | 17,667 | 7 | 8,245 |
| **Totals** | — | **139,317** | — | **93,555** |

The Historic Sites Service involvement in research and related special projects is limited; it includes the National Architectural Inventory and archaeological and historical subjects. The Architectural Inventory provides a record of the country's architectural past that can be used for the restoration of buildings of historical and architectural significance. University involvement is usually through schools of architecture but historians are involved occasionally. Involvement of students is an important feature because of interests created and experience provided. Contracts for archaeological studies in the parks supplement studies made by the staff of the Branch. Three Canadian universities were involved in 1966-67—Calgary, Manitoba and Toronto—and three in 1967-68—Calgary, Manitoba and Trent.

Historical research by university and Branch personnel is required to provide background information for the Historic Sites and Monuments Board of Canada, on which it can base recommendations regarding new historic parks and sites, or extension of the development of those already established. (The École Polytechnique was involved in a historical investigation for the preparation of specifications and supervision of the construction of a reproduction of Jacques Cartier's ship La Grande Hermine.)

Research studies in the National Parks include archaeological projects, plant and animal geology and social studies of park use.

**Department of Industry***

Activities of the Department of Industry in support of university research are not extensive, and have been limited to grants or contracts for special studies which were considered to have a bearing on industrial productivity. The largest expenditures have been in support of the High Altitude Research Project at McGill, which amounted to $1,442,240 in 1966-67 and $57,760 in 1967-68.

A program of support for industrial research institutes at universities was introduced in 1967-68. Grants are to cover administrative costs of institutes that will undertake research for industry by making use of the expertise of staff and facilities available in university laboratories. The institutes are expected to become self-supporting in due course and able to rely on revenue derived from research services provided. No direct costs of research are included in these grants. Payment of grants amounting to $84,-206 were made in 1967-68 for institutes at Windsor, McMaster and Nova Scotia Technical College; a fourth grant is to be made for an institute at the University of Waterloo.

A special grant of $15,000 toward the cost of an economic atlas of Saskatchewan was made in 1966-67 and contracts for special economic studies in that year and in 1967-68 are shown below.

**Department of Industry Contracts, 1966-67 and 1967-68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Contracts | Amount | Contracts | Amount |
| | No. | $ | No. | $ |
| British Columbia | — | — | 1 | 4,889 |
| Queen's | 1 | 15,984 | 1 | 17,812 |
| Toronto | 1 | 10,086 | 3 | 29,900 |
| Waterloo | — | — | 1 | 18,101 |
| Dalhousie | — | — | 2 | 8,291 |
| New Brunswick | — | — | 1 | 3,432 |
| Memorial | — | — | 1 | 7,420 |
| **Totals** | **2** | **26,070** | **10** | **79,845** |

### International Joint Commission*

The Canadian section of the International Joint Commission contracted with a university staff member to compile source material for the establishment and subsequent development of the Commission. Payment of $2,239 was made in 1966-67 and $429 in 1967-68.

### Department of Labour*

The university research program of the Department of Labour was initiated in 1951, because tours of the universities had shown that little work was being done in labour economics and labour relations. The $7,000 provided in the first year had grown to $100,000 in 1966-67 and was used to assist university faculty members and research students engaged in reseach in labour economics and labour relations; some grants to graduate students are used in institutions outside Canada.

**Department of Labour Research Grants, Contracts and Fellowships, 1966-67 and 1967-68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | No. | $ | No. | $ |
| | Grants | | | |
| British Columbia | — | — | 1 | 3,000 |
| Alberta | 3 | 7,700 | — | — |
| Calgary | 1 | 4,000 | — | — |
| Saskatchewan | 1 | 2,900 | — | — |
| Brandon | 1 | 1,000 | — | — |
| Carleton | 1 | 2,000 | 1 | 4,750 |
| McMaster | 1 | 3,350 | 1 | 3,650 |
| Ottawa | 1 | 1,800 | 1 | 5,000 |
| Queen's | 3 | 17,600 | 6 | 22,000 |
| Toronto | 5 | 20,770 | 5 | 15,000 |
| Western Ontario | 3 | 7,200 | 1 | 1,867 |
| Windsor | 1 | 1,600 | 2 | 1,800 |
| York | — | — | 2 | 3,300 |
| McGill | 5 | 15,900 | 1 | 5,000 |
| Montréal | 4 | 14,000 | 5 | 17,800 |
| Sir George Williams | — | — | 1 | 2,500 |
| **Totals, Grants** | **31** | **99,820** | **27** | **85,667** |
| | Contracts | | | |
| Alberta | 1 | 320 | — | — |
| Ottawa | 2 | 12,844 | 1 | 11,088 |
| **Totals, Contracts** | **3** | **13,164** | **1** | **11,088** |
| | Fellowships | | | |
| **Totals, Fellowships** | **1** | **12,000** | **1** | **12,000** |

Publicity for the program is provided by advertising in the *Canadian Journal of Economics and Political Science* (replaced in 1968 by the *Canadian Journal of Economics* and the *Canadian Journal of Political Sciences*), in the *Labour Gazette,* and by letters sent to university presidents. A joint committee of the staffs of Departments of Labour and Manpower and Immigration and university representatives review the applications and make recommendations regarding support. The areas covered are labour economics, industrial relations and human resources knowledge. This committee is known as the Department of Labour–University Research Committee. It advises the Department regarding research programs and policy.

Relations with universities are encouraged in order that specialist knowledge can be made available to the Department for studies or consultation, to provide an exchange of ideas between academic staffs and government employees engaged in day-to-day operations, policy decisions, etc.

The Department of Labour also provides international labour fellowships in collaboration with the International Labour Office, Geneva. These were held by university faculty members in 1966-67 and 1967-68.

### Department of Manpower and Immigration

When this Department was formed in 1966-67 some funds were transferred from the Department of Labour research grant program to continue support of certain projects also transferred to the new Department.

**Department of Manpower and Immigration Research Grants and Contracts, 1966-67 and 1967-68**

| Institution | 1966–67 | | | | 1967–68 | | | |
|---|---|---|---|---|---|---|---|---|
| | Grants | Amount | Contracts | Amount | Grants | Amount | Contracts | Amount |
| | No. | $ | No. | $ | No. | $ | No. | $ |
| British Columbia | 1 | 750 | — | — | 1 | 4,100 | — | — |
| Simon Fraser | — | — | — | — | — | — | 2 | 14,350 |
| Alberta | 1 | 2,800 | — | — | — | — | — | — |
| Dalhousie | 1 | 7,250 | — | — | — | — | — | — |
| Carleton | — | — | — | — | — | — | 1 | 3,000 |
| Lakehead | — | — | — | — | 1 | 2,980 | — | — |
| McMaster | — | — | — | — | — | — | 1 | 1,875 |
| Queen's | — | — | — | — | 2 | 13,600 | 1 | 4,500 |
| Toronto | — | — | 1 | 1,000 | 1 | 11,000 | 4 | 24,046 |
| Waterloo | — | — | — | — | 2 | 4,970 | — | — |
| Waterloo Lutheran | — | — | — | — | — | — | 1 | 1,500 |
| York | — | — | 1 | 2,500 | — | — | — | — |
| McGill | — | — | — | — | 2 | 4,250 | 1 | 20,000 |
| Montreal | — | — | 1 | 18,700 | — | — | — | — |
| **Totals** | **3** | **10,800** | **3** | **22,200** | **9** | **40,900** | **10** | **69,271** |

In 1967-68 the Department of Manpower and Immigration announced two programs designed to provide funds for the support of research by social scientists outside the federal public service; areas of study having high priorities in terms of policy and operation of the Department were designated. These programs were named the Manpower and Immigration Research Grant Program and the Vocational Rehabilitation Grant Program.

### National Design Council

The National Design Council (Department of Industry) was established in 1961 to promote improvement of design in the products of Canadian industry. Research grants provide financial assistance to persons qualified to engage in projects directly related to industrial design. In 1966-67, two grants were awarded to assist university design research projects and five in the following year. Scholarships are offered to persons engaged in industrial design and to students of design for advanced study in Canada and abroad; in 1967-68, two awards of $3,000 were given to Ph.D. candidates—one at Waterloo and the other at Columbia.

**National Design Council Research Grants, 1966-67 and 1967-68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Grants | Amount | Grants | Amount |
| | No. | $ | No. | $ |
| Toronto | — | — | 2 | 10,128 |
| Waterloo | 1 | 3,000 | 3 | 10,950 |
| Montreal | 1 | 2,000 | — | — |
| **Totals** | **2** | **5,000** | **5** | **21,078** |

### National Film Board

During 1967, the National Film Board contributed $28,000 to a study of the effects of audio-visual presentation methods at Expo 67, at McGill University.

### National Harbours Board

During the years covered by this Study the Board supported two university projects in the social sciences. Expenditures in 1966-67 amounted to $5,000, provided in the form of a grant. In the following year $3,000 was expended under a contract arrangement.

**Department of National Health and Welfare**

The Department of National Health and Welfare is responsible for all matters relating to the promotion of health, social security and social welfare of the people of Canada over which the Parliament of Canada has jurisdiction. It is authorized to conduct investigations and research into public health and welfare. Under the authority of the Act, the Department operates several programs in collaboration with the provinces.

**National Health Grants**[8]—Of the programs concerned with the support of research in universities, the largest and oldest is the General Health Grant or Public Health Research Grants Program. It has been operated since 1948, when $100,000 was provided, and increased at $100,000 a year until a total of $500,000 was reached. No allotment of the fund was made to provinces; research projects were supported on the basis of merit, regardless of origin. In 1961-62 the grant was increased to $1.7 million and later determined by a formula based on 23 cents per person. Approximately $4.5 million is now provided annually, of which about $3.0 million is spent in educational institutions and the balance in hospitals and other non-profit institutions. All of the funds provided under this program are administered through provincial departments of health. Standard application or proposal forms are provided by the Department. Individuals who complete these submit them to the Deputy Minister of Health in the province; if provincial approval is granted the proposals are forwarded to the Health Grants Administration in Ottawa. After a series of examinations and appraisals by departmental specialists, consultants and the Research Advisory Committee of the Dominion Council of Health, the applications are returned to provincial departments of health so that formal notice regarding approval or rejection of the proposals can be sent to the individuals (or agencies concerned).[9]

Proposals for studies under the Public Health Research Grant are expected to have a direct relationship to the following aspects of Public Health: (a) prevention of disease or disability; (b) operational or administrative studies; (c) epidemiological studies; and (d) environmental health, including sanitation. Provision also is made for support of research positions

[8] For additional information see: *Research Projects Being Asserted Under the National Health Grants Program in Fiscal Year 1967-68, and Projects Terminated March 31, 1967,* Dept. of National Health and Welfare, Ottawa, 1967.

[9] A booklet *General Instructions 1967,* is provided by the Research Development Section, Dept. of National Health and Welfare for the guidance of applicants and provincial departments of health are provided with a *National Health Grants Reference Manual.*

in Epidemiology, Biometrics or Biostatistics for Department of Preventative Medicine or Dentistry. (This program is not unlike the MRC Medical Research Associateship plan.)

**Health Resources Program**—The most recent program of support for health research in educational institutions is provided under the Health Resources Fund Act of July 1966. The purpose of the Health Resources Program is to help meet the need for health manpower to provide better health care services. As one means to this end the Federal Government has provided funds for the creation of new physical resources in the form of health training and research facilities. A sum of $500 million has been appropriated for contributions of up to 50 per cent of the capital costs of constructing, renovating, acquiring and equipping health training and research facilities during the 15-year period 1966-80. This includes hospitals, or other institutions, or any portion thereof, for training of persons in the health professions or any occupations associated with them, *or for conducting research in the health fields.* The costs of planning or designing a facility may be included but costs of land, interest charges and residential accommodation are excluded. Payments are made to the provinces as work proceeds in the projects.

Proposals by individuals and institutions are discussed first with provincial authorities. The provinces develop five-year programs which are in turn examined by the Health Resources Advisory Committee which advises the federal Minister. The Minister can authorize only individual projects that are part of a five-year program.

**Mental Retardation Fund**—A special provision for a comprehensive approach to the solution of health and welfare problems related to mental retardation was made in January 1967 by Cabinet decision. Over the next five years, funds amounting to $2.5 million will be provided in annual amounts not to exceed $500,000 per year beginning in 1967-68. Of this annual sum, $200,000 can be used for health (or welfare) research and demonstration activities of national interest in the field of mental retardation. Universities are eligible to submit proposals for research projects. Reimbursement of grants from this fund are paid directly to university business offices.

**Medical Services**—Authority for research expenditures for university projects in medical services research was provided under a Treasury Board order in 1965. Very small expenditures for studies in the control of amoebic infection have been made under this authority.

**Food and Drug Directorate Research Contracts**—Research contract funds are made available to institutions for research in specialized areas to provide

specific information required for the enforcement of the Food and Drug Act and Regulations. A Research Contracts Committee of the Directorate assigns priorities to various areas where extramural research is indicated and determines the approximate cost.

**Welfare Grants**—The Welfare Branch of the Department of National Health and Welfare also provides funds for scholarships, fellowships and research grants. A revision of the Act in 1962 provided for a National Welfare Council; the Minister may also appoint a Welfare Research Advisory Committee. National welfare grants include (a) welfare training grants and (b) welfare research grants. About two thirds of the welfare research is conducted in universities and the remainder by national agencies. Project initiation is with grantee groups. No research contracts are awarded. Applications are evaluated by departmental staff, research advisory panels and the Research and Statistics Branch of the Department. The Research Advisory Committee has advice from all of these sources which provide a conglomerate opinion from the over-all program point of view. Final approval is given by the Minister.

By agreement with the provinces copies of all applications are sent to provincial deputy ministers, and comments are invited. (Comments are provided on all Quebec applications.) Grants are paid to the institution (which is the grantee) submitting the application.

The Department has also provided $500,000 per year in operating grants for schools of social work, greatly increasing the capacity of the schools to produce more trained social workers. Scholarship and post-masters fellowship programs are also supported. The latter can be held abroad or in Canada. Only the University of Toronto provides work leading to a doctorate.

The Welfare Branch collaborates with other federal agencies and departments, i.e., the Central Mortgage and Housing Corporation, the Department of Manpower and Immigration, the Solicitor General and Indian Affairs.

**Fitness and Amateur Sport Program**—The Fitness and Amateur Sport Program of the Department of National Health and Welfare was introduced in 1962-63, after the Fitness and Amateur Sports Act was passed late in 1961. The Act provided for a National Advisory Council to advise the Minister and to carry on a continuing review of the program, which is administered by the Fitness and Amateur Sport Directorate.

Two of the programs included in the activities sponsored under the Act involve the universities. Funds are provided for postgraduate scholarships and fellowships and for fitness research grants. Announcements of the availa-

bility of funds are made annually and special application forms are available. Special committees of the National Advisory Council review and make recommendations concerning applications for scholarships and grants.

Scholarships are available for Master's and Ph.D. work in physical education, recreation or related studies. They are intended "to assist in the continual improvement of the competence of physical education teachers and recreation leaders in Canada". Applications for awards are reviewed by the scholarships committee of the National Advisory Council, made up of representatives of university physical education faculties and provincial governments. Candidate must sign an undertaking to work for two years in fitness or recreational work in Canada, on completion of the course of studies for which an award has been made. A Master's degree usually requires submission of a research-based thesis but this is not mandatory; at the Ph.D. level it is almost always a requirement. A report of a special project may be required in lieu of a research-based thesis.

Research fellowships are awarded for post-doctorate studies or investigations lasting 12 months. Special fellowships are available for senior professional persons "to study administrative or other aspects of their programs" and are available on a monthly rate basis plus travel allowance. The purpose of travel must be in the "national" interest.

The fitness research program is "designed to augment the supply of trained research scientists, to assist in the expansion and improvement of graduate education and, generally, to foster research in areas directly related to fitness and amateur sport. Grants are available—to individuals (usually staff members of Canadian universities) for projects which have definite relevancies to the aims and objects of the . . . Act." Funds are paid directly to the institution.

Between 1964 and 1969, three university research units have been supported by means of agreements covering five years with the Universities of Alberta, Montreal and Toronto, which required annual payments of $50,000 to each university. These agreements or contracts will not be renewed after Mar. 31, 1969. A research associate program will be introduced instead. Associates will be eligible to apply for operating grants. Applicants for grants are encouraged to indicate requirements for three years and "unofficial commitments can be made for the entire period if the research subcommittee so recommends. Application must be made annually, for extended support. Upward amendments may be made during the year, not exceeding 10 per cent of the grant, if funds are available. A special "amendment" form is used.

Grants are referred to the Research Review Committee of the National Advisory Council. This Committee is made up of university people, from different parts of Canada and representing a variety of disciplines—anatomy, physiology, physical education, psychology, social work, sociology, etc. To date, the majority of research investigations have been concerned with the physiological effects of exercise and competitive sport; it is expected that greater emphasis will be placed on the psychosociological aspects of sport in future.

**National Health and Welfare Expenditures for Research in Universities and University-Affiliated Hospitals, 1966-67 and 1967-68**

| Category | 1966–67 | 1967–68 |
|---|---|---|
| | $'000 | $'000 |
| Public Health Grants | 3,834 | 3,974 |
| Health Resources | 2,150 | 2,308 |
| Mental Retardation | — | 137 |
| Medical Services[a] | 17 | 18 |
| Food and Drug[a] | 14 | 25 |
| Welfare— | | |
| Grants | 27 | 130 |
| Scholarships[b] | 62 | 56 |
| Fitness and Amateur Sports— | | |
| Grants | 346 | 421 |
| Scholarships[b] | 84 | 95 |
| **Totals** | **6,534** | **7,164** |

[a]Contracts.

