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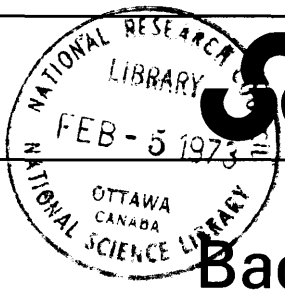

Background Study for the Science Council of Canada

December 1972
Special Study
No. 25

National Engineering, Scientific and Technological Societies of Canada

Perspectives and Recommendations
by the Management Committee
of SCITEC
Background Study
by Prof. Allen S. West

December 1972

National Engineering, Scientific and Technological Societies of Canada

"Many attacks have lately been made on the conduct of various scientific bodies, and of their officers, and severe criticism has been lavished on some of their productions. Newspapers, magazines, reviews and pamphlets have all been put in requisition for the purpose."

Charles Babbage, *Reflections on the Decline of Science in England and on Some of Its Causes*, 1830.

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Ottawa, 1972

Foreword

On the 26th of July, 1971, the Science Council of Canada contracted with the Association of the Scientific, Engineering and Technological Community of Canada (SCITEC) to carry out a study of the scientific, engineering and technological societies in Canada. The plan was, first, to make an inventory of these societies and their problems and, second, to recommend how these societies might better serve Canada in matters of science policy and in the attack on current problems such as highly qualified manpower and professionalism. In particular, it was hoped that the study would lead to questions regarding the interrelationships of these societies and how they might respond more expeditiously to matters of public concern in the scientific domain.

The study was to be managed by a committee. The original members of this Management Committee were Drs. J.B. Armstrong, M.P. Bachynski, Louis Berlinguet, V. Douglas, E.J. LeRoux, J.A.F. Stevenson and Mr. W.G. McKay; at the time of completion of the report, the membership included Drs. Armstrong, Bachynski, Berlinguet, Douglas and P.A. Forsyth, and Messrs. McKay and J.-L. Meunier. Agreement was reached that the study would be carried out by Dr. Allen S. West, on leave from Queen's University.

The original proposal for the study was the result of concerns within SCITEC which were warmly endorsed by the Science Council. Why SCITEC should wish to undertake the study I think is so obvious as to need no further comment from me. The endorsement by the Science Council and its willingness to finance the study were based partly on a desire to see SCITEC fulfill its promise, and partly on concern about the current fortunes of the scientific societies in Canada.

The Council had published its "Open Letter to Physicists"[1], pointing out the need for societies to become active in certain directions. The Council was aware in general, but not in detail, of the number of professional and learned societies in Canada and the very small membership of many of them. It knew also that many of the societies were in financial difficulties; in fact, the only ones that appeared to be healthy were those in areas such as medicine, law and engineering, in which there were provincial accrediting or licensing associations. The Council was aware also of the financial solvency of the U.S. counterparts of many of the Canadian discipline societies, and of the fact that much of their financial well-being came from government contract work. The equivalent opportunities were not available in Canada because of an apparent unwillingness on the part of governments to contract out the kind of work that the societies could undertake.

The Science Council therefore wished to see the societies find a way to overcome their financial problems, to secure government contracts if this were feasible, and in general to meet the challenges that society in Canada was laying before them. It was almost axiomatic that the Science Council should try to achieve these goals by contracting out to the appropriate

[1]O.M. Solandt, "Open Letter to Physicists from the Chairman of the Science Council of Canada". *Physics in Canada*, Volume 26, No. 7, November 1970. Pages 130-135.

society, thereby demonstrating the talents and competence available to others who might choose to follow this same route.

The terms of the contract have been fulfilled to everyone's satisfaction, and the association between SCITEC and the Science Council has been excellent throughout.

We have chosen to publish under a single cover a statement made by the Management Committee of SCITEC, presenting their perspectives and recommendations, and the detailed background study written by Dr. Allen West. We think they are both important contributions to the study of the central issue. We hope in this way to assist SCITEC in furthering the well-being of the national engineering, scientific and technological societies in Canada and their contribution to Canada and Canadians in the future.

As is usually the case in background studies, Professor West has gathered a wealth of information which does not find its way into the final text of his report. This material is held in the archives of the Science Council; those wishing to review it may write to the Records Officer, Science Council of Canada, to arrange an appointment. (The Council's full address appears on page 4 of this report.)

As with all background studies, the perspectives and recommendations of the Management Committee of SCITEC are theirs, and the background study by Professor West is his, and neither necessarily reflects the views or opinions of the Science Council.

P.D. McTaggart-Cowan
11 October, 1972

Perspectives and Recommendations

by the Management Committee of SCITEC:
J.B. Armstrong, M.P. Bachynski, L. Berlinguet, V. Douglas,
P.A. Forsyth, J.-L. Meunier, W.G. McKay

Perspectives

The last decade has seen a growing awareness on the part of the public and of government that the government must play a vital role if science is to be made more responsive to national needs. But the long debate on science policy has tended to ignore the need for a mechanism by which the government, in developing and implementing policy decisions, may communicate with the scientific community. The lack of rapid and reliable communication with the scientific community has caused repeated embarrassment to government, and frustration to scientists and engineers. It is now generally accepted that such communication is necessary and should be organized on a continuing, formal basis if the nation is to benefit from the large bank of expertise represented by the totality of Canada's scientists and engineers.

It is in this context that the study of Canada's science-based societies was undertaken. In the search for a mechanism by which the scientific community in Canada could be organized in the service of the nation, it is natural to turn to the societies to see if in fact they are now performing the projected role or, if they are not, if it is possible that they might do so in the future. The simple answer to the first of the implied questions – "Are the societies now providing effective communication between government and the 'grass-roots' scientists?" – is clearly "No!". The reason is that the individual society was never really intended to perform this role.