[b]Doctorate candidates and special awards for post-doctorate students.

## National Museums of Canada

National Museums of Canada include Museums of Man, Natural Sciences, Science and Technology, and Fine Arts; the last is known as the National Gallery of Canada. Under the National Museums Act of 1967, the museum corporation may undertake and sponsor research relevant to its purpose and "undertake or sponsor programs for the training of persons in the professions and skills involved in the operation of museums". Contract arrangements with members of university faculties and other qualified individuals have been made by the Man and Natural Sciences Museums to extend their in-house research and to round out programs they have planned.

The Museum of Natural Sciences contracts include studies in botany, zoology, geology and paleontology; those of the Museum of Man include archæology, ethnology, folklore and history (both have made contracts with Canadian, United States and other specialists).

National Museums of Canada Research Contracts, 1966–67 and 1967–68

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | No. | $ | No. | $ |
| | Museum of Natural Sciences | | | |
| Victoria | 1 | 1,760 | 2 | 4,500 |
| British Columbia | — | — | 1 | 1,100 |
| Alberta | 5 | 6,500 | — | — |
| Saskatchewan | — | — | 1 | 1,450 |
| Manitoba | 1 | 1,000 | 1 | 1,600 |
| Carleton | 1 | 1,250 | — | — |
| Guelph | 1 | 800 | 1 | 1,200 |
| Ottawa | 2 | 2,000 | 1 | 1,500 |
| Queen's | 1 | 1,150 | — | — |
| Waterloo | — | — | 1 | 2,000 |
| Dalhousie | — | — | 1 | 2,000 |
| Memorial | 1 | 200 | 1 | 2,000 |
| **Totals, Museum of Natural Sciences** | **13** | **14,660** | **10** | **17,350** |
| | Museum of Man | | | |
| British Columbia | 4 | 4,935 | 2 | 4,500 |
| Simon Fraser | 1 | 550 | — | — |
| Calgary | — | — | 2 | 1,200 |
| Alberta | 4 | 10,500 | 2 | 9,100 |
| Saskatchewan | 1 | 3,000 | — | — |
| Manitoba | 1 | 3,000 | — | — |
| McMaster | 1 | 4,000 | — | — |
| Lakehead | — | — | 1 | 2,500 |
| Toronto | 6 | 14,100 | 2 | 5,000 |
| Royal Ontario Museum | — | — | 1 | 1,500 |
| Windsor | 1 | 300 | — | — |
| Waterloo | — | — | 1 | 1,200 |
| Laval | 1 | 4,000 | 1 | 4,000 |
| Montreal | 1 | 300 | 2 | 4,520 |
| Mount Allison | — | — | 1 | 500 |
| Moncton | 1 | 1,500 | 1 | 1,500 |
| **Totals, Museum of Man** | **22** | **46,185** | **16** | **35,520** |

The Museum of Science and Technology is new and is concentrating on the collection and mounting of exhibits relating to aviation, railways, communications, mining, industrial and agricultural technology.

The National Gallery has used the services of a United States chemical specialist to carry on work in the Gallery's laboratory.

**Polymer Corporation Limited***

The Polymer Corporation was established during World War II as a Crown corporation; it has supported research in universities related to its

fields of activity as a matter of policy, to maintain contacts with university scientists and to serve as a basis for recruiting staff. Grants for the purchase of research equipment, conduct of research and payment of research assistants, have been provided in addition to postgraduate scholarships. During 1966-67 and 1967-68 the following amounts were made available.

| Item | 1966–67 | 1967–68 |
|---|---|---|
| | $ | $ |
| Grants— | | |
| Equipment | 60,185 | 35,500 |
| Operating | 18,237 | 19,100 |
| Scholarships | 3,500 | 3,500 |
| **Totals** | **81,922** | **58,100** |

**Privy Council***

The Privy Council does not have a formal program of support for university research but engages university faculty members to carry on special studies and serve on royal commissions, task forces, etc.

**Department of Public Works***

During 1967-68, the Department of Public Works made one grant of $14,000 for research on floating breakwaters and harbour siltation at Queen's University.

**Department of the Secretary of State***

The Administration and Citizenship Branches of the Department of the Secretary of State supported several projects in sociology and anthropology during 1966-67 and 1967-68; those listed below were carried on in universities.

**Secretary of State Research Support, 1966–67 and 1967–68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Projects | Amount | Projects | Amount |
| | No. | $ | No. | $ |
| Simon Fraser | — | — | 1 | 1,430 |
| Saskatchewan | — | — | 1 | 250 |
| Manitoba | 1 | 600 | 1 | 200 |
| Winnipeg | — | — | 1 | 1,000 |
| Carleton | 1 | 2,100 | 1 | 4,500[a] |
| McGill | 1 | 2,150 | 1 | 950 |
| Montreal | 1 | 325 | 1 | 100 |
| St. Francis Xavier | — | — | 1 | 700 |
| **Totals** | **4** | **5,175** | **8** | **9,130** |

[a]Children's International Summer Village; a grant for psychological studies.

**Solicitor General***

The Solicitor General's Department is responsible for the Penitentiary Service and the National Parole Board, which have supported special studies in collaboration with universities.

Two research contracts were awarded during 1966-67 amounting to $48,525; one at the University of Montreal with the Centre of Criminology, and the other at Queen's University. In 1967-68, five universities entered into contracts with the Department involving total expenditures of $79,015. A list of the institutions is given below.

The studies included the following subjects: late-comers to crime; psycho-social adjustment of dangerous sexual offenders; effectiveness of parole; differential supervision and parole risk; typology of inmates and sensory deprivation.

**Solicitor General Research Contracts, 1966–67 and 1967–68**

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Contracts | Amount | Contracts | Amount |
| | No. | $ | No. | $ |
| British Columbia | — | — | 1 | 11,300 |
| Saskatchewan | — | — | 1 | 3,500 |
| Queen's | 1 | 20,000 | — | — |
| Ottawa | — | — | 1 | 5,000 |
| McGill | — | — | 1 | 39,215 |
| Montreal | 1 | 28,525 | 1 | 20,000 |
| **Totals** | **2** | **48,525** | **5** | **79,015** |

**Department of Transport**

The Department of Transport supports research in the universities in the physical and social sciences. A grants program was introduced in 1961-62 by the Meteorological Branch. In 1965 the Transportation Policy and Research Branch initiated grants in support of university research in the social science area of transportation problems. The recently established Canadian Transport Commission expects to continue contract research and to become active in supporting research by means of grants. An Advisory Council has been established which will take a leading role in relation to support of university research.

**Physical Sciences**—The Meteorological Branch of the Deparmtent of Transport has been associated with the University of Toronto almost from its

beginning in 1839. Two of the early Directors of the Meteorological Service were professors in the University; special courses for meteorologists were developed in co-operation with the University of Toronto in 1934 and subsequently introduced at McGill and the University of Alberta as well. More recently, in 1961-62, a grants program was introduced by the Meteorological Branch. The Director of the Branch administers this program with the assistance of an Advisory Committee, of which he is chairman. The secretary and three additional members of the Committee are also from the Branch; there are two representatives from the National Research Council, one from Defence Research Board and two from Canadian universities. Very close liaison is maintained with NRC and the mechanics for administration of the program are very similar to those of the NRC grants program.

The Meteorological Branch conducts a research program itself and has a particular interest in trained manpower both for research and for service responsibilities. In addition to research grants, the Meteorological Branch enters into contracts with universities for research or services in specified areas.

As already indicated, collaboration between the Meteorological Branch and some universities is very close. It includes participation by Meteorological Branch staff in graduate student instruction and supervision, sharing of accommodation and research facilities, joint projects, service on committees, etc. The desirability of strong university research groups in meteorology is recognized by the Branch. Future support may include grants to assist in developing new competence in university groups.

**Transportation Economics (Social Sciences)**—Support of university research related to transportation by means of grants is relatively new. Publicity has been by means of personal contacts, e.g., at the annual meetings of the Canadian Transportation Research Forum, visits of departmental staff to universities, etc. A more general and formal approach is envisaged, possibly including support of institutes that are closely integrated with normal academic programs. Decisions regarding support have been made by the Deputy Minister, with advice from officials in the Transportation Policy and Research Branch. As mentioned above, grants were introduced in 1965; with the establishment of an Advisory Council for the Canadian Transport Commission, outside advice regarding policy and projects will be available.

Funds for research include support of graduate students, payment for computer time, assistants and occasionally limited contract payment to the professor (or grantee).

Department of Transport Research Grants and Contracts, 1966–67 and 1967–68

| Institution | 1966–67 | | 1967–68 | |
|---|---|---|---|---|
| | Grants | Contracts[a] | Grants | Contracts[a] |
| | Meteorological Research (Physical Sciences) | | | |
| | $ | $ | $ | $ |
| British Columbia | 12,000 | — | 22,000 | — |
| Victoria | — | — | 1,000 | — |
| Alberta | 4,500 | — | 7,200 | — |
| Saskatchewan | 7,800 | — | 9,000 | 3,600 |
| Guelph | 10,000 | — | 13,000 | — |
| Toronto | 38,100 | — | 36,500 | — |
| Waterloo | 8,000 | — | 9,000 | — |
| Western Ontario | 15,000 | — | 17,000 | 25,000 |
| Windsor | — | 2,600 | — | — |
| York | 4,000 | — | 5,000 | — |
| McGill | 25,600 | 55,000 | 30,600 | 60,000 |
| Laval | — | 5,000 | — | 10,000 |
| **Totals** | **125,000** | **62,600** | **150,300** | **98,600** |
| | Transportation Economics (Social Sciences) | | | |
| | $ | $ | $ | $ |
| British Columbia | 17,000 | — | 11,000 | — |
| Alberta | — | — | 3,000 | — |
| Manitoba | 1,500 | — | 40,000 | — |
| Carleton | 5,000 | — | — | — |
| Waterloo | — | — | 10,300 | — |
| **Totals** | **23,500** | — | **64,300** | — |

[a] Contract payment for special services.

### Department of Veterans Affairs

The Department of Veterans Affairs employs consultants for medical research projects who are, in most cases, affiliated with university medical faculties or teaching hospitals. Contracts amounted to $88,760 in 1966-67 and $80,747 in 1967-68.

## COUNCILS

### Canada Council

The Canada Council was established in 1957, six years after the report of the Royal Commission on National Development in the Arts, Letters and Sciences was published. The objects of the Council[10] are "to foster and

[10] Canada Council Act. March 28, 1957. "An Act for the establishment of a Canada Council for the encouragement of the Arts, Humanities and Social Sciences."

promote the study and enjoyment of, and production of works in, the arts, humanities and social sciences" and in furtherance of its objects, "to provide . . . for grants, scholarships or loans". Support of research is not restricted to university scholars nor to Canadians, and the Council is specifically authorized to provide capital assistance to "universities and similar institutions of higher learning", for construction of buildings.

The Council is not an agent of the Crown; it was provided with an endowment fund and a university capital grants fund at the outset from the Consolidated Revenue Fund. It was also authorized to receive gifts, bequests, etc. Since 1965-66 these funds have been supplemented by parliamentary appropriations.

The Canada Council consists of a chairman, a vice-chairman and 19 members, and the Act provides for a director and an associate-director who are responsible for the operation and management of the Council's programs. The current programs of the Council were described by the Director, in a statement to the Senate Committee on Science Policy in March 1968.[11] He stated that "the Canada Council bears responsibility for providing national support to the research in the social sciences and humanities. . . . assistance goes to applied research as well as to fundamental research. However it does not support contractual research but only freely initiated projects." Arrangements for co-operation with NRC regarding applications for support of research in disciplines such as psychology, archaeology, anthropology, geography and mathematics have been established.

The Social Sciences and Humanities Program of the Canada Council is described in its 11th Annual Report, 1967-68 (pages 51-111). Financial and other statistics are included which show the growth in this part of the Council's activities from 1964-65 together with estimates of requirements in 1972-73.

The building program under the university capital grants fund is also described in the Annual Report, and all commitments are listed by institution and province (pages 112-117). The original fund of $50 million provided by the Government of Canada and invested in bonds and securities have increased so that by Mar. 31, 1968, grants amounting to $68,163,199.62 have been made to 71 institutions in all 10 provinces and $68,163,234 have been paid to these institutions. It is expected that the fund will be completely spent in 1969-70.

The Canada Council administers two cultural exchange programs on behalf of the Government of Canada. In 1967-68 the Department of External Affairs provided $700,000 for a program of grants and fellowships with the

[11] Senate of Canada. *Proceedings of the Special Committee on Science Policy*. No. 1, Mar. 12, 1968.

cultural exchange plan with France, Belgium and Switzerland. The exchange program has been extended to include West Germany, Italy and the Netherlands and the budget allotment from the Federal Government increased by $150,000 for 1968-69. The sciences are included in these exchanges as well as the arts, humanities and social sciences. Funds for the Canadian Cultural Institute in Rome, amounting to about $25,000 a year, are administered by the Council.

**Canada Council Social Sciences and Humanities Program, 1965–66 to 1967–68**
**(Excluding the Killam and Cultural Exchange Programs)**

| Program | 1965–66 | 1966–67 | 1967–68 |
|---|---|---|---|
| | $'000 | $'000 | $'000 |
| Training and Development— | | | |
| Doctoral Fellowships | 1,181 | 2,931 | 6,477 |
| Post-doctoral Fellowships | — | — | 159 |
| Sabbatical Fellowships | 305 | 617 | 877 |
| Research Activity— | | | |
| Research Grants | 412 | 983 | 2,102 |
| Research Communication— | | | |
| Publication | 138 | 293 | 243 |
| Meetings and Exchanges | 150 | 147 | 250 |
| Research Resources— | | | |
| Research Collections | 565 | 500 | 1,003 |
| Special Awards and Grants | 73 | 51 | 97 |
| Consultant Expenses | 32 | 59 | 116 |
| **Totals** | **2,856** | **5,581** | **11,324** |

The Canada Council also administers the Killam Trust Fund, which was established under that name following the death of Mrs. Dorothy J. Killam in 1965. Some fellowships mainly in the natural sciences, had been awarded from the anonymous gift made some years prior to her death by Mrs. Killam. The first grants for major projects were made during the current year. Under the terms of the bequest the support of the creative and performing arts is excluded, but "generous support of a few programs of study or research of exceptional significance" is anticipated.

The list of Canada Council's activities in support of the humanities and social sciences appearing on the following page is copied from a bulletin board poster distributed in August 1968. A special brochure describing these activities is available from the Council, also one describing the program of Killam Awards; a copy of the first page of the latter is reproduced on pages 305-306.

## THE CANADA COUNCIL AID TO THE SOCIAL SCIENCES AND HUMANITIES

The Canada Council offers FELLOWSHIPS and GRANTS to develop research and scholarly resources in the social sciences and humanities.

FELLOWSHIPS three annual competitions.

1—Doctoral Fellowships

2325 awards. Persons having no more than two years of course requirements to fulfill. From $3,500 to $4,500, plus travel allowance. Renewable. For candidates having completed the first two years of their programme up to $1,000 is added to doctoral fellowship. Closing date: 15 December 1968.

2—Post-doctoral Fellowships

35 awards. To scholars having obtained their doctoral degree after January 1st, 1963 who wish to devote from eight to twelve months to a program designed to broaden their scholarly experience and who either are on leave of absence without salary or have not yet taken a permanent academic post. Closing date: 1 October 1968.

3—Leave Fellowships

160 awards. To members of staff of Canadian universities and other scholars who will be engaged in independent research or other form of creative scholarship while on leave of absence, on partial or no salary. Closing date: 1 October 1968.

GRANTS The Council offers grants to support: Research, Publication, Meetings and Exchanges and Library Research Collections.

1—Research Grants

To career scholars and researchers, for research and clerical assistance, travel, equipment and supplies.

2—Publication Grants

a) To learned journals. Applications must be filed by well-established learned societies or leading groups of scholars.

b) For publication of scholarly manuscripts.

3—Grants for Meetings and Exchanges

a) To pay fare to a limited number of scholars participating in international conferences abroad.

b) To assist in financing occasional meetings of scholars.

c) To help Canadian university heads bring visiting scholars to their institutions.

4—Library Research Collection Grants

To assist university libraries to increase resources necessary for advanced research at the graduate level.

N.B. Applications for grants 1, 2 and 3 accepted any time. Applications for 4 must reach Council before December 1st, 1968. Brochures providing more detailed information may be obtained from:

Awards Service, The Canada Council,
140 Wellington Street, Ottawa 4, Ontario

and from:

The Dean of Graduate Studies or the Registrar or the Students Awards Officer

## THE KILLAM AWARDS OF THE CANADA COUNCIL

### ELIGIBLE CANDIDATES

Career scholars, whether or not attached to a university at the time of application, who are citizens or permanent residents of Canada, are eligible.

### ELIGIBLE AREAS OF SUPPORT

Eligible for support is research in any of the social sciences or the humanities, interdisciplinary research in the social sciences and humanities and interdisciplinary research linking any of the physical or biological sciences with any of the social sciences or the humanities.