A society is usually formed primarily to assist the development of a particular discipline by providing certain services to the practitioners of that discipline. It is generally agreed that Canadian national science-based societies have played, and continue to play, a significant role in the development of the sciences in Canada. This traditional role, based mostly on the dissemination of information through organization of meetings and symposia, provision of journals and the arranging of lecture tours, has stimulated the rate of growth of much of Canadian science, influenced its direction and improved the overall quality. Because the societies have been successful in this traditional role, some would argue that they should not be expected to play a larger or a different one. The contrary view is that since they are reasonably well established, and represent one form of structured organization of the scientific community, the societies should be mobilized for the urgent tasks which some see as more important than those for which they were originally formed.

Science and technology are together playing an ever increasing role in the life-style of modern Society. As a result, they have a direct effect on social and individual values. This produces a climate for science and technology that is vastly different from that which existed only a few years ago. The contemporary climate is one of concern with the needs of Society (environment, welfare, quality of life), a demand for participatory democracy at the grass-roots level, and an involvement by the scientific community in the evolution of science policy in Canada.

There are signs, on the one hand, that the public and the government are expecting the scientific societies to restructure themselves in order to be able to respond rapidly and as adequately as possible to public needs, and,

on the other hand, that a large segment of the scientific community is demanding such restructuring and such involvement.

Among the many difficulties associated with having the present societies undertake this new role, there is one which is so fundamental as to require special attention and special action. Indeed, if a satisfactory solution cannot be found it is doubtful that the societies can play a useful role in responding to the economic, cultural and social needs of Canadians. The difficulty is that most of the science-based societies in Canada were formed to promote a single discipline, while most of the problems to which Canada wants scientific solutions are interdisciplinary in nature. The expertise required to give the best possible advice rarely exists within a single scientific society. This implies that the societies must so organize themselves that the appropriate mix of expert advice can be marshalled quickly from several societies when the need arises. And the need may be expected to arise ever more frequently in the future.

It is with recognition of the rapidly changing social sciences, of the growing public demand for social awareness and social responsibility on the part of science and technology, and of the willingness of individual scientists to accept that demand, that the following recommendations are made. The aim of the recommendations is to form a base from which Canadian scientific societies can better serve Canada and Canadian science.

Recommendations

1. The societies should expand their traditional role of furthering the development of science and technology in Canada.

The traditional role of the scientific societies in Canada continues to be a very important one because of the geography of the country and the influence of the dominant scientific effort in the United States. In particular, communications on science in Canada and between Canadian scientists, as promoted through annual meetings, symposia, lectures, journals, society news magazines, etc., have made and will continue to make an important contribution to the growth, identity and quality of science and technology performed in Canada and to its relevance to Canadian problems.

In addition, it is recommended that the societies play a leading role in several new directions which can still be considered to be part of their traditional functions. These directions are identified below:

a) Societies which are prepared to identify scientific areas and scientific problems within their own disciplines and make recommendations on what programs should be undertaken in Canada should be encouraged by contract support from the Ministry of State for Science and Technology or from some other government department or agency. Such an approach will often take the form of a "feasibility study" of a given subject or problem.

b) Many of the societies are now strong enough to take the lead in developing the direction their own disciplines will take in Canada, and so should represent Canadian science internationally – a role which the NRC Associate Committees have assumed in the past.

c) The societies should assume, as part of their responsibility, the improvement of understanding and cooperation among members of the university, government and industrial sectors. This can take the form of special meetings, symposia, tasks, etc, which require active participation by these sectors.

d) The data obtained during the following study of national engineering, scientific and technological societies should be maintained, periodically up-dated, and expanded. This could be a continuing responsibility of SCITEC.

e) With the maturity of science in Canada, some attention by the societies to recording and preserving the history of the development of science and technology in Canada would be a worthwhile activity contributing to Canadian culture.

2. The scientific societies (including the social science societies) should become more effectively involved in programs for social benefit.

The scientific societies can make an important contribution to Canada through programs for social benefit. This will be a difficult task, since initially it will be necessary for each society to convince its membership that science is also a social activity and that the social implications of science are part of the society's responsibilities, and also to recognize that the impact of science on Society is multi-disciplinary in nature and may require the simultaneous efforts of a number of societies. As well, societies

need to recognize the young, and involve youth in such related activities.

The aim of the societies should be to provide leadership for the solution of social problems in which they, individually or in cooperation with each other, can play a significant role. In order to stimulate interest amongst their membership in problems of social benefit, it is suggested that each society prepare a position paper on:

a) its accomplishments,

b) what it should be doing, and

c) how it should proceed.

It is recommended that the societies organize open mission-oriented conferences and symposia with emphasis on social goals and obligations. Such conferences could deal with social, political, technological and scientific considerations with varying emphasis. (Some typical subjects for such symposia might be Arctic pollution, population, quality of life, science policy, industrial policy.) Such conferences would bring various disciplines, including the social sciences, together. Added benefits of this approach would include influencing scientists to do research more relevant to Canadian needs (by identifying these needs more closely, by identifying the significance of relevant areas, and by influencing the amount of funding for science in these areas). Furthermore, the part to be contributed by each discipline to a given problem area could be better defined, and could subsequently be used in planning future developments or in educating those involved in planning future developments.

It is recommended that government departments make use of the societies to perform work under contract in those socio-scientific areas where, individually or jointly, they can best (or possibly more quickly, more accurately, more competently, or with greater credibility) provide the appropriate studies. This is a resource which, unfortunately, Canada has not used effectively. Some areas to which the societies could contribute include manpower projections, scientific information, granting systems and career counselling. A fraction of the national budget for R & D (say, ½ of 1% of the total expenditure) should be allocated for the support of such projects; the Ministry of State for Science and Technology should be given the responsibility for administration and funding.

3. A Canadian House of Science, Engineering and Technology is needed in order to provide facilities for greater economy and effectiveness of Canadian national science-based societies.

A major difficulty for the scientific societies in Canada is the financial costs involved in operating a central office and its related services. The current fragmentation of the central offices of the societies, and the resulting duplication of many functions, is very wasteful and results in draining the resources of each society to the extent that it has few remaining finances to devote to other activities.