The Canada Council wishes to reach by this announcement exceptional scholars working individually or in collaboration with other scholars. It would like them to present projects which are likely to break new ground and carry wide-ranging implications.

The Canada Council does not wish, at this stage, to prejudge the areas of support under the Killam Awards Programme. It hopes that the response to this programme will help to reveal what areas of inquiry are challenging Canadian scholars today. However, a number of promising areas of research have been suggested, among them, the following:

the information explosion and communications,
the interaction between man and his environment in a period of rapid technological change,
automation and its influence on work and leisure,
health in a changing society,
the development and utilization of natural resources,
the study of spoken languages in Canada,
the philosophy and methodology of science,
the re-appraisal of political, social and economic institutions,
social alienation and involvement.

It should be understood that these research areas are offered only for guidance and are not meant to preclude applications in other fields.

To assist scholars in the preparation of their research projects, the Canada Council would welcome applications dealing with the planning phase of such projects. Grants made in support of the planning phase of a project, however, would entail no commitment on the part of the Council to support subsequent research.

At a later period in the programme, the Council may well decide to concentrate the available resources upon one or two major projects of exceptional merit.

### VALUE

Grants under the Killam Awards Programme will cover research expenses, including research assistants, technical and clerical services, equipment, materials and supplies, and travel (including that of immediate dependents, when required).

In addition, stipends for principal investigators can be allowed, depending on the project. Such stipends could be fully commensurate with university salaries.

It should be noted that the Killam Awards Programme is designed primarily to support scholars in their research. It is not directed at the present time towards the establishment or general maintenance of research institutes.

**Medical Research Council**

Since 1960, the Medical Research Council has been a virtually autonomous body, responsible for its own program but operating within the administrative framework of the National Research Council.[12] According to the Annual Report for 1967-68,[13] "the main concern of the Medical Research Council is the development of medical research, and support of medical research workers, in the university centres of Canada; its program therefore is entirely extramural. Research in the broad field of the medical sciences is supported chiefly through an extensive program of grants-in-aid of investigations proposed and carried out by the members of the staff of Canadian universities and their affiliated hospitals and institutes, and through the provision of personnel support by means of Studentships, Fellowships, Scholarships, and Associateships."

**Medical Research Council Extramural Research Program, 1966-67 and 1967-68**

| Program | 1966–67 | 1967–68 |
|---|---|---|
| | $ | $ |
| Fellowships | 899,418 | 1,584,797 |
| Scholarships | 855,080 | 1,221,477 |
| Associateships | 849,429 | 954,842 |
| Summer scholarships | 92,400 | 194,400 |
| Grants-in-aid of research | 12,087,607[a] | 15,388,049 |
| General research grants | 336,000 | 336,000 |
| Travel grants | 7,967 | 19,520 |
| Group | — | 214,245 |
| Negotiated development grants | — | 170,500 |
| Visiting scientists | 44,026 | 206,399 |
| Special activities | 178,073 | 209,771 |
| **Totals** | **15,350,000[a]** | **20,500,000** |

[a] Includes $3,000,000 provided in 1965-66 for projects in 1966-67.

The Annual Report also contains brief but definitive statements describing each of the categories of support mentioned above and administrative procedures relating to them are outlined in an annual brochure distributed by the Medical Research Council.[14] Committees of the MRC concerned with the granting processes in special areas, and selection of candidates for Fellowships, Associateships, etc., are listed in the annual report.

The Chairman of the Medical Research Council, Dr. G. Malcolm Brown, has given an excellent account of MRC activities including a brief historical statement to the Senate Committee on Science Policy.[15] A function of the Council not included under "development and support of medical

[12] Since July 1968, the Medical Research Council has reported to the Minister of National Health and Welfare.

[13] *Medical Research Council University Support, 1967-68.*

[14] *Medical Research—Extramural Program.*

[15] Senate of Canada, *Proceedings of the Special Committee on Science Policy,* No. 8, Mar. 21, 1968.

research" is "to maintain something of an overview of medical research as a whole in the country". A recent report[16] of a study mounted by MRC provides both a quantitative and qualitative assessment of the medical research going on in Canada.

The following financial summary of expenditures for all MRC programs in 1966-67 and 1967-68 is taken from page 10 of the MRC Annual Report.

**National Research Council**

The National Research Council has been making grants-in-aid of research and awarding scholarships and fellowships since 1917. Its current activities in supporting university research have evolved during the past ten years, coinciding with the period of rapid growth in Canadian universities, in numbers, in size and in sophistication.

Some of the grants programs of government departments and agencies that are described in this Appendix are similar to the operating grants activity of the NRC, and most of them have been developed during the same period of growth and expansion of NRC programs. The NRC has encouraged departmental and agency support of university research and frequently is represented on their committees, when the disciplines involved are eligible for Council support as well, i.e., astronomy; biology and agriculture; chemistry; engineering—chemical, civil, electrical, mechanical; geology; geophysics; mathematics; metallurgy; meteorology; oceanography; physics; and experimental psychology. (Dental research was also included until recently but is now included in the Medical Research Council's programs together with research in pharmacy and veterinary research.) Close liaison is maintained with the Medical Research Council and with the Canada Council, to cover overlapping interests.

The objects and current activities of the National Research Council in support of university research were described in some detail in its brief to the Study Group which was published in March 1968, and has been given fairly wide distribution.[17] These have been discussed in other parts of this Report and are the subject of comments and recommendations (Chapters 5 and 6). Additional recent information regarding NRC can be found in the report of the Science Policy Committee of the Senate.[18]

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[16] Medical Research Council of Canada Report No. 2, *Canadian Medical Research: Survey and Outlook*, Ottawa, Queen's Printer, 1968.

[17] *Support of Research in Canadian Universities by the National Research Council of Canada*, NRC March, 1968.

[18] Senate of Canada, *Proceedings of the Special Committee on Science Policy*, No. 3. Oct. 23, 1968.

The National Research Council has published annual reports[19] of the university support programs since 1958-59 which include details of all awards made during each fiscal year. These reports also reveal changes and developments in the extramural programs as they have evolved over the years, as numbers of applications for grants, scholarships and fellowships increased and gradually embraced a greater variety of scientific disciplines and inter-disciplinary complexities.

In 1967-68 there were 16 Grant Selection Committees and two Associate Committees responsible for awarding research grants.[20] The Associate Committees were for dental research (now an MRC responsibility) and experimental psychology. These committees now review applications from staff members of 56 Canadian universities and colleges.

[19] NRC *Annual Report on Support of University Research.*

[20] See pp. 40-43 of NRC brief to the Study Group.

**National Research Council Grants and Awards, 1966-67 and 1967-68**

| Main Category | 1966–67 | 1967–68 |
|---|---|---|
| | $'000 | $'000 |
| Research Grants— | | |
| Operating | 17,482 | 24,482 |
| Minor equipment | 5,785 | 5,016 |
| | 23,267 | 29,498 |
| General research | 966 | 1,687 |
| Travel | 242 | 231 |
| Senior research fellowships | 124 | 194 |
| Associateships (dental) | 44 | 66 |
| | 1,376 | 2,178 |
| Scholarships and Fellowships in Universities— | | |
| Postgraduate scholarships | 3,938 | 5,068 |
| Library science scholarships | 12 | 15 |
| 1967 science scholarships | — | 226 |
| Dental fellowships | 85 | 89 |
| PIER fellowships | 19 | 17 |
| Post-doctorate fellowships | 987 | 859 |
| | 5,041 | 6,274 |
| University Facilities— | | |
| Major installations, institutes and development grants | 2,414 | 3,720 |
| Computers | 1,300 | 2,373 |
| | 3,714 | 6,093 |
| Other assistance and promotion | 768 | 1,357 |
| **Totals** | **34,166** | **45,400** |

Other services to the scientific community are provided by the National Science Library and Canadian Patents and Development Limited, both of which are NRC agencies.

The National Science Library is operated by NRC under its Act as a service to Canadian scientists, to provide them with direct and immediate access to publications and information in their day-to-day work. Conventional and mechanized techniques are used for literature searches, preparation of bibliographies and to provide Selective Dissemination of Information services.

In 1947, NRC procured incorporation of Canadian Patents and Development Limited, "to assist in making more available to the public, through industry, the benefits from inventions arising from publicly-financed and publicly or institutionally-performed research". The services of Canadian Patents are available to government departments and to universities; in the case of the latter, by means of voluntary agreements between individual universities and the company. There are 18 agreements in effect at the present time; the first one was signed in October 1948 and the most recent one in April 1967.

NRC began publishing the *Canadian Journal of Research* in 1929; in 1935 it was produced in four sections, which have now become eight separate Journals. In 1967, 69 per cent of all papers published came from Canadian sources; of these almost two thirds were from universities. Between 1957 and 1967, the number of papers published increased from 769, to 1,911, an indication of the general increase in scientific activity during that decade.

## Appendix 2

# THE MOBILITY OF HIGHLY QUALIFIED MANPOWER

It has long been recognized that persons receiving graduate degrees have a high degree of mobility. More than half of the registered Ph.D. students in the science and engineering courses of Canadian graduate schools come from outside Canada.[1] Within Canada many of the graduate students of each province originate from other provinces. After obtaining their graduate degrees many of the persons find employment in other provinces or in other countries. In our hearings at Canadian universities we heard that the high mobility of graduate students made some of the provinces question the appropriateness of their support of graduate training. Why should they pay large costs for students who came from outside the province for graduate studies and upon completion of these studies left the province for other parts of Canada? The problem is particularly acute in the smaller provinces which tend to lose a larger fraction of the students they train. Perhaps the mobility supports a larger federal role in research and graduate training? We found that very few data existed to support the strong impressions about the mobility of graduate students and therefore we sought original data which are presented and analyzed below.

We found that the kind of mobility information we desired could be obtained from the survey of highly qualified manpower carried out in early 1967 by the Department of Manpower and Immigration in Ottawa. The survey was intended to cover all persons employed in the sciences and engineering fields in Canada. Its aim was to obtain the employment characteristics and other basic data about the pool of technical personnel in Canada. The results of the survey have not yet been analyzed but each respondent was asked the place of his high school education, the place of his Bachelor's degree, the place of his highest graduate degree and the place of his employment. There were 64,170 respondents and they represent a large group of personnel whose mobility can be studied.

With the co-operation of the Department of Manpower and Immigration[2] we used the data from the 1967 Manpower Survey to obtain the mobility results shown in Tables 1-6 of this Appendix. The six tables show the province-to-province mobility at various levels—from high school

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[1] O. H. Levine, *Profiles and Characteristics of Graduate Students Enrolled for the Doctorate in Science and Engineering at Canadian Universities*, National Research Council, Ottawa, March 1968.

[2] We are grateful to Mr. K. V. Pankhurst of the Department of Manpower and Immigration for the co-operation which made our analysis possible.

to university, from university to graduate school and from university or graduate school to employment. The data support the general impressions about mobility which we heard at the universities. Before analyzing them we comment on the sample represented by the 64,170 respondents.

The respondents to the Manpower Survey constitute an appreciable fraction of the recepients of graduate degrees from Canadian universities. For example, Table 1 shows 2,368 persons who received Ph.D's at Canadian universities or 30 per cent of the 8,000 Ph.D's in *all* fields granted by Canadian universities in *all* years prior to 1967.[3] The other 70 per cent include Ph.D's in the humanities and most of the social sciences who were not part of the survey, Ph.D's who were deceased, Ph.D. recipients in the sciences and engineering not on the mailing lists of the survey, non-respondents. The response rate of the survey was 75-80 per cent. The above numbers also suggest that the mailing list of the survey was nearly complete.

The mobility data we seek should be relatively free of most of the biases inherent in a manpower survey. It is not difficult to bias the results for employment characteristics by omissions in the mailing list, but mobility data are probably comparable for all fields and all employment sectors and therefore more difficult to bias. For the same reason a detailed assessment of non-respondents is likely to be unimportant for the mobility data. There are two significant sources of error in our analysis. First of all, the sample was primarily those persons now employed in Canada. It is therefore inadequate in assessing the number who leave Canada. A correction for this error is discussed below. Secondly, the survey was not aimed at and therefore does not include most of the humanists and social scientists.

For each move made by the respondents there are several numbers that can be used to characterize mobility. The first is the number, $N_l$, who leave each province (or country) for other provinces. The second is the number, $N_r$, who remain in the province. The fraction, $f$, who remain is

$$f = N_r/(N_l + N_r) \tag{1}$$

Tables 7–11 give the value of $N_l$, $N_r$ and $f$ corresponding to each of the basic Tables 1–6. (There is no discernible difference between the mobility data of Tables 5 and 6. Recipients of graduate degrees show the same behaviour as non-recipients in moving from high school to university—so the numbers derived from the two tables are combined in Table 11.) The sample on which our fractional retention, $f$, is based varies in size from province to province. If we regard each graduate in a province as having a probability $\theta$ of staying within the province and a probability of $1-\theta$ of leaving the province then, for $N$ graduates (with $N = N_l + N_r$) the probability that $N_r$ remain within the province is given by the binomial distribution

[3] *Canada Year Books*; data compiled by DBS.

$$P_N(N_r) = \frac{N!}{N_r!\,(N-N_r)!}\ \theta N_r\,(1-\theta)N-N_r \qquad (2)$$

The mean value of $N_r/N$ is $\theta$ and the variance of $N_r/N$ is $\theta\ (1-\theta)/N$. For each province the value of $f$ is an estimate of $\theta$ taken from the sample. Correspondly, an estimate of the variance is given by $f(1-f)/N = f(1-f)/(N_l+N_r)$. Therefore the standard deviation of each value of $f$ is given approximately by

$$\sigma_f = (N_r N_l)^{\frac{1}{2}}\,(N_r + N_l) - 3/2 = (f(1-f)/(N_r + N_l))^{\frac{1}{2}} \qquad (3)$$

In each of the tables we give the individual values of $f$ and their standard deviations estimated in this way. In addition the tables also list an auxiliary number, $N_P$, used in the analysis of $f$ below $N_P$ is the total number of places which were occupied in each province: for example, for Table 7, $N_P$ is the total number of Ph.D's employed in each province, as obtained from the totals of the appropriate columns of Table 1.

There are almost no other data of which we are aware which corroborate our results. A study at the University of Alberta about the origin of students registered in its graduate courses[4] supports the data of Table 4.

There are a number of general conclusions which emerge from our results and which are important for our study. The detailed analysis given below strengthens some of these conclusions.

1. Canada both imports and exports the recipients of graduate degrees, to an extent which clearly testifies to the fact that an efficiency analysis of doctoral studies is not susceptible to the limitations of national boundaries. Table 7 shows that in each of the provinces (other than Quebec) the number of Ph.D's employed is more than twice the number of persons receiving their Ph.D. degree in that province. Therefore more than half of the Ph.D's are imported from outside. Table 1 shows that more than half of those obtaining their Ph.D. degree outside Canada obtain it in the United States. An appreciable fraction of these will be persons of Canadian origin who take their graduate education in the United States and then return to Canada. An American study of Ph.D. recipients[5] showed that in the nine-year period 1958–66 there were about 1,800 Ph.D. recipients who had obtained their baccalaureate in Canada. Of these, 39 per cent obtained their first post-doctoral employment in the United States and 56 per cent returned to Canada for their direct post-doctoral employment. Thus Canada has continued to rely on the United States for a large portion of its Ph.D's—perhaps to an extent which inhibits the implementation of Canadian policy in graduate training. On the other hand the NRC Study of O. H. Levine[6] showed that 51 per cent of the registered

[4] We are indebted to Dean A. G. McCalla for making the results of this study available to us and for raising some of the questions which we seek to answer.

[5] *Doctorate Recipients from United States Universities, 1958-1966,* National Academy of Sciences Publication 1489, Washington D.C. 1967.

[6] *Op. cit.,* p. 536.

Ph.D. students (in science and engineering) of Canadian universities in 1966–67 were not Canadian citizens. It appears from our data that most of these leave Canada after obtaining their graduate degrees. Thus Table 4 shows that of the persons presently employed in Canada with graduate degrees from Canadian universities, 8,700 also obtained their undergraduate degrees in Canada while only 669 obtained their undergraduate degrees outside Canada. Perhaps the non-Canadian portion of the graduate student population is larger now than in the past. Even so, these figures suggest that most of the graduate students originating from outside Canada also leave Canada for employment.

2. The fraction of graduate degree recipients who are employed in the province of their graduate education is small—particularly in the smaller provinces. Table 7 shows that only Ontario retains more than half of its Ph.D. recipients. In the smaller provinces the retention is nearer 30 per cent. Such a low retention rate makes it difficult for the smaller provinces to feel financially responsible for graduate training. A detailed study of the retention is made below. The retention of Master's degree recipients is slightly higher (Table 8) and the retention of Bachelor's degree recipients (Table 9) is higher still. It should be noted that the Bachelor's degree recipients of our sample are those regarded as technical personnel. Although we have no data, it appears likely that the retention of other Bachelor's degree recipients (teachers, lawyers, etc.) might be higher still.
3. Table 10 shows that within Canada a large number of students leave the province of their baccalaureate to undertake graduate work. The retention is similar to that of graduate degree recipients moving to employment. Only Ontario and Quebec retain more than half of their baccalaureate recipients. This movement toward graduate schools should be contrasted (Table 11) with the smaller movement between high school and university. Again, this conclusion tends to undermine the responsibility of the smaller provinces toward providing the financial support for graduate training.
4. Tables 7, 8 and 9 show that the provinces are unequal in their employment opportunities for technical personnel. The number of Ph.D's employed ($N_P$ of Table 7) per capita is higher in Ontario than in all other provinces. It is particularly low in Quebec and in the Maritimes.