It is therefore recommended:

a) that a Canadian House of Science, Engineering and Technology be formed;

b) that this consist of a large (single building) Centre which will provide office space and facilities for the secretariats of the various Cana-

dian national scientific societies; and

c) that this Centre be equipped with common modern business facilities to perform the "housekeeping" functions of the societies – membership lists, subscriptions, etc. The Centre should provide facilities for publication of news bulletins for the various societies; it should also be equipped and staffed to serve the bilingual/bicultural requirements and services for the societies. In addition, conference and meeting facilities would be incorporated into the Centre.

The initial capital costs of the Centre would have to be borne by the Government of Canada, and the facilities then rented to the various societies.

Such a Centre would have many advantages, such as: providing economies of scale and modern business techniques for the common administrative functions of the societies; equalizing the opportunity for societies, large or small, to have adequate secretariats; facilitating communication between societies; giving a public focus to science in Canada and to the role of the societies; assisting the societies to meet their bilingual/bicultural responsibilities to the country; and providing the facilities for societies to perform a significant role relating to science and Society, as outlined earlier.

4. The societies should play an active, continuing role in the formulation and implementation of Canadian science policy.

Canadian national science-based societies have both the expertise amongst their membership, and the responsibility, to provide a continuous input for the formulation and implementation of science policy in Canada.

In order to be effective, the societies need to develop techniques which will:

a) rapidly sample the opinions of their "grass roots" membership,
b) effectively synthesize the spectrum of responses,
c) provide an open forum where these views may be debated, and
d) relay the result to government or other concerned organizations.

There do not appear to be any accepted procedures for obtaining such views, and it will be necessary for the societies, both individually and jointly, to experiment with various approaches until a suitable approach is found. The societies should not be too timid in searching for and testing a variety of possible procedures.

It should be stressed that each individual society needs to be able to reflect the views of its members. In many instances, such views will be more effective if focussed through a central or umbrella organization such as SCITEC. Furthermore, there is a need for such a neutral focal organization to which government can turn when it wants advice, opinion or information. This "focal" organization must, however, work through the individual societies. Thus, to be effective, the individual societies need to be in a position either to respond directly to government or to participate with other societies as a partner in the central or focal organization.

The centralization of facilities for the various societies, as envisaged in the discussion of a House of Science, Engineering and Technology, should markedly facilitate joint action by the societies.

Once either the central organization or the individual societies are in a position to provide effective advice to government, they might also be in a position to use their expertise to assist the universities and industry.

5. The societies must take a more active part in informing the non-scientists about the role, contribution and implications to Society of science and technology.

With the increasing importance of science and technology in determining the life-style of Society, it is unfortunate that the non-scientist is, in general, exposed far more to the negative aspects of science and technology than to their positive contributions. Furthermore, the general public is often ill-informed on the implications of various scientific or technological developments until it is too late to respond. Members of contemporary Society are increasingly demanding that they be well informed on matters related to science and technology. In addition, since the taxpayer pays most of the bills for science, after all, it is in the best interest of the scientific community to keep the public informed.

The societies individually and jointly can do much to create an interested and informed public through:

a) making increased efforts to communicate to the public using the public media – newspapers, radio and television (numerous opportunities are available: national conference, major discoveries, public issues, etc.);

b) cooperating more closely with the science writers;

c) addressing communications to youth, both directly and via the teaching of science and career counselling;

d) providing a forum for discussion, by scientists and non-scientists, of public issues involving Society and science and technology;

e) supporting a news vehicle specializing in science policy and social concern (the journal *Science Forum* is an excellent start in this direction, but it requires increased support and continuing development);

f) initiating programs which emphasize considerations of the future, thereby stimulating public interest by informed extrapolations of the future impact of science and technology;

g) taking a public position on the scientific aspects of major issues (such as pollution, the Amchitka nuclear test, those effects on the atmosphere of the supersonic transport which involve science and technology, and other issues on which the societies are in a position to make a competent assessment).

6. There are several important issues which require additional study before detailed recommendations can be made.

A common problem of many societies is the cost and administrative effort related to the publication of scientific journals in their disciplines. Questions regarding the need for Canadian journals, the form they should take, who should be responsible for them, how their costs should be paid, and how they might be efficiently administered require more detailed examination than has been possible here.

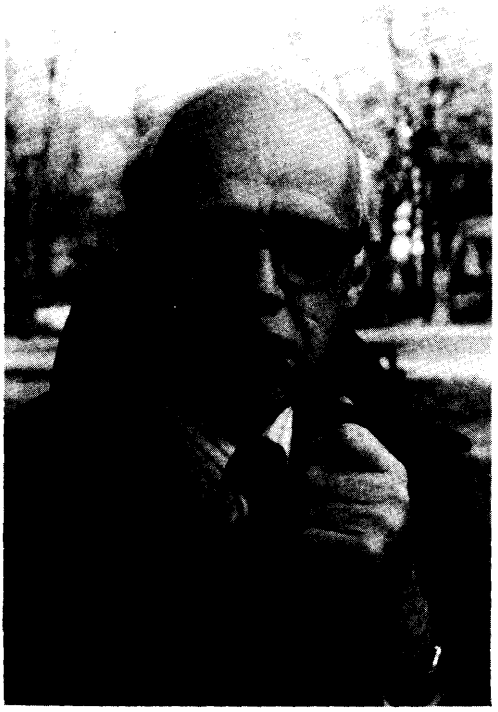
Another controversial area currently being debated is the role of the professional and scientific societies as bargaining agents in obtaining

direct benefits for their memberships. This problem is strongly influenced by the varying provincial regulations which govern the regions of Canada. Again, more detailed study of this area is required before recommendations can be made.

It is therefore recommended that detailed studies be undertaken on these issues.

Background Study

by Prof. Allen S. West



Allen S. West

B.Sc. (Entomology) University of Massachusetts, 1931; Ph.D. (Forest Entomology – Zoology) Yale University, 1935.
Born in Worcester, Massachusetts, August 13, 1909.

Allen S. West worked for the U.S. Forest Insect Service in Arizona and California before coming to Canada in 1939 to occupy the chair of Forest Entomology at the University of New Brunswick; he subsequently became a Canadian citizen. He served in the Canadian Army, Chemical Warfare Service, during World War II. Since 1946, he has been a member of the staff of the Department of Biology, Queen's University. He has served as Senior Scientist for Defence Research Board (DRB) and Canada Agriculture field parties engaged in studies of the biology and control of biting flies, and has been on assignment to Africa for the World Health Organization, Parasitic Diseases Section. During the past fifteen years, his research interests have included field studies on biting flies and laboratory studies of the allergic reactions to the bites of blood-sucking arthropods. He is the author of more than 60 research papers and numerous reviews.

He is a Past President of both the Entomological Society of Canada and the Entomological Society of Ontario, and is a member of several other Canadian and U.S. societies. He has served several terms on the DRB Advisory Committee on Entomological Research.

The study on which this report is based was carried out from September 1971 to April 1972 while Professor West was on sabbatical leave from Queen's University.

Acknowledgements

This report could not have been written without the cooperation of many individuals who gave freely of their time, by way of personal interviews or providing information in correspondence. Space does not permit individual recognition of these more than 200 engineers and scientists, but the writer wishes them to accept his sincere thanks.

Appreciation is expressed to the members of the Management Committee which supervised this study: Dr. J.B. Armstrong (Chairman), Executive Director (Medical) Canadian Heart Foundation, Ottawa; Dr. L. Berlinguet, Vice-President of Research, University of Quebec; Dr. Virginia Douglas, Department of Psychology, McGill University; Dr. M.P. Bachynski, Director of Research, RCA Limited/Research Laboratories, Montreal; Dr. E.J. LeRoux, Assistant Director-General, Canada Agriculture, Ottawa; Mr. W.G. McKay, Chairman of the Board, Underwood McLellan and Associates Limited, Winnipeg; and Dr. P.A. Forsyth, Department of Physics, University of Western Ontario, London. Dr. LeRoux resigned in February 1972 and was replaced by Mr. J.-L. Meunier, Associate Awards Officer, National Research Council, Ottawa. Particular mention is made of the genial cooperation provided by Mr. J.Y. Harcourt who, as Executive Director of SCITEC, served as an ex-officio member of the Management Committee.

The advice and constructive comments of Dr. P.D. McTaggart-Cowan, who acted as Project Officer for the study, were particularly helpful, as were discussions with several other members of the Science Council staff.

Mr. D. Hunka, Chief of Administration, was extremely diligent in facilitating working conditions. Members of his staff provided cooperative support throughout the study.

The writer is very much indebted to Professor J.W. Grove, Head of the Department of Political Science, Queen's University, for making available the files and unpublished reports of his Canada Council-supported studies on scientific societies; these included a report prepared by Mrs. Margot Wojciechowski of Kingston and portions of a thesis draft written by Professor Peter Aucoin, Department of Political Science, Dalhousie University, Halifax. In addition, Professor Grove made available a manuscript written by him and Mrs. Wojciechowski, entitled "Canadian Scientific Societies"; it was later published in *Science Forum*, June 1972.

The contributions of Mrs. Wojciechowski, who served as a research assistant to the Study Leader, were of major significance because of her experience and wide knowledge.

Appreciation is expressed to Professor Arnold Thackray, Department of History and Sociology of Science, University of Pennsylvania, Philadelphia, for his stimulating article "Reflections on the Decline of Science in America and on Some of Its Causes".[1] This article is the source of the frontispiece quotation from Charles Babbage.

Last and by no means least, the writer expresses his most sincere

[1]Thackray, A. "Reflections on the Decline of Science in America and Some of its Causes". *Science 173*, 2 July 1971. Pages 27-31.

appreciation of the devoted and loyal service rendered by Mrs. Lynn Tremblay, secretary for the study. Her tact, good humour and forebearance of the writer's idiosyncrasies and foibles made the completion of this report possible.

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C. A forum should be organized, composed of individuals whose particular charge would be a viewing of the broad aspects of relationships between science and Society (page 103).

D. A number of changes in the organization, mode of operation and scope of activities of scientific and professional societies are suggested, including a reduction in the number of societies and, in many cases, a major increase in society dues (page 105).

E. Certain financial commitments and cooperative efforts on the part of the Federal Government are suggested, including a liaison committee involving the Ministry of State for Science and Technology and the proposed overall coordinating organization (page 106).

Definitions

The following definitions are provided as an aid to the reader in understanding the usages of certain words and terms in this report. It is not expected that everyone will agree with the terminology as used, but it is hoped that ambiguity will be avoided, and an economy of words achieved.

1. science means "man's accumulated and systematically arranged knowledge about himself and his world and the research by which he continually adds to this body of knowledge".[1]

2. technology means "the body of scientific knowledge that has been effectively adapted to practical use and is fully available to meet man's immediate needs".[1]

3. society refers to an organization of engineers and/or scientists; unless otherwise indicated, this term includes social science organizations.

4. Society refers to the body public, the Canadian people.

5. scientific society applies to those organizations whose aims are directed principally toward advancement of a discipline.

6. professional society applies to those organizations concerned principally with the regulation of a profession and the welfare of its members.

7. the scientific community is the total population of engineers and scientists, apart from any involvement with the societies which constitute one element of activity of some members of the community.

8. learned society, as used in this report, is in part synonymous with scientific society, but also includes organizations in the humanities.

9. With apologies to some engineers who may object, **scientist(s)** will at times include engineers. The designation **s.s.** (*sensu strictu*) following **scientist** will indicate the specific exclusion of engineers.

[1]Science Council of Canada Report No. 4, *Towards a National Science Policy for Canada.* Queen's Printer, Ottawa, 1968. Page 7.

Part I

Introduction

In a mounting groundswell during the past decade, the social order and way of life that have been created in Canada and elsewhere are increasingly coming under attack, particularly by the young. In all areas those individuals, institutions and organizations who "read the handwriting on the wall" have been becoming more and more involved in self-reassessment. More and more, Society is coming to regard science and technology (an undirected science and technology) as responsible for many of the "ills" afflicting it, and is starting to realize that technological advances can no longer be justified as ends in themselves.