The fractional retention, $f$, of Tables 7–11 varies from province to province. It is larger in the provinces having more people or more places $N_P$. A simple law describes most of the variation of $f$ and also provides us with an estimate of how many graduate degree recipients are lost from Canada.

A graduate degree recipient leaves his school to occupy an employment vacancy. If the graduate school is uniformly surrounded by employment

vacancies then the probability, $P$, that the student will not be captured into an employment vacancy after travelling a distance $r$ from the graduate school is

$$P = e_{-}\eta^{r} \tag{4}$$

where $\eta$ is an absorption coefficient. The fraction, $f$, of graduate students who obtain employment within a distance $r$ is then

$$f = l - e_{-}\eta^{r} \tag{5}$$

If the graduate school is at the centre of a geographical unit containing $N$ employment vacancies then the distance $r$ is proportional to $N^{\frac{1}{2}}$ because the world is two-dimensional. One might argue that $N$ should be taken as proportional to the total population of the geographical unit. It is even more reasonable to take $N$ as proportional to the number of occupied places, $N_P$, of Tables 7–11. Therefore we have

$$\eta^{r} = \mu N_P^{\frac{1}{2}} \tag{6}$$

where $\mu$ is a coefficient to be determined from the analysis of the data in the tables. Our final result is

$$f = l - e{-}\mu N_P^{\frac{1}{2}} \tag{7}$$

Although this size-law for $f$ is based on a gross oversimplification of the mobility data it describes most of the variations of $f$ of the tables.

Figures 1–5 show the data of Tables 7–11 for $f$ plotted against the corresponding values of $N_P^{\frac{1}{2}}$. Also shown is a fit of formula (7) to the data as obtained by varying the constant $\mu$. In each case, if $fi$ is the value of $f$ for the province $i$ as obtained from our data, $\sigma i$ the corresponding standard deviation of $fi$, and $fi^{\mu}$ the calculated value of the retention ratio, we obtain $\mu$ by minimizing

$$\Sigma i\,(fi - fi^{\mu})^2\,\sigma i^{-2} \tag{8}$$

where the sum runs over all of the provinces in the table.

The size law of Equation (7) has many weaknesses—it ignores many of the sociological factors associated with mobility—but it does seem to account for most of the province-to-province variation of the retention ratio $f$. The success of the law as illustrated by the figures strengthens our central conclusion that the smaller provinces will always have weaker arguments for supporting graduate training than their larger neighbours. In any efficiency analysis for graduate study the smaller provinces have some consumer benefits per graduate training dollar comparable to those of the larger provinces, for example, the benefits to the undergraduate training of a university arising from a concomitant graduate program. But in the important area of post-doctoral employment

our data clearly shows that the larger provinces reap greater direct benefits. They employ more of the products of their own graduate schools. It is here that size is a favourable factor and that the disparity in size among the provinces can undermine the graduate schools of the smaller provinces.

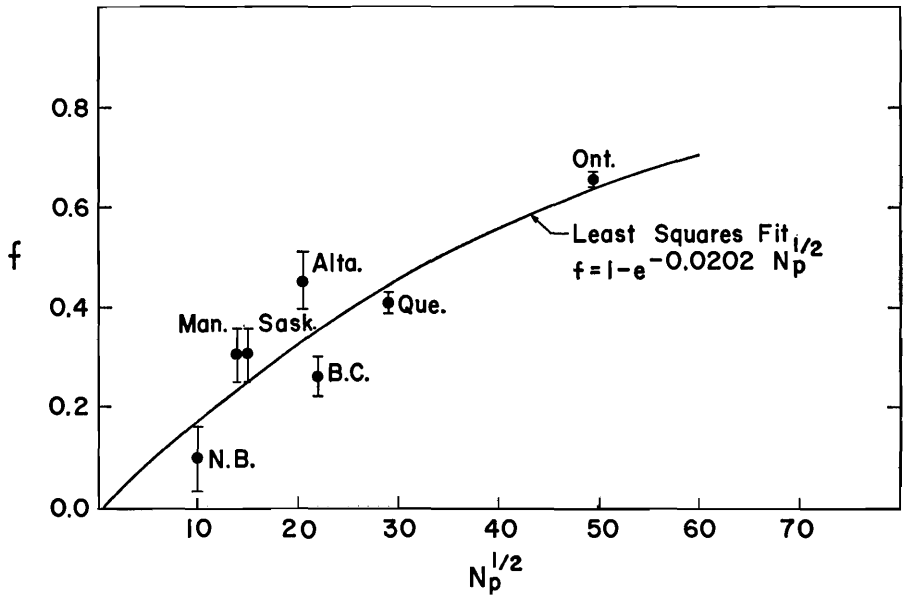
The size-law as fitted to the data provide an estimate of the leakage of personnel from Canada as a whole. For example, the value of $N_P$ for all Canada from Table 7 is 4,875. The corresponding value of $f$ obtained from the least-squares fit of Fig. 1 is 0.75. This suggests that 25 per cent of Canadian Ph.D. graduates leave Canada. According to this estimate the sample of the Manpower Survey is biased by including too few Ph.D. graduates who are now employed outside Canada. Thus Table 1 shows only 10 per cent of the persons who received their Ph.D. at a Canadian university are now employed outside Canada. It should be remembered that the Manpower Survey was directed at persons employed in Canada and only picked up this 10 per cent incidentally. A self-consistent correction of the tables for the leakage from Canada could be made but it is not worth the effort. It would tend to reduce slightly all the values of $f$ obtained from the data.

Most of the Ph.D. recipients who leave Canada end up in the United States. Table 12 supports our estimate of the leakage rate from Canada. It provides data from the very similar Manpower Survey (covering the same disciplines and with about the same response rate) carried out in 1964 in the United States. The numbers should be increased by about 25 per cent to update them to 1967 for comparison with Canadian figures. The table shows 448 Canadian Ph.D's employed in the United States. Updated to about 600 in 1967, this value may be related to the 1949 Ph.D's now employed in Canada by Canadian universities. Again we find that about 25 per cent have left Canada.

The non-Canadians who receive their graduate training in Canada undoubtedly have a much smaller retention rate not indicated by the above analysis. The above analysis does not conflict with our general conclusion that most of them leave Canada after receiving graduate degrees.

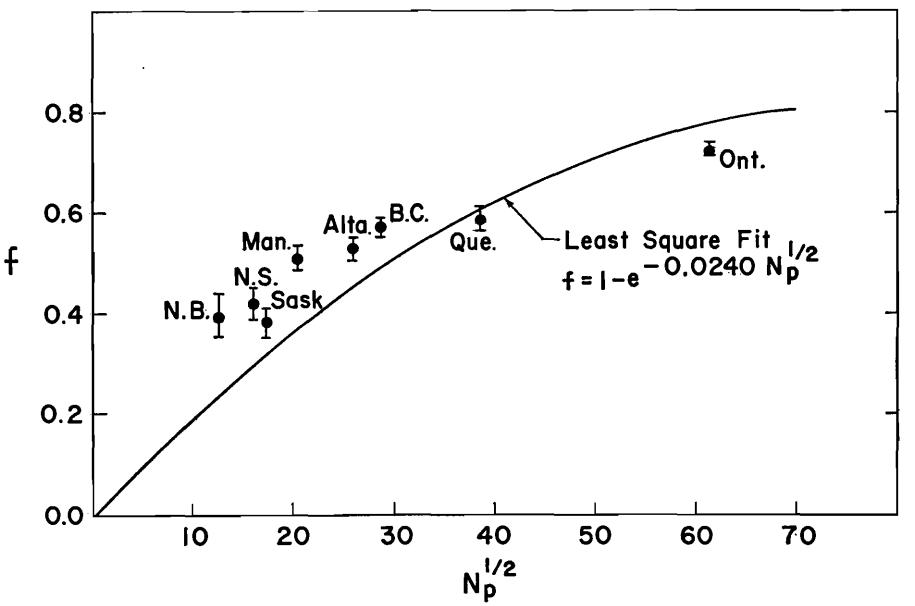
Appendix 2—Figure 1

FRACTION OF PH.D'S RETAINED IN EACH PROVINCE VS. THE SQUARE ROOT OF THE NUMBER OF EMPLOYMENT POSITIONS



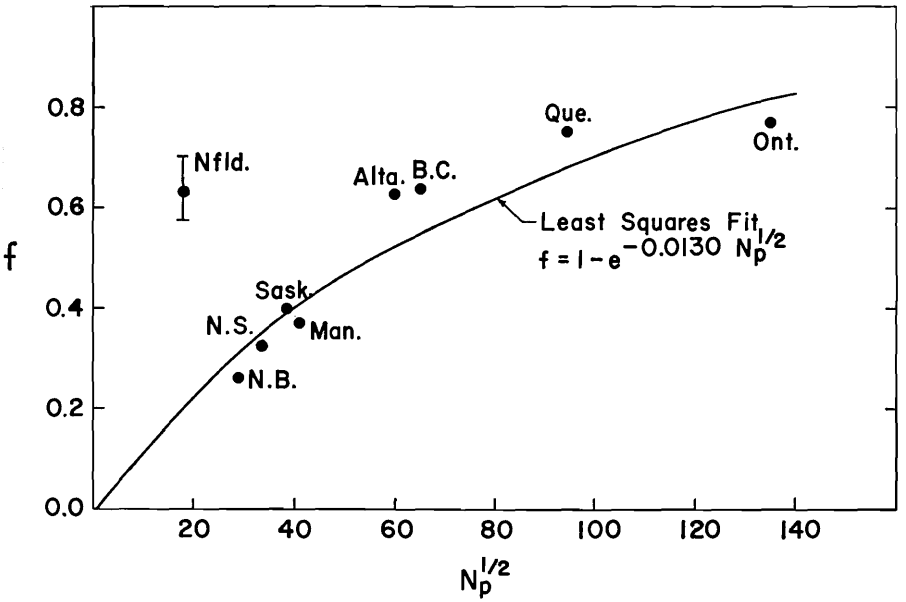

Appendix 2—Figure 2

FRACTION OF MASTER'S RETAINED IN EACH PROVINCE VS. THE SQUARE ROOT OF THE NUMBER OF EMPLOYMENT POSITIONS



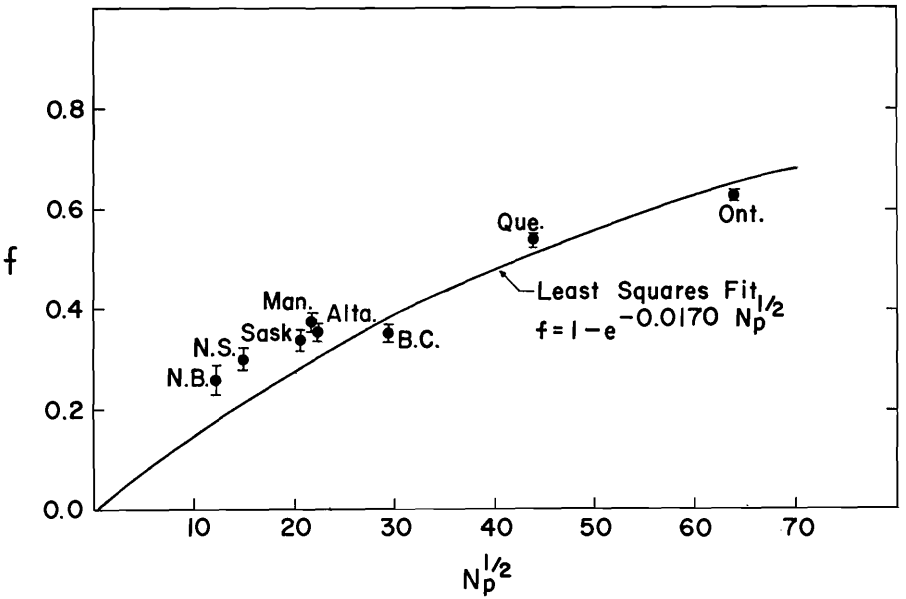
Appendix 2—Figure 3

FRACTION OF BACCALAUREATES RETAINED IN EACH PROVINCE VS. THE SQUARE ROOT OF THE NUMBER OF EMPLOYMENT POSITIONS




Appendix 2—Figure 4

FRACTION OF BACCALAUREATES RETAINED IN EACH PROVINCE FOR GRADUATE WORK VS. THE SQUARE ROOT OF THE NUMBER OF GRADUATE STUDENT POSITIONS



Appendix 2—Figure 5

FRACTION OF HIGH SCHOOL GRADUATES OF EACH PROVINCE WHO REMAIN IN THE PROVINCE FOR THEIR BACCALAUREATE VS. THE SQUARE ROOT OF THE NUMBER OF BACCALAUREATE POSITIONS

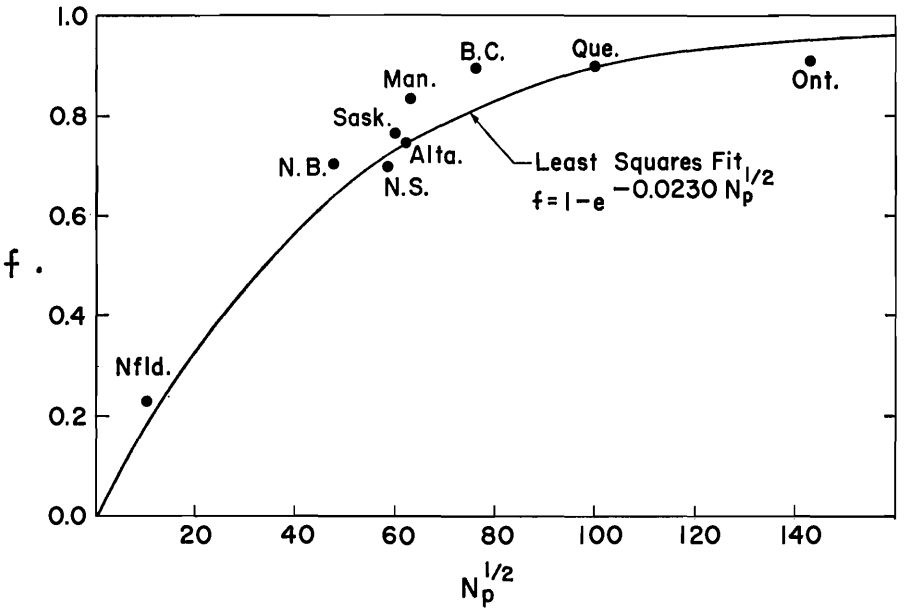


**Table 1—Place of Ph.D. vs. Place of Present Employment, for the Sample with Highest Degree (Ph.D.)**

| Place of Ph.D. | Place of Present Employment | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B.C. | Alta. | Sask. | Man. | Ont. | Que. | N.B. | N.S. | Nfld. | U.S. | U.K. | Other | No Response |
| British Columbia | 38 | 11 | 2 | 2 | 48 | 7 | 1 | 7 | 2 | 22 | 3 | 5 | 12 |
| Alberta | 9 | 35 | 3 | 3 | 18 | 4 | — | — | — | 14 | 2 | — | 6 |
| Saskatchewan | 3 | 13 | 24 | 4 | 21 | 4 | 1 | 2 | 1 | 5 | — | — | 6 |
| Manitoba | 2 | — | 6 | 24 | 15 | 2 | — | 1 | — | 6 | 1 | 1 | 2 |
| Ontario | 46 | 30 | 14 | 21 | 631 | 78 | 17 | 29 | 3 | 83 | 9 | 10 | 69 |
| Quebec | 27 | 32 | 24 | 21 | 265 | 337 | 12 | 19 | 7 | 63 | 4 | 14 | 60 |
| New Brunswick | 1 | 2 | — | — | 8 | 3 | 2 | 1 | — | 3 | — | — | 1 |
| Nova Scotia | 1 | — | — | — | 2 | 1 | — | 2 | — | — | — | 1 | 7 |
| Newfoundland | — | — | — | — | — | — | — | — | — | — | — | — | — |
| United States | 212 | 197 | 97 | 82 | 757 | 167 | 40 | 42 | 11 | 340 | 5 | 33 | 111 |
| United Kingdom | 90 | 47 | 37 | 26 | 437 | 69 | 15 | 24 | 4 | 35 | 24 | 3 | 33 |
| Other | 29 | 32 | 11 | 8 | 179 | 94 | 6 | 15 | 7 | 23 | 1 | 13 | 31 |
| No response | 18 | 14 | 6 | 8 | 77 | 60 | 4 | 2 | 2 | 15 | 2 | 4 | 38 |