In the daily press, on radio and television, and in some of the publications of the scientific and professional societies, we are more or less constantly reminded of the need for involvement of the scientific community in Society. Lately, there has been a stirring of response among the Canadian societies, and an indication that reassessment is on the increase.

This self-examination among the societies has not, however, progressed to the degree that might be implied in the Fourth Annual Report of the Science Council of Canada. In it, Dr. O.M. Solandt suggests that the very existence, and the Reports, of the Science Council have "led to an important introspective self-examination by nearly all elements of the scientific community. Scientists and engineers, in their professional organizations and learned societies, in government agencies, ... and in industry have given careful attention to their roles, missions and performances, and in many cases have, as a result, made substantial changes in their goals and activities."[1]

It is therefore opportune that a study of engineering, scientific and technological societies should be undertaken at this time. It is obvious that these societies satisfy some needs for their members, by way of providing for communication through publications and Annual Meetings, and/or by way of providing for the enhancement of a profession. Less obvious is that the scientific community fills a national need through the social and political force its societies constitute – a force which OECD considers far from negligible.[2]

As will be shown in this report, the contributions by scientific societies extend beyond the provision of benefits to individual members, to the benefit of Society as a whole, particularly by way of input to governments, universities and industry. However, because of problems faced by scientific societies, particularly financial problems, this latter role has in the past been somewhat minimized.

A consideration of the need to assess the current and potential role of the societies and to contemplate ways in which these societies could serve Canada more effectively was the subject of discussions between the Science Council of Canada and The Association of the Scientific, Engineering and Technological Community of Canada (SCITEC) during the winter and spring of 1971. These discussions led to the signing, in July 1971, of a Science Council contract for the undertaking of the present study by SCITEC.

[1]Science Council of Canada, *Fourth Annual Report, 1969-1970.* Queen's Printer, Ottawa, 1970. Page 28.

[2]Organisation for Economic Cooperation and Development. *Reviews of National Science Policy: Canada.* OECD, Paris, 1969. Page 339.

Study Terms of Reference

The terms of reference for the study, as set forth in the contract, are as follows:

"1. To make an inventory of Canadian scientific, engineering and technological societies, including the social sciences, and in particular:

a) to review aims and objectives of Canadian scientific, engineering and technological societies;

b) to assess the effectiveness of the present organizational framework of such societies, methods through which they operate in serving scientific and professional needs of their disciplines, and their resources;

c) to determine the interrelationships that societies have to each other, to government, universities, industry and to other groups;

d) to examine their international relationships, commitments and responsibilities.

"2. To recommend a basis on which Canadian scientific societies could better serve Canada in matters of science policy, manpower, professionalism and cooperation, and in particular:

a) to make suggestions regarding interrelationships of scientific societies, for example, pooling of their secretarial resources, and in such other areas as may become apparent, to improve their effectiveness in the service of Canada;

b) to make suggestions as to means by which the scientific disciplines may respond more expeditiously on matters of public concern."

Early in the study it was agreed that "could better serve Canada" must not be limited only to specific areas such as science policy, manpower, and professionalism; it should also include consideration of how the scientific community, through its societies, could develop a social consciousness, and respond to the public demand for an interpretation of science and technology and for direction and control of technology for the betterment of Society.

Originally, the project was referred to as "A Major Study of National Science-Based Societies". Because of some obvious misunderstanding of the term "Science-Based", the present title, "A Study of National Engineering, Scientific and Technological Societies", has been used subsequently.

Organization of the Study

By the terms of the original contract, the study was to be initiated on 1 September 1971, and terminated with the submission of a report on 31 March 1972. In January 1972 a one-month extension, without additional funds, was granted.

Science Council provided office space, supplies and furnishings, duplicating facilities and mailing and telephone services, and did the accounting for the contract funds.

The Study Leader, Professor A.S. West, reported on 1 September, as did Mrs. Lynn Tremblay, secretary for the study. The services of Mrs. Margot Wojciechowski of Kingston, Ontario were retained on a part-time

hourly basis. Mrs. Wojciechowski worked mostly in Kingston, but made a number of one-day trips to Ottawa and attended some of the meetings of the Management Committee. Limited use was made of several graduate and undergraduate students, who were employed on an hourly basis in Kingston and Ottawa to tabulate information. Science Council personnel were, on occasion, made available to assist in pressing matters.

The seven-member Management Committee (see "Acknowledgements") was appointed in advance of 1 September. Dr. P.A. Forsyth replaced the late Dr. J.A.F. Stevenson, who was to have been a member of the Committee. Under the terms of the contract, this Committee was responsible for direct supervision of the study, with the Study Leader being responsible for day-to-day management. Supervision by the Committee was facilitated by Dr. J.B. Armstrong and Dr. E.J. LeRoux, both located in Ottawa, acting as an executive. Initially, the Management Committee met monthly. In the later stages of the study, more frequent meetings were held.

Procedure

The initial step was to compile a list of scientific and professional societies in Canada. A number of provincial organizations were included because of a recognition of their roles in relation to some of the national societies. Some of the concerned citizens' groups were listed as well, because of a belief that the societies must interact with these groups. Numerous sources of information were used in compiling the list. Particularly helpful was *Scientific and Technical Societies of Canada.*[3] It is understood that this publication is currently being updated.

Approximately 400 organizations composed the initial list.

Selection of Societies for Inclusion in the Study

The Management Committee selected those national organizations which it felt should be contacted. In part, decisions had to be based on availability of information as to names and addresses of society officers and limitations of time for locating such information. The list of 108 societies was increased over a period of months to a total of 121. A tabulation of the societies is provided in Appendix A.

A few explanatory comments are in order. It is obvious that an extremely broad view of "science-based" was taken. The objective was to give any national organization that might conceivably consider itself science-oriented in any degree the opportunity of making an input to the study. The Canadian Historical Association was added because it was the only affiliate of the Social Science Research Council of Canada that had not been selected initially. The Canadian Society of Rural Extension was added for a similar reason, with regard to its affiliation with the Agricultural Institute of Canada.

Organizations such as the Canadian Council on Urban and Regional Research (an appointed body, and hence not a scientific society in the con-

[3] *Scientific and Technical Societies of Canada*, compiled by the National Science Library. National Research Council of Canada (NRC), Ottawa, 1968.

ventional sense) and the Arctic Institute of North America were included because of their sponsorship of research projects.

The inclusion of several organizations which are U.S.-based (e.g., The Arctic Institute of North America, the Air Pollution Control Association and the Marine Technology Society) was justified on the grounds of the existence of active Canadian membership groups.

Several French-language societies were included because their memberships are not confined to the Province of Quebec.

More conspicuous may be some of the omissions, such as the Association of Exploration Geochemists, the Canadian Well Logging Society, and the Canadian Institute of Surveying. Several societies came into existence during the course of this study, including the recently formed Canadian Geoscience Council and – insofar as is known, the infant of the lot – the Association of Environmental Geology, which was organized in March 1972.

The study has created a valuable source file which, it is hoped, can be maintained and updated.

Requests for Information and Responses

Following the mailing of a letter by Dr. L. Berlinguet (then President of SCITEC) announcing the study, and a letter by the Study Leader indicating the intended procedure, a request for specific information was sent to the Secretaries of the societies (or to Presidents in those cases where Secretaries' names and addresses were unknown). This request is reprinted in Appendix B.

Eighty-two societies provided the requested information, complete in varying degree. Because this variation occasioned gaps in the tabulation of data, the number of societies cited in relation to particular facets of the information is not constant.

Five societies withdrew from any association with the study, one of these indicating an interest but being unable to find time to fill the request. Fourteen organizations did not respond at all, even after a follow-up letter. (With one exception, these societies operate on "benevolent time", a problem which will be considered later.) Seventeen societies sent some form of acknowledgement – for example, providing names and addresses of officers – but did not respond further. Several of these were contacted by way of interviews. Three societies were included at a very late date.

Additional response was obtained in reply to a "statements letter", in which a number of suggestions were made concerning the problems faced by societies. It is advisable to emphasize that the study was designed to be for the most part more qualitative than quantitative, and that the accumulation of masses of statistically assessable data was not an objective.

Interviews

The decision to base much of the study on personal interviews, as opposed to a detailed questionnaire, was without exception approved by interviewees. More than 100 interviews were conducted with representatives of

63 societies. The value of talking with more than one member of a given society was shown many times by the differing opinions and information obtained. The Secretariat of one society gave the impression that the organization was "one happy family"; the candid opinions of the society's President provided quite a different story.

In addition, group meetings were held in six locations, and opinions were obtained from talks with a number of individuals selected for reasons other than membership in particular societies.

By design, interviews were scattered from St. John's to Vancouver, so as to sample the various kinds of societies as well as societies large and small. The writer is confident that these interviews have provided a feeling of the "pulse" of Canadian national engineering, scientific and technological societies.

SCITEC IV

SCITEC IV, held in conjunction with the Annual Meeting of SCITEC in February 1972, was developed around the theme of "The Impact of Scientific, Engineering and Technological Societies on Science, the Scientific Community and on Society".

Part of the program involved a series of Workshops. The Chairman of each Workshop was provided with a series of guideline questions intentionally designed to relate discussions partially to the terms of reference of the present study.

Most of the opinions expressed in these Workshops confirmed information gathered by the writer. In many respects, the Workshop reports[4] would almost provide an outline for this report.

Apologia

The views expressed in this report are those of the writer and do not necessarily represent those of the study's Management Committee nor of the Science Council of Canada. The writer is solely responsible for any inadvertent errors contained herein.

In examples in support of various statements and facets of information about scientific societies, specific organizations have been named in a number of instances. It will be obvious that some societies have been referred to more frequently than others, and that some are not specifically mentioned at all. It would have been totally impractical to list all societies in each instance. The mentioning of a society by name, or failure to mention it, confers neither particular distinction nor implied lack of importance. The writer regrets that limitations of time prevented inclusion of more societies in the interview program. Again, selections were made without prejudice.

[4]SCITEC IV. Annual Conference and Annual General Meeting. Ottawa, February 25 and 26, 1972. Pages 44-63.

Part II

An Inventory

Introduction

The purpose of this inventory is to present an overall picture of the kinds of engineering, scientific and technological societies, and of their characteristics, purposes, modes of operation, activities and interrelations, both nationally and internationally. It is not the intent to provide a detailed description of a large number of societies. The activities of societies are examined in relation not only to their own interests, but also to their possible service to governments, universities, industry and Society.

The challenges facing these societies in Canada are reviewed at the end of this section of the report, which considers the problems faced by societies. Solutions to these problems must be found if the scientific community is to play the role that is increasingly being demanded of it.

A few comparisons will emphasize some of the diversities among societies. Ages range from a few weeks to more than one hundred years, numbers of members from 54 to more than 87 000, annual budgets from less than $400 to approximately $1 600 000, reserve funds from $400 to at least $660 000, and annual dues from $2 to $350. Societies operating in the black during the latest fiscal year for which financial reports were available (not the same year for all societies) showed "profits" ranging from $33 to $113 000; for those societies operating in the red, deficits ranged from $12 to at least $70 000. Gross publication costs varied between $311 and $198 000. Direct and indirect subsidies are extremely variable. As will be discussed presently, the aims, objectives, modes of operation and activities are very much diversified. Other widely ranging variables include distribution of employment of members, geographical distribution of members, and membership qualifications.

It is obvious that Canadians are joiners (and in this regard not peculiar). There are possibly as many as 5 000 Canadian organizations. Scientists do not differ from non-scientists; they want and need an identity. The societies provide this identity for members of the scientific community under a wide variety of organizations which do, however, have some common bonds.