**Table 2—Place of Master's Degree vs. Place of Present Employment, for the Sample with Highest Degree (Master's)**

| Place of Master's Degree | Place of Present Employment | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B.C. | Alta. | Sask. | Man. | Ont. | Que. | N.B. | N.S. | Nfld. | U.S. | U.K. | Other | No Response |
| British Columbia | 346 | 40 | 16 | 16 | 116 | 21 | 2 | 9 | 2 | 25 | 2 | 8 | 125 |
| Alberta | 33 | 182 | 20 | 8 | 56 | 9 | 1 | 3 | 3 | 18 | 4 | 5 | 73 |
| Saskatchewan | 13 | 25 | 99 | 17 | 70 | 15 | 1 | 4 | — | 11 | 1 | 3 | 67 |
| Manitoba | 16 | 29 | 25 | 177 | 63 | 9 | 2 | 1 | 1 | 14 | 1 | 7 | 68 |
| Ontario | 74 | 89 | 29 | 61 | 1,884 | 243 | 27 | 45 | 11 | 86 | 7 | 27 | 569 |
| Quebec | 24 | 15 | 6 | 17 | 224 | 509 | 17 | 19 | 3 | 24 | 1 | 12 | 181 |
| New Brunswick | 3 | 3 | — | 1 | 31 | 13 | 46 | 12 | 4 | 2 | — | 1 | 12 |
| Nova Scotia | 5 | 5 | 1 | — | 54 | 12 | 11 | 73 | 6 | 2 | — | 3 | 42 |
| Newfoundland | — | — | — | — | — | — | — | — | 6 | — | — | — | 5 |
| United States | 180 | 158 | 76 | 77 | 646 | 265 | 27 | 50 | 6 | 197 | 5 | 30 | 305 |
| United Kingdom | 46 | 18 | 9 | 11 | 229 | 101 | 7 | 11 | 6 | 14 | 13 | 7 | 53 |
| Other | 39 | 30 | 12 | 7 | 262 | 168 | 3 | 8 | 3 | 20 | — | 11 | 67 |
| No response | 33 | 38 | 11 | 19 | 164 | 114 | 9 | 14 | 6 | 14 | 1 | 12 | 100 |

**Table 3—Place of Bachelor's Degree vs. Place of Present Employment, for the Sample with Highest Degree (Bachelor's)**

| Place of Bachelor's Degree | Place of Present Employment | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B.C. | Alta. | Sask. | Man. | Ont. | Que. | N.B. | N.S. | Nfld. | U.S. | U.K. | Other | No Response |
| British Columbia | 2,384 | 275 | 38 | 47 | 558 | 208 | 2 | 17 | 2 | 122 | 7 | 53 | 564 |
| Alberta | 193 | 1,602 | 81 | 58 | 392 | 116 | 5 | 11 | 5 | 50 | 7 | 33 | 312 |
| Saskatchewan | 160 | 388 | 992 | 129 | 576 | 140 | 15 | 11 | 8 | 54 | 2 | 16 | 292 |
| Manitoba | 181 | 238 | 99 | 952 | 770 | 210 | 9 | 25 | 5 | 56 | 9 | 14 | 328 |
| Ontario | 329 | 358 | 115 | 201 | 10,572 | 1,265 | 105 | 135 | 30 | 390 | 22 | 152 | 1,890 |
| Quebec | 84 | 75 | 17 | 39 | 1,098 | 5,269 | 103 | 105 | 22 | 112 | 14 | 75 | 919 |
| New Brunswick | 42 | 41 | 16 | 27 | 533 | 301 | 420 | 140 | 41 | 34 | 2 | 33 | 173 |
| Nova Scotia | 37 | 35 | 7 | 15 | 449 | 287 | 89 | 546 | 122 | 35 | 2 | 38 | 202 |
| Newfoundland | 3 | 2 | — | — | 9 | 2 | 2 | 2 | 38 | 1 | — | 1 | 19 |
| United States | 143 | 298 | 39 | 29 | 533 | 179 | 8 | 12 | 6 | 134 | 2 | 10 | 170 |
| United Kingdom | 237 | 90 | 31 | 40 | 1,007 | 291 | 16 | 27 | 13 | 39 | 16 | 17 | 117 |
| Other | 154 | 67 | 27 | 45 | 557 | 307 | 11 | 21 | 5 | 19 | 5 | 14 | 88 |
| No response | 272 | 128 | 46 | 63 | 1,034 | 427 | 51 | 63 | 46 | 15 | 7 | 21 | 438 |

**Table 4—Place of Bachelor's Degree vs. Place of Graduate Work, for All Recipients of Graduate Degrees**

| Place of Bachelor's Degree | Place of Graduate Work | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B.C. | Alta. | Sask. | Man. | Ont. | Que. | N.B. | N.S. | Nfld. | U.S. | U.K. | Other | No Response |
| British Columbia | 609 | 21 | 14 | 4 | 163 | 78 | — | 2 | — | 488 | 63 | 10 | 36 |
| Alberta | 32 | 340 | 18 | 7 | 121 | 61 | 2 | — | — | 329 | 30 | 7 | 37 |
| Saskatchewan | 26 | 22 | 286 | 27 | 122 | 56 | — | 2 | — | 265 | 22 | 5 | 36 |
| Manitoba | 34 | 28 | 12 | 373 | 140 | 60 | — | 1 | — | 300 | 45 | 4 | 27 |
| Ontario | 66 | 30 | 30 | 15 | 2,904 | 218 | 2 | 7 | — | 1,133 | 219 | 26 | 119 |
| Quebec | 20 | 12 | 12 | 7 | 199 | 1,113 | 3 | 9 | 1 | 510 | 116 | 55 | 111 |
| New Brunswick | 12 | 2 | 2 | — | 97 | 54 | 121 | 18 | 1 | 114 | 31 | 1 | 15 |
| Nova Scotia | 12 | 5 | 5 | — | 107 | 89 | 8 | 164 | 1 | 121 | 32 | 1 | 20 |
| Newfoundland | 1 | — | 1 | — | 8 | 3 | — | 5 | 6 | 1 | 1 | — | — |
| *United States* | 15 | 6 | 1 | 8 | 39 | 23 | 1 | 1 | — | 567 | 4 | 11 | 19 |
| United Kingdom | 18 | 21 | 12 | 8 | 101 | 56 | 7 | 4 | 2 | 72 | 717 | 17 | 32 |
| Other | 34 | 19 | 15 | 19 | 161 | 83 | 4 | 11 | — | 164 | 65 | 642 | 146 |
| No response | 9 | 3 | 2 | 5 | 30 | 43 | 1 | 4 | — | 52 | 29 | 300 | 187 |

**Table 5—Place of High School vs. Place of Bachelor's Degree, for All Recipients of Graduate Degrees**

| Place of High School | Place of Bachelor's Degree | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B.C. | Alta. | Sask. | Man. | Ont. | Que. | N.B. | N.S. | Nfld. | U.S. | U.K. | Other | No Response |
| British Columbia | 1,200 | 19 | 5 | 9 | 43 | 21 | 4 | 1 | — | 38 | 1 | 1 | 10 |
| Alberta | 61 | 881 | 15 | 13 | 66 | 23 | 2 | — | — | 68 | 1 | 1 | 5 |
| Saskatchewan | 41 | 27 | 789 | 55 | 61 | 18 | 3 | — | — | 15 | — | — | 8 |
| Manitoba | 28 | 11 | 12 | 857 | 50 | 26 | 3 | 3 | 1 | 12 | — | — | 14 |
| Ontario | 30 | 11 | 12 | 31 | 4,163 | 152 | 34 | 20 | — | 82 | 10 | 1 | 59 |
| Quebec | 6 | 3 | — | 2 | 71 | 1,570 | 33 | 23 | — | 19 | 5 | 3 | 66 |
| New Brunswick | 1 | 1 | — | — | 12 | 32 | 286 | 64 | — | 4 | 2 | — | 6 |
| Nova Scotia | — | 1 | 2 | 2 | 25 | 77 | 64 | 363 | — | — | — | 2 | 11 |
| Newfoundland | 2 | — | — | — | 7 | 9 | 4 | 32 | 25 | 2 | 1 | — | 1 |
| United States | 3 | — | 4 | 2 | 13 | 17 | 2 | 8 | — | 363 | 1 | 6 | 10 |
| United Kingdom | 21 | 9 | 5 | 7 | 42 | 41 | 6 | 3 | — | 18 | 930 | 8 | 37 |
| Other | 86 | 18 | 21 | 40 | 184 | 157 | 22 | 42 | — | 57 | 98 | 1,320 | 416 |
| No response | 9 | 3 | 4 | 6 | 32 | 25 | 5 | 6 | — | 17 | 18 | 21 | 22 |

**Table 6—Place of High School vs. Place of Bachelor's Degree, for the Sample with Highest Degree (Bachelor's)**

| Place of High School | Place of Bachelor's Degree | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B.C. | Alta. | Sask. | Man. | Ont. | Que. | N.B. | N.S. | Nfld. | U.S. | U.K. | Other | No Response |
| British Columbia | 3,448 | 45 | 11 | 49 | 150 | 51 | 3 | 3 | — | 112 | 12 | 3 | 150 |
| Alberta | 260 | 2,508 | 47 | 53 | 192 | 56 | 7 | 5 | — | 241 | 1 | 1 | 107 |
| Saskatchewan | 145 | 121 | 2,557 | 190 | 245 | 40 | 9 | 2 | — | 51 | — | 2 | 73 |
| Manitoba | 77 | 26 | 55 | 2,338 | 155 | 72 | 16 | 4 | — | 53 | 2 | 1 | 83 |
| Ontario | 91 | 23 | 19 | 121 | 13,468 | 571 | 230 | 53 | 3 | 513 | 18 | 5 | 693 |
| Quebec | 18 | 6 | 9 | 8 | 327 | 6,178 | 186 | 80 | — | 72 | 4 | 2 | 327 |
| New Brunswick | 4 | 3 | 1 | 9 | 66 | 113 | 1,011 | 213 | 1 | 8 | — | — | 41 |
| Nova Scotia | 6 | 1 | 4 | 12 | 99 | 177 | 196 | 1,200 | — | 10 | — | 5 | 94 |
| Newfoundland | 1 | — | — | — | 13 | 46 | 29 | 171 | 73 | 4 | 1 | 4 | 36 |
| United States | 7 | 1 | — | 3 | 33 | 32 | 10 | 6 | — | 397 | 6 | 3 | 24 |
| United Kingdom | 33 | 18 | 3 | 6 | 113 | 60 | 7 | 8 | 1 | 25 | 1,657 | 16 | 525 |
| Other | 169 | 90 | 58 | 85 | 609 | 456 | 91 | 104 | 1 | 67 | 204 | 1,256 | 377 |
| No response | 18 | 23 | 19 | 22 | 94 | 80 | 8 | 15 | — | 10 | 36 | 22 | 81 |

**Table 7—Mobility Numbers for Ph.D. Recipients in Canada Moving to Places of Employment**

| Place of Ph.D. | Number Remaining $N_r$ | Number Leaving $N_l$ | Fraction Remaining $f$ | Number Employed $N_p$ |
|---|---|---|---|---|
| British Columbia | 38 | 110 | 0.257 ± 0.036 | 476 |
| Alberta | 35 | 43 | 0.449 ± 0.056 | 413 |
| Saskatchewan | 24 | 54 | 0.308 ± 0.052 | 224 |
| Manitoba | 24 | 54 | 0.308 ± 0.052 | 199 |
| Ontario | 631 | 340 | 0.650 ± 0.015 | 2,458 |
| Quebec | 337 | 488 | 0.408 ± 0.017 | 826 |
| New Brunswick | 2 | 18 | 0.100 ± 0.067 | 98 |
| Nova Scotia | 2 | 5 | 0.286 ± 0.170 | 144 |
| Newfoundland | — | — | — | 37 |

**Table 8—Mobility Numbers for Master's Degree Recipients in Canada Moving to Places of Employment**

| Place of Master's Degree | Number Remaining $N_r$ | Number Leaving $N_l$ | Fraction Remaining $f$ | Number Employed $N_p$ |
|---|---|---|---|---|
| British Columbia | 346 | 257 | 0.573 ± 0.021 | 812 |
| Alberta | 182 | 160 | 0.532 ± 0.027 | 632 |
| Saskatchewan | 99 | 160 | 0.382 ± 0.030 | 304 |
| Manitoba | 177 | 168 | 0.513 ± 0.027 | 410 |
| Ontario | 1,884 | 699 | 0.729 ± 0.009 | 3,799 |
| Quebec | 509 | 362 | 0.584 ± 0.018 | 1,479 |
| New Brunswick | 46 | 70 | 0.397 ± 0.046 | 153 |
| Nova Scotia | 73 | 99 | 0.424 ± 0.038 | 249 |
| Newfoundland | 6 | — | 1.000 | 57 |

**Table 9—Mobility Numbers for Bachelor's Degree Recipients in Canada Moving to Places of Employment**

| Place of Bachelor's Degree | Number Remaining $N_r$ | Number Leaving $N_l$ | Fraction Remaining $f$ | Number Employed $N_p$ |
|---|---|---|---|---|
| British Columbia | 2,384 | 1,329 | 0.642 ± 0.008 | 4,219 |
| Alberta | 1,602 | 951 | 0.627 ± 0.010 | 3,597 |
| Saskatchewan | 992 | 1,499 | 0.398 ± 0.010 | 1,508 |
| Manitoba | 952 | 1,616 | 0.371 ± 0.010 | 1,645 |
| Ontario | 10,572 | 3,102 | 0.773 ± 0.004 | 18,088 |
| Quebec | 5,269 | 1,754 | 0.750 ± 0.005 | 9,022 |
| New Brunswick | 420 | 1,210 | 0.258 ± 0.011 | 835 |
| Nova Scotia | 546 | 1,114 | 0.329 ± 0.012 | 1,115 |
| Newfoundland | 38 | 22 | 0.633 ± 0.062 | 343 |

**Table 10—Mobility Numbers for Bachelor's Degree Recipients in Canada Moving to Graduate Schools**

| Place of Bachelor's Degree | Number Remaining $N_r$ | Number Leaving $N_l$ | Fraction Remaining $f$ | Number Who Received Graduate Education $N_p$ |
|---|---|---|---|---|
| British Columbia | 609 | 1,149 | 0.348 ± 0.011 | 888 |
| Alberta | 340 | 607 | 0.359 ± 0.016 | 509 |
| Saskatchewan | 286 | 547 | 0.343 ± 0.017 | 410 |
| Manitoba | 373 | 624 | 0.374 ± 0.015 | 473 |
| Ontario | 2,904 | 1,746 | 0.625 ± 0.007 | 4,192 |
| Quebec | 1,113 | 944 | 0.541 ± 0.011 | 1,937 |
| New Brunswick | 121 | 332 | 0.267 ± 0.021 | 149 |
| Nova Scotia | 164 | 381 | 0.300 ± 0.020 | 228 |
| Newfoundland | 6 | 20 | 0.230 ± 0.083 | 11 |

**Table 11—Mobility Numbers for High School Graduates in Canada Moving to Universities**

| Place of High School | Number Remaining $N_r$ | Number Leaving $N_l$ | Fraction Remaining $f$ | Number who attended university $N_p$ |
|---|---|---|---|---|
| British Columbia | 4,648 | 581 | 0.889 ± 0.004 | 5,765 |
| Alberta | 3,389 | 1,113 | 0.753 ± 0.006 | 3,849 |
| Saskatchewan | 3,346 | 1,025 | 0.765 ± 0.006 | 3,652 |
| Manitoba | 3,195 | 607 | 0.840 ± 0.006 | 3,894 |
| Ontario | 17,631 | 2,030 | 0.897 ± 0.002 | 20,333 |
| Quebec | 7,748 | 867 | 0.899 ± 0.003 | 10,100 |
| New Brunswick | 1,297 | 534 | 0.708 ± 0.011 | 2,270 |
| Nova Scotia | 1,563 | 682 | 0.696 ± 0.010 | 3,424 |
| Newfoundland | 98 | 326 | 0.231 ± 0.021 | 105 |

**Table 12—Number of Persons in the National Science Foundation Register, Employed in the United States, with Birthplace, Secondary School or University Shown as Canada, 1964**

| Item | Total | Highest Degree Obtained | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | At a Canadian University | | | | | | Other than a Canadian University |
| | | Total | Ph.D. | Master's | Medical Degree and Ph.D. | Other | Not Stated | |
| | No. | No. | No. | No. | No. | No. | No. | No. |
| Birthplace—Canada | 2,895 | 771 | 295 | 131 | 12 | 329 | 4 | 2,124 |
| Secondary School—Canada | 218 | 43 | 13 | 10 | 1 | 19 | — | 175 |
| University—Canada | 255 | 255 | 140 | 36 | 8 | 70 | 1 | — |
| **Totals** | **3,368** | **1,069** | **448** | **177** | **21** | **418** | **5** | **2,299** |

SOURCE: Compiled by the General Surveys Section from data supplied by the National Science Foundation, U.S.A.

## Appendix 3

# McGILL UNIVERSITY PATENT POLICY

We consider the patent policy in use at McGill University a useful model for the consideration of universities which wish to introduce or update their present policy and we, therefore, reproduce it here with the permission of McGill.

**McGILL UNIVERSITY**

FACULTY OF GRADUATE STUDIES AND RESEARCH

PATENT POLICY (for inclusion in Statutes)

As recommended to the Board of Governors by Senate 16.3.66

*1. Principles and Objectives*

The University recognizes as a fundamental principle that it should maintain complete freedom of research and the unrestricted dissemination of information. Research done solely in anticipation of profit is incompatible with the aims of the University. Nevertheless it is recognized that in the course of its research activities ideas or processes may be developed on which, in the public interest, patents should be sought. The University and the inventor have a responsibility to promote the effective development and utilization of such discoveries, and to insure that they will not be restricted in their use in a way which is detrimental to the public interest.

It is also recognized that the effective development of patents based on their research activities have occasionally provided Universities with revenues which have made possible the encouragement of further research both in the field in which the patent was developed and in the University as a whole.