A Historical View

Apparently, the first scientific society in Canada was the Nova Scotian Institute of Science, founded in 1862 as the Nova Scotian Institute of Natural Science. This society had its origin in the Halifax Mechanics Institute, founded in 1831, which gave rise to the Halifax Literary and Scientific Association and, subsequently, to the present organization.

The Entomological Society of Canada, founded in 1863, was the first national society to be formed. In 1870 the name was changed to the Entomological Society of Ontario in order to qualify for a provincial grant; however, the society continued to function as a national organization until the rebirth of the Entomological Society of Canada in 1950.

Other national societies formed before the turn of the century were: the Canadian Medical Association (1867); The Royal Society of Canada (1882); The Engineering Institute of Canada (1887); The Canadian Insti-

tute of Mining and Metallurgy (1898); and The Royal Astronomical Society of Canada (founded in 1890 as the Astronomical and Physical Society of Toronto, became the Toronto Astronomical Society in 1900, and adopted present title in 1903 as a result of its national scope; meetings of the Toronto group date back to 1868).

During the period from 1902 to 1913, another nine societies were established: the Canadian Dental Association and the Association des Médecins de Langue française du Canada (1902); The Royal Architectural Institute of Canada, the Canadian Institute of Actuaries and the Canadian Pharmaceutical Association, Inc. (1907); the Canadian Nurses Association and the Canadian Institute of Forestry (1908); the Canadian Public Health Association (1910); and the Canadian Political Science Association (1913).

No societies were formed during World War I years.

Of the 15 societies established prior to 1920, only four (the Entomological Society of Canada, The Royal Society of Canada, The Royal Astronomical Society of Canada and the Canadian Political Science Association) were not associated with what was mainly an established or developing professional group. Initially the members of these four societies were perhaps remnants of what Thackray[1] has called the "elegant amateurs". The growth of professionalism and specialism led to replacement of "elegant amateurs" by "poor professionals, virtuosi by scientists, the confident gentry by the aspiring lower orders". This development occurred later in the United States than in Great Britain (where it began in the mid-19th century), and still later in Canada.

Some of the older national societies had their origins in local, provincial or regional groups (e.g., The Canadian Institute of Mining and Metallurgy); in contrast, the provincial engineering bodies were organized under the aegis of The Engineering Institute of Canada.

The Modern Period

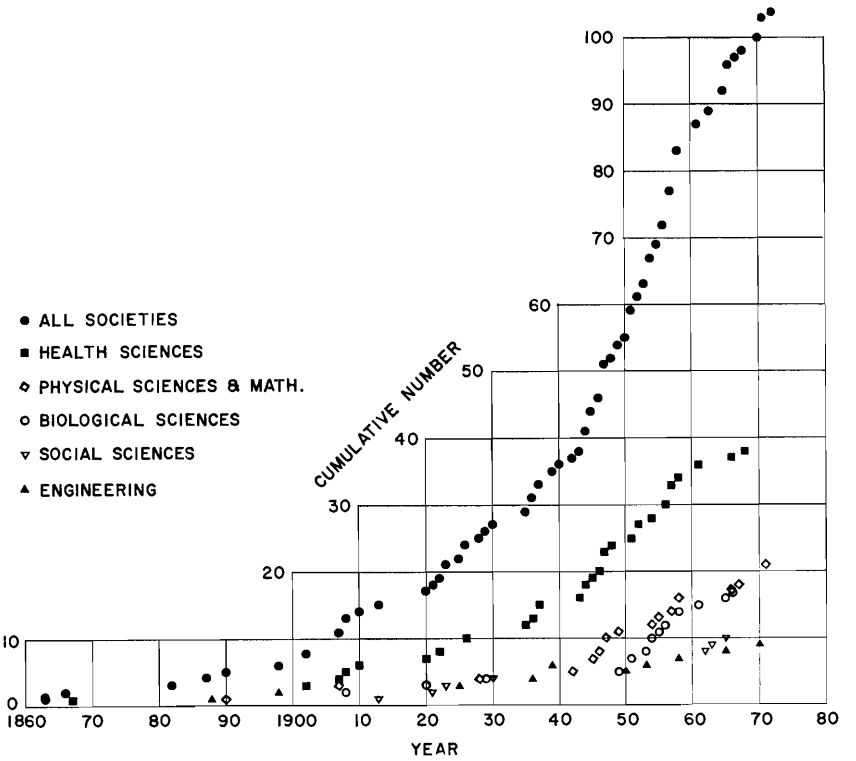
Eighty-nine of the 104 societies for which founding dates are at hand were established from 1920 onwards. Figure II.1, showing the cumulative number of societies plotted against founding dates, may suggest a slightly sigmoid curve for the grouping of all societies. From 1920 to 1943, the rate of increase in numbers of national societies was more or less constant, with a not surprising gap during the Depression years (1931 to 1934). Starting in 1944 and continuing until about 1960, the rate of increase was accelerated. There is a suggestion that since 1960 the rate may be slowing.

Separate plotting of the Health Sciences (medical and paramedical) societies and the Biological Sciences societies suggests the same general pattern.

Physical and Mathematical Sciences societies, totalling 21, exhibit a different pattern of rate of founding. Only three (The Royal Astronomical Society of Canada, The Royal Architectural Institute of Canada, and the Alberta Society of Petroleum Geologists) existed prior to 1942. In common

[1]Thackray, A. "Reflections on the Decline of Science in America and Some of Its Causes". *Science 173*, 2 July 1971. Pages 27-31.

Figure II.1 – Cumulative Number of Societies Versus Founding Dates



Source: Data for Figures II.1 and II.2 were gathered from the selected societies during the course of this study. Details may be found in Part I, under the heading "Procedure" (pages 28-30).

with the Health Sciences, there was a spurt of activity immediately after World War II. In comparison, the Biological Sciences did not spawn new societies until 1949, a possible explanation being the lesser direct involvement in the war effort.

The societies limited strictly to engineering have increased steadily since 1950, to a total of nine. The Social Science societies exhibit the spottiest distribution of dates of origin.