*2. Rights of the University, the Inventor, and Supporting Agencies*

(a) The University affirms its interest in all patentable discoveries or inventions of members of its academic, technical or administrative staff, or by students registered in its Faculties, or by other personnel engaged in its teaching or investigative programs, which are made in the course of the performance of their duties within or without the University, or which are made possible by a measure of University support.

(b) The University affirms that it will provide recognition to inventors through a share in the proceeds from their inventions in the following ways: i) The inventor and his academic associates will profit indirectly, through the allotment by the University of at least a portion of its income from the invention to their research programs. ii) A modest fraction of the profit should be given to the inventor himself, in order to encourage him to bring his invention to the patentable stage and to patent it under the auspices of the University and to provide him with a measure of direct reward that does not depend upon his continuing employment at the University. iii) The desires of the inventor with respect to the use of any surplus of revenues derived from his patents will be considered.

(c) The University affirms the principle that revenues from patentable inventions should normally be devoted to the further support of research.

(d) Under the terms of certain contracts and agreements undertaken by the University on behalf of members of the University with various agencies of government or other supporting bodies the University and the grantee may be required to assign patent rights to the granting or contracting agency. The University recognizes the equity of outside sponsors of research with respect to patentable discoveries made under such grants and retains the right to enter into such agreements when they do not conflict with its basic objectives.

(e) Notwithstanding the above, the University does not consider that it has an interest in the exploitation of the work of members of the University undertaken in their capacity as consultants to outside bodies nor in cases in which the invention results from the demonstrably private research of the University member.

(f) The University affirms that nothing in this policy statement has reference to revenue derived from royalties from copyrights on work which has been published.

(g) Acceptance of this policy is a condition of employment by the University, and of registration as a student, and of being accepted in any capacity in any University-controlled laboratory or program, and it is understood that no member of the University will enter into any patent negotiations without informing the University in writing to the Dean of Graduate Studies and Research that he is doing so.

(h) Procedures for implementing this Policy are deposited with the Secretary of the Board of Governors and the Dean of the Faculty of Graduate Studies and Research, from whom copies may be obtained. Representations relating to this Policy and its implementation should be made to the Dean for consideration of the University Patents Committee.

## Appendix 4



### Schedule A

OPERATING EXPENDITURES OF EDUCATIONAL INSTITUTIONS

Subject to the Act and these Regulations, the aggregate of the operating expenditures incurred for post-secondary education by or in respect of an educational institution or secondary institution shall include the following categories of expenditures:

(*a*) *Academic expenditures:*
Expenditures with respect to academic departments, laboratories, summer schools, extension courses, dean's and departmental offices, salaries and employee benefits, and other academic departmental budget items.

(*b*) *Library expenditures:*
Such ordinary expenditures provided for in the institution's annual budget as salaries, employee benefits, books and periodicals, binding and supplies in respect of the institution's main library, branch and faculty or departmental libraries.

(*c*) *Administrative expenditures:*
Expenditures in respect of operation and maintenance of administrative offices such as those of the president, principal, comptroller, bursar, registrar, accountant, internal auditor, purchasing agent, personnel and other administrative officers, including salaries and employee benefits.

(*d*) *Plant expenditures:*
Such expenditures in respect of the superintendent's office as janitors' and cleaners' salaries and employee benefits, supplies, repairs, fuel, electricity, gas, fire insurance, telephone service, vehicle operation and other operating expenses related to physical plant and grounds.

(*e*) *Miscellaneous expenditures:*
The expenditures incurred in respect of convocations, legal and audit fees, liability insurance, public relations, student placement services, counselling services and other general post-secondary institution expenses.

# Appendix 5



## Schedule B

(FORM 2)

POST-SECONDARY EDUCATION ADJUSTMENT PAYMENTS

FINAL PROVINCIAL RETURN TO THE
DEPARTMENT OF THE SECRETARY OF STATE

Province of————

Provincial return of post-secondary education operating expenditures for the Government of Canada fiscal year 19——-19——.

A. *Financial return for educational institutions that are not secondary institutions:*

1. *Gross operating expenditures* ..... ————

2. *Exclusions (if included in 1):*

(*a*) Total of amounts expended in respect of student financial aid ..... ————

(*b*) Total of amounts expended as or on account of the capital cost of land, buildings, physical plant, facilities or equipment
(Exception: books, periodicals etc. as in section 4(1)(*a*) of the Regulations) ..... ————

(*c*) Total of amounts expended as or on account of interest ..... ————

(*d*) Total of amounts expended in payment of a capital debt ..... ————

(*e*) Total provision for depreciation on buildings, physical pl‹ ', facilities or equipment ..... ————

(*f*) Total of amounts expended in respect of ancillary enterprises
(Exception: section 4(1)(*b*) of the Regulations) ..... ————

(*g*) Total of amounts expended as or on account of rent on land, buildings, physical plant, facilities or equipment
(Exceptions: 1. Rental charges for computer and data processing systems and photocopying equipment and a yearly imputed rental of a maximum of 20% of the purchase cost of same as in section 3(*d*)(i) of the Regulations. 2. Amount expended in respect of janitorial services, electricity, water, gas, fuel and municipal taxes, as in section 3(*d*)(ii) of the Regulations.) ..... ————

(*h*) Total of administration overhead expenditures of provincial government departments. _____

(*i*) Total of amounts expended for furniture and equipment and for alteration, repair, renewal or renovation of buildings. (If not already excluded in (*b*) above) ..... _____

*Total exclusions* ..... ..... _____

3. *Deductions* (if included in 1):

(*a*) Total of amounts received by educational institutions for assisted, sponsored or contract research:

(1) from Her Majesty in right of Canada or any agent thereof or from the Canada Council ..... _____

(2) from other sources ..... _____

(*b*) Total of other amounts received by educational institutions in respect of post-secondary education operating expenditures from Her Majesty in right of Canada or any agent thereof or from the Canada Council ..... _____

(*c*) Total of amounts paid to the province in respect of post-secondary education operating expenditures by Her Majesty in right of Canada or any agent thereof (which do not appear in institutional accounts as received from federal sources) ..... _____

*Total deductions* ..... _____

4. *Net operating expenditures* (Gross operating expenditures minus total exclusions and total deductions) ..... _____

5. Add: allowance for furniture and equipment, and for alteration, repair, renewal or renovation of buildings equal to 8.5% of net operating expenditures ..... _____

6. *Total operating expenditures* (4 plus 5) ..... _____

B. *Financial report for educational institutions that are secondary institutions:*

1. Aggregate allowable operating expenditures for post-secondary education ..... _____

2. Aggregate full-time enrolment in post-secondary programmes .... _____

3. Amount per student ..... _____

C. *Additional data required:*

A list of certified programmes offered at each post-secondary institution in the province with total full-time and total part-time enrolment in all of these programmes at each institution (the list should include programmes in institutions that are secondary institutions as well as programmes in institutions that are not secondary institutions).

NOTE: The listing of certified programmes, and the financial return and the financial report, must be signed and certified in accordance with the *Federal-Provincial Fiscal Arrangements Act,* 1967.

_____ _____

Signed Date

## Appendix 6

# BRIEFS

At the outset of the Study, in order to acquaint ourselves with the views of those directly involved with university research and with the Federal Government research support function, we invited the submission of briefs from universities and colleges throughout the country, all the departments and agencies of the Federal Government, and a number of private and semi-private bodies. We also asked the researchers and administrators with whom we met in our university hearings to encourage their colleagues to make whatever personal submissions they saw fit. As a result, we received a large number of briefs. It is the purpose of this Appendix to describe their content.

At the outset we wish to acknowledge the thoughtful co-operation of the very large number of individuals who participated in the preparation of the briefs. The ideas expressed in them were a rich source of inspiration and we learned much from them. Indeed the members of the Study Group owe to those who submitted briefs much of the credit for whatever originality we may have been able to incorporate into our Report.

### Briefs from the Universities

Briefs from the university sector were of four types: (a) those submitted in the name of a university; (b) those submitted in the name of a faculty, school or department; (c) those submitted by learned societies and other bodies rooted in the academic community; and (d) those submitted by individual members of some universities. Those in categories (a), (b) and (c) were usually the product of a committee of diversified composition, and in some cases, at least, the views of the professoriate were canvassed.

**Federal Goals in Support of Research**—The conviction that the Federal Government has a major though not exclusive role to play in the support of university research was unanimous; and the Prime Minister's statement to that effect presented at the Federal-Provincial Conference of October, 1966, was occasionally endorsed in the briefs. This federal role was most often defined as responsibility to ensure a balance in university research. Balance, it was stated, involves considerations of the relationship between basic and applied research, and also relative effort in research in different disciplines or

groups of disciplines. Other federal roles seen included the development of a national research policy and regional centres of excellence; the application of research to the solution of major Canadian social problems and the enhancement of national material well-being and prestige; guaranteeing a supply of trained manpower; and strengthening Canadian science. Also suggested as federal goals were the tasks of ensuring Canada's contribution to the international community, of encouraging work on peculiarly Canadian subjects, of providing for the performance of research not done by government agencies, and of reducing the dependence of Canadian universities upon American research funds and postgraduate education. One university saw the federal research support role as a tool in the forging of the Canadian identity.

In support of the above views, it was repeatedly pointed out that, in contrast to the situation in the United States, industry and private foundations contribute little to university research in Canada; that very little research is of provincial or local relevance only; that total dependence upon provincial funds would be unhealthy for the universities; and that only the Federal Government in Canada is in a position both administratively and financially to provide the valuable element of national competition and adequate sums of money. It was also observed that, to the extent that graduate student support is an element in research support, then the interprovincial mobility of graduate students constituted a compelling argument for federal involvement.

**University Goals in Research**—While the phraseology used varied considerably, there emerged from the briefs a clear consensus to the effect that the universities' goals in research lay in the production, transmission and application of new knowledge, or, alternatively, in discovery, in the training of new researchers and improvement of teaching and in the use of new information for solving practical problems. In spite of the occasional observation that, in certain disciplines, not enough university research is of an applied nature, the prevailing view was that basic discovery, and the pedagogic function of university research should take precedence over practical application. There was a general reluctance to assign priorities between the first two of these, and the brief which described the university as "an educational community where research is done" was exceptional. More frequent was the affirmation that the two were complementary and that universities would be well advised to maintain a research program of high quality in order to attract good teachers, although one brief urged universities to reflect in their administrative structure the fact that not all professors are both good teachers and good researchers.

Certain briefs assigned to the universities the goal of capitalizing on special local situations, geographic or other; others recommended concentrat-

ing on local problems; still others argued for more attention to developing a "balanced" program of research.

**Allocation of Funds**—The great majority of briefs from the university sector called for an increase in the level of federal support, but with marked variations in degree of urgency. At one extreme, it was generally acknowledged that while the natural and medical sciences could profitably use greater sums of money, they had benefited greatly by the large increases in support in recent years. The social sciences, on the other hand are increasing the number of qualified investigators and their research methods are becoming much more costly; a large number of briefs indicated therefore that the social sciences require large increases as soon as possible. It was often asserted that the health of these disciplines was in grave danger in Canada, the alleged shortage of research funds putting Canadian universities at a competitive disadvantage with American ones. The point was also made more than once that a great deal of research done by royal commissions could and should have been done by academic social scientists as a matter of course, had the proper support been available. The severest comment was reserved, however, for present research support in the humanities, which one brief described, typically, as "a national disgrace".

The recent quantum jump in Canada Council appropriations was gratefully acknowledged by several authors, but further such increases were urged, one major university lamenting the fact that its social science and humanities departments had received an average of only $3,000 per department in research support from all sources in 1966-67. Numerous references were made to the special problems of law, nursing, administrative studies, psychology, geography, education, religious studies and architecture, which, it was maintained have no clearly identifiable source of support or fall between the jurisdictions of two or more Councils. It was urged that steps be taken to ensure that all disciplines within the universities be adequately and unambiguously covered by the granting agencies. Increased support for *basic* social science research, in particular, was advocated by several authors.

A few briefs sought correction of an alleged NRC bias against applied research but another suggested that NRC leave the support of applied research entirely to the federal mission-oriented departments. NRC was, in fact, the object of much satisfaction, but hopes were expressed that, in particular, the renewable resource disciplines, applied engineering, theoretical physics and geophysics would soon enjoy higher levels of support, and that more money would be forthcoming for technicians and equipment needed in engineering research. Frequent reference was made to the need for greater support for group and inter-disciplinary projects. Some briefs advocated special support to the new universities and to those in economically depressed

areas where little or no support could be expected from industry. Two briefs specifically urged federal support of the creative arts in universities as part of research support.

**Scope of Support**—The briefs revealed a very deep concern in the universities for the hidden drain on university resources deemed to be the result of federally funded research; federal payment of the indirect costs attributable to federal research grants was urged in almost every university brief. One important brief was devoted entirely to this subject. Only one author expressed any reservations on this point. Usually the Bladen Commission's figure of 30 per cent was endorsed, but occasionally the figure used was higher. It was argued that this is the logical implication of a federal full-cost support policy. Similarly, several briefs called on the Federal Government to provide further capital assistance for research, to cover not just major equipment, but also buildings. It was suggested that grants-in-aid were, in a sense, a liability when not accompanied by provision for these ancillary costs. Repeated reference was made to the inadequacy of Canadian university libraries and a federal contribution was called for with considerable eloquence and urgency, especially by the humanists and social scientists, many of whom maintained that books were their test tubes, so to speak, and should form a part of any grant just as does minor equipment for an applicant to NRC. One brief suggested that Canada Council make block grants for library costs at the departmental level, others were content with the present system, but all wanted the present "state of emergency" remedied by the prompt provision of increased sums.

Only a minority of the briefs directly broached the question of federal contributions to professors' salaries. As a matter of principle, the feeling seemed to be that such contributions should not be made, except in the case of a research contract. This position was in some cases qualified, however, by considerations of expediency, as several briefs urged that grants be provided enabling humanists and social scientists to buy back teaching time from their universities for research purposes. This, it was felt, is one of their greatest needs. A plea arising mostly from the social scientists, was for federally paid summer salary supplements, which would, it was argued, improve the weakening competitive position of Canadian social science departments vis-à-vis their United States counterparts. It was felt that summer supplements could help to keep professors on campus, thus correcting the present lack of basic research in social science disciplines in Canada.

Most briefs took up the question of graduate student support. A large number of them denounced the practice, so common in the natural sciences, of supporting students through professors' research grants. Nevertheless, they still maintained that increased sums should be made available for doctoral

students, particularly in the social sciences and humanities. In addition, several briefs requested federal support at the Master's level. Only one brief said that support at this level should be left to the provinces; another argued that support here should depend on the research content of the Master's degree programs themselves. One author was very anxious that federal scholarships not be tenable abroad, since such tenability would dilute the healthy effect on Canadian graduate schools sought through increased student support.

Other cost categories repeatedly mentioned for increased federal support were: conference attendance, technical assistance, travel and publication (especially for humanists), computing time and hardware, research institutes or centres, and data collection.

**Government-University Liaison**—The general feeling was that while university-government liaison was rather good, especially in certain disciplines, there was still room for improvement. This, it appears, could be achieved variously by increasing opportunities for exchange of personnel, both faculty and graduate students, through summer jobs, sabbatical and leave arrangements, by harmonizing university and government regulations relating to research, by improving the flow of information between the two sectors as to what research is being done, and by better publicity, particularly on the part of Canada Council, regarding its granting system and procedures.

On the subject of joint government-university research establishments, opinion expressed in the briefs was divided. Among those who supported the idea in principle, there were varying views as to where administrative responsibility should lie—with one party, the other, or both. It was widely held that whatever the formal arrangements, success would depend primarily on the personalities involved.

**Award and Review Procedures**—The following points were made, most of them more than once: (1) grants above a certain value should involve site visits for review; (2) government in-house research should be subject to review by university personnel; (3) NRC methods (lack of red tape, etc.) should be emulated; (4) peer group adjudication is the best system; (5) progress reports should be kept to a minimum; (6) some grants should be for three to five years; (7) use of outside referees is desirable; (8) membership of NRC panels should change more often; (9) payment should be made directly to the individual grantee; (10) Canada Council should publicly clarify its awards and review procedures; (11) the small universities are under-represented on NRC committees; (12) Canada Council should use a wider range of referees than it does at present; (13) the number of good graduate students under a professor's supervision should be one of the

criteria considered in awarding grants; (14) Canada Council's present grant system is essentially sound; (15) awards should be announced earlier than they now are by NRC and most agencies; (16) NRC panels should be more specialized than at present; (17) Canada Council should adopt NRC'S committee system; (18) grants should be announced in August, to coincide with the academic year.

Opinion was evenly divided as to whether adjudication should focus on the applicant's record, the nature of the proposed project, or both.

**Organization of Federal Support**—Concerning the respective roles of the university-oriented research councils and the mission-oriented agencies, there was a marked preference expressed in a large number of briefs for preserving the present multiplicity of funding sources and, above all, for avoiding the establishment of a single agency for support of university research. This was occasionally qualified by the suggestion that the mission-oriented agencies should concentrate their support in fields directly relevant to their missions, and in one case that they might even confine their role to purchase by contract, except when strong manpower considerations dictated otherwise.

A variety of suggestions were made concerning the number and nature of federal organs to be involved. One university suggested the creation of a Ministry of Research and Development to oversee the whole of federal activity in this field. Most proposals were, however, more modest, in some cases involving the creation of a lesser organ to embrace a series of councils, similar in function to NRC, MRC and Canada Council. The proposed number of such councils varied from the present three to as many as six, with the potential new councils envisaged as covering such areas as education, engineering, business administration, renewable resources, social sciences, humanities, law, fine arts, new projects, interdisciplinary projects, and health sciences. On the other hand, a few briefs argued the need to avoid excessive proliferation of councils and one university argued that there was no need for a separate engineering council. Whatever the view on the desirable number of councils, the feeling was virtually unanimous that provision should be made to ensure that every discipline was the clear responsibility of at least one council. It was suggested that where there was uncertainty about the choice of sponsor, an overall umbrella agency might assign projects to one council or another, or that an inter-council committee might perform this task.

Still on the matter of councils, some briefs advocated the separation of Canada Council's patronage-of-the-arts function from its research support program. A few briefs supported separation of the humanities and social sciences. A large number of briefs took up the question of separating NRC's

university support program from its in-house function. Many were for such a split, arguing that there is an internal conflict of interest between these two sectors of NRC as presently constituted. A similar number, however, opposed it, arguing that the coexistence in a single body of the granting and operational functions was a healthy state of affairs. It is, therefore, interesting to note that one author advocated the establishment of a social science research council on the present NRC model, combining university support with an in-house function. Elsewhere, it was suggested that MRC's mandate be expanded so as to make that body a general health sciences council with responsibility for dentistry, nursing, pharmacy, etc., as well as for medicine.

Proposals were also made to expand the mandate of the Science Council to include responsibility for the social sciences and humanities, and to give it an advisory role on budgetary matters concerning both the research councils and the mission-oriented agencies.

More detailed proposals included the following: (1) that Canada Council increase university representation on its bodies; (2) that NRC create an associate committee on applied mathematics; (3) that the existing Humanities and Social Science Research Councils be given a larger role in research funding.

**Miscellaneous**—Other frequently repeated observations by the authors of the briefs included the following:

1. That, in the sciences, at least, too great a proportion of Canadian research effort is concentrated in Federal Government establishments, and that, while there were once good reasons for this, there should now be a relocation to the university sector.
2. That, while retaining the present grants to individuals, an increased amount of money should be made available for term grants, group support and departmental support, and that more agencies should offer grants comparable to the NRC Negotiated Development Grant.
3. That the Federal Government should establish a national research registry for information purposes.
4. That federal agencies should standardize their procedures and grant application forms.

**Briefs from Federal Agencies**[1]

Whereas the briefs from the university sector were of an almost entirely exhortatory nature, those received from the Federal Government agencies

[1] "Agencies" is used here in a general sense, to include all departments, boards, agencies, councils and Crown corporations of the Federal Government.

were largely concerned with describing the various activities of those agencies in support of research. The agencies were not, it should be noted, replying to an itemized questionnaire and the information contained in their submissions did not constitute a definite catalogue in this matter.

The briefs confirmed the fact that the vast majority of federal support to the universities is channelled through a dozen agencies or fewer. Several agencies replied simply that their ties with the universities were either negligible or nonexistent.

Support, where it occurs, assumes a variety of forms. In their briefs, 15 agencies indicated that they awarded grants-in-aid to individuals or groups of professors, 15 used contracts, 10 were involved in graduate student support (one supporting some undergraduates as well), six awarded some form of block grant to a university or faculty, three awarded post-doctoral fellowships, 11 made use of professors and graduate students as consultants, and nine provided student employment, notably in the summer. Ten agencies indicated that they were in the habit of making their research facilities available to professors and graduate students, eight said their personnel frequently gave lectures or participated in seminars at universities, two claimed that they employed academics to lecture to their staff, and several revealed that their personnel were involved in graduate thesis supervision, either alone or jointly with a university member.

The briefs described a variety of procedural practices with differences between divisions of some larger departments, even. Publicizing available support funds is done in some cases by informal word of mouth, in others by means of a limited mailing list, and in the case of the larger support programs, by wide distribution of appropriate literature in universities and colleges across the country. Most funding bodies require submission of a formal application although there are a few exceptions to this rule. The composition of selection or adjudication bodies varies, as well, from those made up entirely of personnel from the funding agency, through those using committees of mixed government-university membership, to those which, like one major granting agency with no in-house function of its own, use selection committees composed entirely of academics. Announcements of grant awards are generally made some time soon after the start of the government fiscal year, scholarship awards being made later in June or July. There are exceptions; one major agency entertains applications for grants at virtually any time. Payment of awards in most cases is made through the university business office, though some agencies pay money directly to the recipient, especially in the case of contracts. Graduate students abroad receive their scholarship money directly.

For liaison purposes, some agencies appoint university members or representatives of other agencies to some of their advisory bodies. Others described the numerous cross-appointment arrangements existing between universities and federal research establishments across the country, and the "liaison visits" made by members of some agencies to the universities.

Although primarily of a descriptive nature, these briefs did express the following opinions and recommendations:

1. The existence of high quality in-house research in a granting agency helps to avoid an unhealthy "bureaucratic approach" to funding.
2. Annual grant application enhances the chances of an upward revision of the support granted.
3. Universities need to establish adequate internal research administrative structures. This might facilitate formula granting for research or scholarships in the future.
4. To establish a separate engineering research council would be a regrettable and divisive step.
5. A single funding agency would be undesirable.
6. Provinces have an important complementary role to play in university research support.
7. The Federal Government should consider capital grants to industry or joint grants to an industry and a university for use in setting up research establishments on university campuses.
8. Direct support of research institutes is preferable to joint staffing from the agency's point of view.
9. Canada needs more basic economic research and perhaps an independent institute of economic research.
10. Provision for improved liaison and sharing of facilities between universities and the Federal Government should be encouraged.

Opinion was divided on the subject of indirect costs, with two agencies firmly against federal contribution thereto and two agencies willing to contribute at least partially.

One major mission-oriented agency felt it should assume the major role for all types of research support in the disciplines related to its mission.

**Briefs from Private and Semi-Private Bodies**

Briefs in this category received by the Study Group were few in number. They sought, in most cases, to summarize the activities of their respective

organizations and to state the case for increased appropriations from the Federal Government for their respective fields. They demonstrated a detailed grasp of the issues involved in federal support of university research, and their observations covered the same wide range of topics raised in the university and government briefs, often endorsing views expressed therein. A few of these briefs suggested that their organizations, given federal appropriations, might be able to play a useful role as funding bodies, thus capitalizing on the expertise assembled in them.

**Conclusion**

It has not been possible to reproduce here all the views expressed in the briefs received by the Study Group. Our purpose has been to summarize the main issues and indicate the scope of the comment which we received.

## Appendix 7

# ORGANIZATIONS AND INDIVIDUALS SUBMITTING BRIEFS

### BRIEFS RECEIVED FROM THE UNIVERSITIES[1]

Alberta
Bishop's
British Columbia
Brock
Calgary
Carleton
Dalhousie
Guelph
Laurentian
McGill
McMaster
Memorial
Ottawa
Queen's
Saskatchewan
Simon Fraser
Sir George Williams
St. Francis Xavier
Toronto
Trent
Victoria
Waterloo
Western
Windsor
York

### BRIEFS RECEIVED FROM ACADEMICALLY BASED ORGANIZATIONS

Association of Canadian Medical Colleges
Association of Universities and Colleges of Canada
Atlantic Provinces Inter-university Committee on the Sciences
Canadian Association of Geographers
Canadian Economics Association
Canadian Institute of Onomastic Sciences
Canadian Political Science Association
Canadian Psychological Association
Canadian Society for the Study of Religion
Canadian Sociology and Anthropology Association
Executive Committee of Canadian Association of Graduate Schools
Executive Committees of Humanities Research Council and Social Sciences Research Council
Tri-universities Fine Arts Committee (Simon Fraser, Victoria, British Columbia)

[1] In many cases several submissions were received from a single university, representing individual disciplines or groups of disciplines. These are not listed separately.

## BRIEFS RECEIVED FROM GOVERNMENT AGENCIES

Agriculture
Atomic Energy of Canada Limited
Bank of Canada
Canada Emergency Measures Organization
Canadian Broadcasting Corporation
Canadian Dairy Commission
Canadian National Railways
Canadian Patents and Development Ltd.
Defence Research Board
Dominion Bureau of Statistics
Dominion Coal Board
Economic Council
Eldorado Mining & Refining Ltd. (now Eldorado Nuclear Ltd.)
Energy, Mines and Resources
External Affairs
External Aid Office (now Canadian International Development Agency)
Farm Credit Corporation
Fisheries Research Board
Forestry and Rural Development
Indian Affairs and Northern Development
Industry
Justice
Labour
Manpower and Immigration
Medical Research Council
National Capital Commission
National Film Board
National Gallery of Canada
National Research Council
Polymer Corporation
Registrar-General (now Consumer and Corporate Affairs)
Royal Canadian Mounted Police
St. Lawrence Seaway Authority
Transport
University Grants Commission (Manitoba)
War Veterans Allowance Board

## BRIEFS RECEIVED FROM NON-GOVERNMENT, PRIVATE ORGANIZATIONS

Addiction Research Foundation of Ontario
Arctic Institute of North America
British Columbia Research Council
Canadian Arthritis and Rheumatism Society
Canadian Association for Advancement of Health Sciences
Canadian Council on Urban and Regional Research
Canadian Heart Foundation
Canadian Mental Health Association
Canadian Nurses Association
Canadian Organization for Joint Research
Canadian Peace Research and Education Association
Institute of Public Administration of Canada
National Cancer Institute of Canada
Ontario Cancer Treatment and Research Foundation
Ontario Research Foundation

## BRIEFS RECEIVED FROM INDIVIDUALS[2]

| | |
|---|---|
| E. Bouvier | Dept. of Economics, University of Sherbrooke |
| D. A. Chant | Dept. of Zoology, University of Toronto |
| P. Copes | Dept. of Economics and Commerce, Simon Fraser University |
| J. A. Easterbrook | Dept. of Psychology, University of New Brunswick |
| L. Ferguson | Dept. of Geology, Mount Allison University |
| R. M. Grainger | Faculty of Dentistry, University of British Columbia |
| W. F. Graydon | Associate Dean, Faculty of Applied Science and Engineering, University of Toronto |
| W. N. Hull | Dept. of Politics, Brock University |
| C. McCulloch | Dept. of Ophthalmology, University of Toronto |
| K. G. McNeill | Dept. of Physics, University of Toronto |
| M. L. Northway | Institute of Child Study, University of Toronto |
| G. L. Reuber | Dept. of Economics, University of Western Ontario |
| A. J. Rhodes | Director, School of Hygiene, University of Toronto |
| A. E. D. Schonfield | Dept. of Psychology, University of Calgary |
| D. L. T. Smith | Dean, Western College of Veterinary Medicine, University of Saskatchewan |
| G. F. G. Stanley | Dean of Arts, Royal Military College |
| K. W. Studnicki-Gizbert | Dept. of Economics, York University |
| M. E. White | Dept. of Classical Studies, University of Toronto |
| P. H. White | Dean, Faculty of Commerce and Business Administration, University of British Columbia |

[2] In addition to those listed above a number of individuals submitted briefs as part of their university's submission.

## Appendix 8

# UNIVERSITIES WITH WHICH STUDY GROUP MEMBERS VISITED

Alberta (Edmonton)
Bishop's
British Columbia
Brock
Calgary
Carleton
Dalhousie
Guelph
Laval
Manitoba
McGill
McMaster
Memorial
Moncton
Montréal
Mount Allison
New Brunswick
Ottawa
Queen's
Saskatchewan (Saskatoon and Regina)
Sherbrooke
Simon Fraser
Sir George Williams
Toronto
Trent
Victoria
Waterloo
Western
Windsor
York

## Appendix 9

# FEDERAL AGENCIES AND DEPARTMENTS WITH WHICH STUDY GROUP MEMBERS VISITED

Agriculture

Atlantic Development Board

Atomic Energy Control Board

Atomic Energy of Canada Limited

Canada Council

Canada Emergency Measure Organization

Canadian Patents and Development Limited

Central Mortgage and Housing Corporation

Defence Research Board

Dominion Bureau of Statistics

Dominion Coal Board

Economic Council

Energy, Mines and Resources

External Affairs

External Aid

Fisheries

Fisheries Research Board

Forestry and Rural Development

Indian Affairs and Northern Development

Industry

Labour

Manpower and Immigration

Medical Research Council

National Design Council

National Film Board

National Health and Welfare

National Museums of Canada

National Research Council

Privy Council

Secretary of State

## Appendix 10

# OTHER ORGANIZATIONS WITH WHICH STUDY GROUP MEMBERS VISITED

Association of Universities and Colleges in Canada

Canadian Agricultural Economic Research Council

Canadian Council on Urban and Regional Research

Canadian Heart Foundation

Humanities Research Council

Institute of Public Administration of Canada

Social Science Research Council

# Minority Report

*by*

L. P. Dugal

## THE ROLE OF THE FEDERAL GOVERNMENT IN SUPPORT OF RESEARCH IN CANADIAN UNIVERSITIES

In early summer of 1967, the Science Council and the Canada Council appointed a committee to submit a report on the role of the Federal Government in the support of research in Canadian universities. This committee consisted of members chosen by these two organizations under the chairmanship of Roger Gaudry, Rector of the Université de Montréal. To be of value, this Report had to be based on a thorough, detailed and well-documented investigation of the present structures of the federal organizations which grant financial aid in support of research in universities, of the procedures that were being followed, of the effectiveness of this aid, and so on. Moreover, the Report was expected to make recommendations based on the information the investigation would produce.

The Gaudry Committee entrusted Dr. J. B. Macdonald, former President of the University of British Columbia, with the responsibility of making recommendations. Dr. Macdonald selected a group of collaborators whose names appear in the foreword to the Report. It was also agreed at the beginning that the Macdonald Report would be published in full, irrespective of the reception it received by the Gaudry Committee, the Science Council or the Canada Council.

I was the only Quebec member of this working group and, despite the friendship and high regard I have for my colleagues, I find myself obliged to reject some of the recommendations of this Report and to disassociate myself from the philosophy which underlies it, which is not so clearly expressed as implied.

First of all, I wish to say that the listing of my name as co-author on a document describing the role of the Federal Government in university research does not imply that I acknowledge the exclusive jurisdiction, or even the priority, of the Federal Government in this area. Here, the sharing of powers between the federal and provincial governments entails a constitutional problem which does not fall within our competence; we were of course clearly aware that on the one hand it was the Federal Government that first contributed to the development of research in Canadian universities, and which continues to so do through its councils, boards and departments; on the other hand, we knew, as does everyone else, that education is under the jurisdiction of the provinces.

Pending the solution of the constitutional problem mentioned above, I think that the working group should have concentrated on putting existent facilities in order; until now, there has been no uniform granting policy

among the various federal agencies. The working group should have carried out the most detailed investigation possible, analyzed existing conditions, and made recommendations to improve or maintain present methods, procedures and structures at the federal level.

The investigation was conducted over the past two years and the Report has now been completed. Let me say that, on the whole, it represents a considerable amount of work, a source of valuable information and an excellent defence of the importance of research in the universities.

But the Report does not take sufficient cognizance of the fact that the English-speaking universities are not the only ones in our country, and that in the area of research the French-speaking universities have always been handicapped. The French-speaking universities have always had more trouble than their English counterparts in recruiting from outside Canada a sufficient number of research workers with enough seniority to get research awards, usually granted on the basis of excellence; they have never been pampered by gifts or endowments from those financial firms or wealthy people who, we must bear in mind, accumulated their wealth, at least in part, from the French-Canadian consumer or through the exploitation of Quebec's natural resources. They had little or no representation on the granting agencies of the Federal Government. (See Appendix 6: If the amounts granted by these agencies to the Canadian universities were totalled, it would become obvious that in 1966-67 the French-speaking universities of Quebec received less than $1 million of a total of $13 million granted by these agencies; conditions were almost the same in 1967-68). Only three organizations—the National Research Council, the Canada Council and the Medical Research Council—have granted a higher proportion of research money to the French-speaking universities of Quebec (up to 13 per cent of the total), but this proportion is still much lower than it should be.

I think that the working group should have brought attention to this situation, sought out the reasons for it, and made appropriate recommendations to rectify the disproportionate distribution outlined above. But it did not see fit to do so. It seems even that such recommendations were purposely avoided, at least this impression is given by Table 3:2 (page 45) which lists for each year, from 1962 to 1967 inclusive, the total awards granted for research in Canadian universities; specific universities are not listed but, instead, are quoted in group areas (Western Provinces, Ontario, Quebec and Maritime Provinces). Thus, the amounts listed for Quebec do not provide any information on the division of funds between the English-speaking and the French-speaking universities.

In a last-minute effort to correct this basic weakness of the Report, the concept of "High merit" so cherished by the other group members was toned down (Recommendation 12) as indicated in the following examples: (a) the Strategic Development Grants (Recommendation 17), which mentions that

some equilibrium between the English-speaking and French-speaking universities should be maintained when evaluating the merit factor, (b) Capital Expenditures Grants (Recommendation 60), where the notion of equilibrium between French-speaking and English-speaking universities is taken into account in defining the merit on which the award should be based. I feel this most important problem received far too little attention in a report of such major length, with the result that a solution which is most urgently required may be further delayed.

I must say, in deference to my colleagues, that we had too little time to investigate and analyze the voluminous documents which pertained to the study, and that the problem of French-speaking universities did not constitute their main concern; their philosophy, often apparent in the Report, is that the policy of granting awards must be based on the criterion of excellence only, the "High merit" which is repeatedly stressed (except for the two small provisos mentioned above). This is not a realistic policy because it does not take into account the present state of university affairs in Canada. I would agree with such an ideal policy if all universities enjoyed the same favourable conditions for attaining the desired excellence; the fact is that for many reasons desirable or minimal excellence is not reached at the same time by every individual or organization. Many research scientists, laboratories, and institutes today enjoy a level of excellence they certainly did not have when they received their first awards. Had they been subject to the same policies as are now proposed, they would not have been eligible for the awards they received, often very large, which enabled them to attain their present level of excellence, so that they now consider themselves the guardians of truth and efficiency in the field of research.

I believe, therefore, that the policy proposed by the working group would be unjust to a large number of Canadian universities and certainly to the French-speaking universities. This is why I must disassociate myself from the underlying philosophy of the Report.

I feel, also, that some specific recommendations are quite unacceptable, and especially those which are mentioned in Chapter 9, dealing with federal grants for capital expenditure. Certainly universities need capital-expenditure grants, but I cannot support a recommendation for a federal-provincial conference which might result in the Federal Government or a federal organization paying in whole or in part for buildings devoted to research. It could have been suggested simply that a federal-provincial conference should study the problem of the lack of space for research, which at present constitutes a limiting factor in the development of research in some universities. I acknowledge this to be a real problem. But it is impossible for me to agree with the recommendation as it is worded, nor with the other concepts, suggestions, reasoning or stated principles as expressed in Chapter 9. For example, (a) the first paragraph (page 185), which does not leave much responsibility for, nor recognize the jurisdiction of the provinces in, the area

of support of university research, (b) the acknowledgement of the position taken by the Federal Government in 1967 (page 189 No. 5), (c) the allotment of funds based on merit (rather than a per capita allotment or any other method) of grants for research buildings; (the last point adds to my basic objection to Recommendation 60 as mentioned above).

Here the Report has strayed far from the intention, expressed by some of us at the beginning of our investigations, to draw up recommendations that would allow the provincial and federal governments to act as real partners in the area of financing research in the universities.

I do not agree, moreover, with Recommendation 3, which would require a complete separation between the National Research Council and its laboratories. I believe that very close co-operation between the two proposed organizations is essential and that the best way of achieving it is to keep both divisions under the authority of one president, making sure that different vice-presidents have specific responsibilities, e.g., one for the guidance and development of laboratories, the other for policy and methods of granting. The Research Council Division will always need the help of eminent scientists from the Council's laboratories to evaluate suggested research programs, and the laboratories will always need the sound judgment and experience of university staff members and other members of the Council Division. Such a system has worked well up to now. There was, of course, room for improvement, and I am happy to note that serious efforts have been carried out toward this end. I do not see any justification for carrying out the drastic separation that is recommended.

I hesitate to endorse or to reject Recommendations 4 and 5, because I know very little about the structures and procedures of the Canada Council. But here again, I think that one Council with two divisions, one for the arts and the other for the humanities and social sciences, would more easily attain its intended objectives.

I am somewhat concerned by the vagueness of Recommendation 10; how would the seven members (why seven?) be chosen, what will their influence really be in the establishment of priorities, etc.?

I must add that the Report does not mention a point which I deem essential: that is, that members of committees, councils, etc., as mentioned in the various recommendations should be bilingual, or at least they should understand French sufficiently so that the French-speaking members would be able to express themselves in their own language, and *be understood.*

With regard to the other recommendations, I think their implementation would bring a notable improvement to the present system, so long as the "status quo" is not modified. I am thinking especially of recommendations 23 and 66.

A) *Recommendation 23* deals with the indirect costs of research grants; for each such grant made by the Federal Government to the research workers

in our universities, the latter and, indirectly, the provincial governments must pay the direct costs (estimated at 35 per cent, cf No. 24). The Federal Government later transfers 50 per cent of these costs to the provinces (fiscal transfer of 1967). Thus, under the present system, the Federal Government forces the provinces to pay 50 per cent of indirect costs of all such research the Federal Government initiates. Recommendation 23 would correct this situation, and would require the Federal Government to pay 100 per cent of the indirect costs ascribable to such grants.

B) *Recommendation 66* would allow the provinces to add the costs generated by the granting of graduate student scholarships to the expenditures already accountable under the 1967 agreement (fiscal transfer). The provincial government would establish the pecuniary value of scholarships for these students (including foreign students) and, of course, it would establish its policy and methods of allocation; but the Federal Government, under this recommendation and this agreement, would pay half of the costs.

Finally, I must stress that when I wrote this commentary on the Macdonald Report, I had at my disposal only the English text submitted to the Gaudry Committee on February 13, 1969. The French version reached me on February 28th, which was too late for me to read it with care (it was a document of more than 500 pages) and add to my other remarks an evaluation of the translation itself.

NATIONAL RESEARCH COUNCIL OF CANADA


A COMMENTARY ON

SPECIAL STUDY NO. 7

# THE ROLE OF THE FEDERAL GOVERNMENT IN SUPPORT OF RESEARCH IN CANADIAN UNIVERSITIES

WHICH WAS PREPARED
FOR THE
SCIENCE COUNCIL

NATIONAL RESEARCH COUNCIL OF CANADA

A Commentary on

Special Study No. 7

"THE ROLE OF THE FEDERAL GOVERNMENT IN SUPPORT OF RESEARCH IN CANADIAN UNIVERSITIES"

which was prepared
for the
Science Council

Foreword

The activities of the National Research Council continue to be dependent on a well-informed appreciation of the needs of science and engineering in Canada. Comments contained in this document constitute a summary of views expressed at a recent meeting of the National Research Council. In making these available for your information, I should also like to invite your comments to assist Council in the continuing effective development of scientific and industrial research in Canada.

W.G. Schneider
President

June 17, 1969

Introductory

The recommendations in this Special Study No. 7 prepared for the Science Council of Canada were a major topic of discussion at the meeting of the National Research Council held in Ottawa on 16-17 June. Although its own views differed in a number of respects from those expressed in the Study, the Council nevertheless welcomed the appearance of the Study as an indication of national concern for the healthy development of all research disciplines in Canadian universities.

Many of the 77 recommendations of the Study deal with procedural and administrative matters. A large number of these are in use by the National Research Council. The main policy recommendations deal with the broadening of the financial support in several directions, the formation of three councils to distribute the funds, and an enlarged mandate to the mission-oriented agencies and departments of the Federal Government to solicit and support university research on essentially the same basis as the councils. The National Research Council concurs with the recommendation for enlarged research support by federal departments and agencies but questions whether such support provided on the same basis as that of the councils is necessarily the most appropriate.

Reconstitution of Federal Councils

In order to insure support for all disciplines recognized by Canadian universities, the Study recommends three administratively identical councils: a reconstituted National Research Council, the Medical Research Council, and a Humanities and Social Sciences Council. In addition it recommends the formation of two umbrella committees, one to coordinate the policy and programs of the three councils, and another to give independent advice to Treasury Board.

The intracouncil coordinating committee (which now exists as a less formal structure) could perform a useful role in insuring support of interdisciplinary research. It seems likely that mission-oriented departments and agencies will provide increasing support for university research and this will require the councils to perform an effective "balance-wheel" function and to ensure adequate support for all disciplines. Such a role will require greater coordination between the various departments and agencies and the related councils. Unfortunately this matter was not dealt with by the Study Group.

One of the recommendations of the report states: "The National Research Council be reconstituted so as to have as its sole responsibility the support of scientific and engineering research

in universities and related institutions" (Rec. 3). This recommendation would split the Council's university support program from its other two programs - laboratory operation, and support of research in industry. A significant omission of the Study is that it makes no mention of the Council's Industrial Research Assistance Program. Through this program university personnel may participate in the advancement of industrial research.

At a time when there is a great need for the coordination and interaction of scientific and engineering research in universities, government and industrial laboratories, the recommended split in an organization that has gone a long way toward these objectives, seems to be a retrograde step. For example, the National Research Council has some forty active associate committees made up of government, university and industrial personnel, and university participation at the research level is made possible through the grants program. In addition there are PIER fellowships that permit personnel with industrial experience to return to university, and the reverse proposal of having industrial fellowships has been approved by the Council and is now in the course of being implemented. Other examples of programs designed to effect a greater coupling of university, industry and

government research are in existence or are being planned.

The functions assigned to the councils in the Report are primarily passive, namely, to fund research originating in the universities on the basis of merit. This is an important function but Council considers that it must maintain a more active role as it has in the past, for example, by the initiation of negotiated major grants, the Industrial Research Assistance Program and other programs to advance Canadian science and engineering research. The needs may be different for the disciplines served by the other councils but in science and engineering the three-way coupling of research in universities, government and industry should be strengthened, and this also requires that NRC play an active role.

It is evident from the report that the Study Group received more favorable comments than criticism on NRC's past policy, performance and procedure in making university awards. Indeed, most of the procedural recommendations are modelled after NRC practice. After reviewing the history of NRC, it is stated (p. 102) that: "These changes provide ample evidence of NRC's ability to respond to changing conditions and requirements over the years". However, the report takes little cognizance of the recent evolutionary changes in Council policy

made in response to rapidly changing conditions. Instead, the Study Group recommends an evolutionary pattern that would tend to dissociate university research in science and engineering from related research in government and industrial laboratories.

The basic reasons given for splitting NRC lack conviction and are sometimes based on limited information. The arguments include, "increasing divergence in the functions of the intramural and extramural programs"; the university awards program will grow more rapidly than the intramural program; more sophistication will be required in administering grants; NRC laboratories and the university support program need independent spokesmen. Some of them appear to be based largely on lack of information; for example, "The use of NRC scientists as conveners of grant selection committees is inadequate to meet modern demands".

The facts are as follows:

1. Each of NRC's three major programs - university research support, industrial research assistance, and intramural research is funded by separate non-transferable Parliamentary votes that involve completely independent decision-making. These decisions are made at the political level, and not by Council.
2. The Members of the National Research Council are appointed by Cabinet from universities and

industry. From its members Council names a committee on Budget and Forecasting, and Committees on Annual Grants, Negotiated Major Grants, and Scholarships and Fellowships, which make recommendation to Council on all policy matters in their areas. The Budget and Forecasting Committee is responsible for preparation of budget estimates and assigning budget allocations to each grant selection committee.

3. Each of the three major programs of Council has its own vice-president who has executive responsibility for the particular program and reports directly to Council. The Vice-President (Awards) is in charge of the awards office where all staff work is done.

4. Grant selection committees are made up of six to eight university staff members appointed by Council for three-year terms. One of their number acts as chairman. The conveners' functions and duties are misrepresented in the report of Special Study No. 7. The convener is an active researcher from NRC staff or government laboratory who is knowledgeable in the particular discipline. He acquaints himself with all applications, insures that all relevant information is available, and that each case gets a fair hearing. The Chairman may or may not request his opinion on the

scientific merit of a particular application.

5. Policy and decision-making respecting the university grants program is sole responsibility of the appointed Council, (and its committees), and not of NRC laboratory staff.
6. Starting with information provided by universities, forecasting studies initiated by Council form the basis of periodic reports on projected fund requirements of university research in science and engineering. These forecasts, which provided some of the data quoted in the report of the Study Group, serve as the basis for budgetary requirements laid before Parliament.

There is a tendency throughout the Report to equate university research with basic research. In fact, a large part of university research financed by NRC is not basic research but applied research. While the Council must maintain strong support for truly basic research, it must also play an active role in applied fields and relate the proposed projects to others going forward in government, industry and other university laboratories.

The Council has created a number of interfaces between industry and universities that have made industry aware of the universities' research capabilities and conversely provided uni-

versity personnel with challenging research opportunities. For example, an industry participating in the Industrial Research Assistance Program may have part of its work done in a university if the company lacks the necessary facilities. Another interface between universities and industry is provided by the Council's subsidiary, Canadian Patents and Development. Through this organization a university invention can be patented and licensed to industry.

Areas of Support and Their Financial Implications

The Study Group makes a number of recommendations that would require the Federal Government to invest substantially larger sums for the support of university research. Among the recommended expenditures is $120 million annually for research buildings, $4 million annually for libraries, and other substantial expenditure items that are not estimated, for example, the payment of full direct costs plus 35% to cover indirect costs. Recommendations requiring "available" funds for financing major proposals by the councils, start-up costs by mission-oriented agencies and many others are too open-ended to permit an estimation of cost.

Regarding the provision of Federal Government capital grants for research buildings, there can be no doubt that the housing of research facili-

ties. Council has provided some facilities for marine sciences and other activities but has necessarily had to limit such demands on its funds. Council strongly endorses this recommendation particularly for high-priority programs and for specialized research facilities. A federal-provincial conference, as recommended, is an essential first step, considering the joint responsibility of the two levels of government and the scale of funding required.

Library support is requested primarily for the humanities and social sciences but NRC is also requested to provide support for libraries in science and engineering. In the past, with resources limited, Council has found it difficult to regard this as a high-priority item. Library facilities may be a limiting factor in new universities but, in general, science and engineering research seldom requires an extensive backlog of old volumes (available through the National Science Library on request) and current periodicals are available at most institutions.

The Study recommends that the Federal Government pay all direct costs of the research it supports in Canadian universities. This is reasonable for all mission-oriented "purchased" research but is difficult to apply to grants provided for basic research support on a purely "merit" basis.

For example, an investigator may apply for $50,000 and receive $25,000, depending on "merit" and budgetary constraints. The sum awarded is deemed adequate to pursue the proposed research albeit on a less ambitious scale or at a slower pace, i.e., fewer technicians, postdoctorate fellows etc. In this sense the meaning of "full direct costs" is not at all clear.

Payment of indirect costs at a rate of 35% of the direct research support is also recommended by the Study Group. This is likewise complex. The Federal Government now pays to the provinces 50% of such costs through fiscal transfer arrangements. If the formula used by a province for financing its universities is based only on educational parameters, or makes inadequate allowance for the indirect costs generated by grants from other sources, then these indirect costs must be borne by the general university budget.

For some years NRC has provided each university with general research grant equal to 7½% of the grants awarded to that institution. As operating grants are tied to the individual researcher, this modest formula grant provides the university administration with a flexible contingency fund. This fund cannot be regarded as a contribution to indirect costs since it may be used largely for direct cost items. Council in the past has

favored increasing this type of grant as a basic institutional grant for research support. The Study Group recommends that this kind of non-adjudicated grant should be discontinued when strategic development grants are initiated, presumably on the assumption that indirect cost will be paid as recommended. Whether the development of research in universities might benefit more from augmented funds for direct costs, rather than using such funds for indirect costs, will require more detailed study.

The report recommends several types of major grants including: group or program grants; negotiated development grants as used by NRC "to build on strength"; and negotiated development grants as used by MRC, retermed strategic development grants, "to recognize desire and willingness to initiate a significant program where it does not exist". These strategic development grants have been widely interpreted in two ways: (1) support of a new program (disciplines), and (2) as a means of reducing regional disparity - an interpretation also used in the minority report (p. 358). These two interpretations of strategic development grants are based on entirely different needs.

Over the years NRC has made a number of major grants that appear to differ in name only from those recommended. Block grants (i.e., group

or program grants) were made for a number of years and found to be unsatisfactory to the recipients. The Institute of Parasitology at McGill and the Institutes of Oceanography at UBC and Dalhousie University were started and supported on the basis outlined for strategic development grants. The more modern form of negotiated development grants has as one element of the negotiation the assurance that the university can take over the salary and other responsibilities within a limited period. While the report recommends a similar procedure for strategic development grants, this will require close examination if they are used to rectify regional disparities, as both the university and province will have to agree to future commitments.

The Study Group noted that NRC has been the only federal agency making computer grants on a lump-sum basis and now recommends that this be discontinued and that research computation costs be supported from the normal operating grants. As noted in the report, lump-sum grants were necessary at the outset to develop viable computing centres. The discontinuation of computer grants and the transfer of computation costs to operating grants has been under active consideration by Council for some time with a view to early implementation.

In recent years the Council has also

given a good deal of consideration to the problem of graduate student support. The recommendations in the report of the Study Group highlight the problems but the proposed solutions are less certain. They recommended that student support from grants be discontinued, that scholarships be reduced to about 10% of the graduate enrollment, and that student support from provincial and university sources be allowed in fiscal transfers.

Council scholarships are at present restricted to Canadians and landed immigrants. The number awarded in 1967-68 was about 16% of the total graduate student population in science and engineering. This proportion has been declining in recent years. A more permissive policy has been in effect with respect to support of graduate students under research operating grants. This was desirable when trained personnel were in short supply and it made possible the augmentation of a limited supply of Canadian students by a substantial number of foreign students. However, the situation is now changing and existing policies are being re-examined. A complete and sudden withdrawal of student support from operating grants would be likely to cause serious difficulties in many universities, and accordingly any change in policy must be phased in gradually. A major advantage in permitting student support under grants

is that it tends to encourage graduate students to work under the supervision of the most competent researchers. The Study Group recommendations for support of graduate students, other than those supported under the Council's scholarships, may tend to put universities in some provinces at a disadvantage. It is not yet clear that these recommendations are adequate and whether their implementation in the near future is feasible.