The post-World War II surge in the formation of new societies is a reflection of the growth of the engineering, scientific and technological community in Canada, as well as of the increased degree of specialization of science and technology. In 1961 it was estimated that 80 to 90 per cent of all the scientists who ever lived were then alive; today the estimate is nearer 99 per cent.

W.H. Auden said in 1962, "When I find myself in the company of scientists, I feel like a shabby curate who by mistake has strayed into a drawing room full of dukes".[2] This comment no doubt was the origin of Thackray's term "dominant dukes" for the new breed of scientists who

[2]Quoted by Thackray, *op. cit.*

have replaced the elegant amateurs and poor professionals. At least in the United States, these "new mandarins" of science have come to occupy a dominant role in the directions and priorities of science. To a lesser extent it may be that in Canada too we have a scientific "elite", whose influence it may be difficult for the societies, particularly the specialists' societies, to counteract.

The Kinds of Societies

For an understanding of how and why societies are formed, it is helpful to look at the kinds of Canadian national societies in existence. Any attempt at a rigid classification of societies is fraught with problems, particularly because of a changing direction of emphasis of activities for many organizations. Unlike the relative slowness of organic evolution, which permits the establishment of a taxonomic hierarchy, the current "mutation rate" in the activities of scientific societies dictates a fluid classification.

Classification by Aims and Objectives

According to aims and objectives, two broad categories of societies are recognized:

1. Scientific societies, whose main purposes are the promotion or advancement of a discipline, and communication among members concerning these advances (e.g., the Genetics Society of Canada, The Canadian Society for Clinical Investigation and the Canadian Aeronautics and Space Institute); and

2. Professional societies, whose chief purposes relate to the regulation of a profession, concern for the welfare of members, and protection of the interests of the public (e.g., the Association of Consulting Engineers of Canada and the Canadian Dental Association).

This categorization is an oversimplification, because some scientific societies are tending to become involved in professionalism (and more will likely do so in the future), and professional societies are tending to become increasingly associated with what hitherto have been regarded as functions of learned societies.

A distinction can be made also between *specialist societies* (those concerned with a particular subject area – e.g., the Canadian Political Science Association) and *coordinating or liaison organizations* (e.g., the Biological Council of Canada, the very recently organized Canadian Geoscience Council and the Canadian Veterinary Medical Association). These coordinating organizations may be an affiliation of a group of scientific societies with common ties (as is the Canadian Federation of Biological Societies), or an association to provide for communication and cooperation among provincial professional organizations (as are the Canadian Council of Professional Engineers and, in part, the Agricultural Institute of Canada).

The limitations to attempting a classification according to aims and objectives are emphasized by the following partial list of purposes of societies, which are not arranged in an order of any significance and not all

mutually exclusive. These aims and objectives are found in various combinations in the Constitutions and By-Laws of societies:

- enhancing the standards of the profession,
- exchanging knowledge,
- advancing the professional and economic well-being of members,
- providing a forum,
- providing advice on pertinent legislative matters,
- promoting a knowledge and appreciation of the profession to the public,
- promoting research for better [agriculture, for example],
- cooperating with other societies in matters of mutal interest,
- advancing the science,
- promoting the science in the interests of mankind,
- representing the profession at national and international levels,
- publishing a Journal,
- providing information to the public,
- enhancing ethical standards and practical efficiency,
- acting as a national voice for the society,
- obtaining recognition for the profession.

Classification by Discipline Areas

Attempted classification of societies by discipline areas also has limitations. It is an over-simplification to suggest that all societies can be assigned to the Physical Sciences, the Life Sciences or the Social Sciences – and in turn be designated as scientific or professional, or basic or applied, according to chief purposes. Such groupings are useful in discussing *research*. When the specific interests and activities of members of societies are considered, it becomes all too apparent that many societies fall into more than one of the above categories. For example, the Canadian Association of Geographers could be classified in the Physical, Life and Social Sciences; The Town Planning Institute of Canada has feet in both Physical and Social Sciences camps, and is at once a scientific and a professional organization.

Groupings of Societies Used in This Study

For the purposes of this study it was considered necessary to group societies in some manner, recognizing that no relatively simple classification would satisfy everyone. Somewhat arbitrarily, it was decided that societies would be designated as belonging to the Health Sciences, Biological Sciences, Physical and Mathematical Sciences, Social Sciences, or Engineering, with the exception of a few organizations which would be designated as liaison societies.

Scientists and engineers will recognize the arbitrariness and, to a degree, the artificiality of these groupings. Biochemists have been placed in the Health Sciences, but many would more properly belong in the Biological Sciences, as would many psychologists who have been placed with their colleagues in the Social Sciences. Agricultural engineers, geographers, biomedical engineers, chemical engineers and physiologists are other

examples of groups whose societies cannot be neatly pigeon-holed.

The assignment of societies included in this study is given in Appendix A.

Interdisciplinary Relations and the Scientific Community

The tendency and apparent need to group societies must be placed in perspective. The traditional lines that have distinguished scientific and engineering disciplines are disappearing, although rigid compartmentalization is still the rule in the universities. Much has been written in recent years about the collapse of the "Ivory Tower" aspect of our universities.[3] Equally, the "Ivory Towers" of physics, geology, geography, political science, engineering and psychology, to name but a few, are disappearing in varying degrees. Interdisciplinary areas of science have become commonplace: witness biophysics, biomedical engineering and environmental law. Even where interdisciplinary areas have not been dignified by name, there is much interaction among members of the scientific community. Interdisciplinary research has become a catch-phrase.

It is important to recognize that many of today's societal problems, for which Society has a right to demand solutions, can be solved only by the cooperation of professionals from a number of disciplines – scientists, engineers, social scientists, doctors, lawyers and political scientists, among others. Two examples will suffice. A high-rise apartment syndrome has been described recently[4]; "treatment" of this syndrome will involve cooperative study by medical people, town planners, architects, psychologists and social workers. The whole pollution control-quality of the environment issue has attracted the concern of practically all segments of the scientific community.

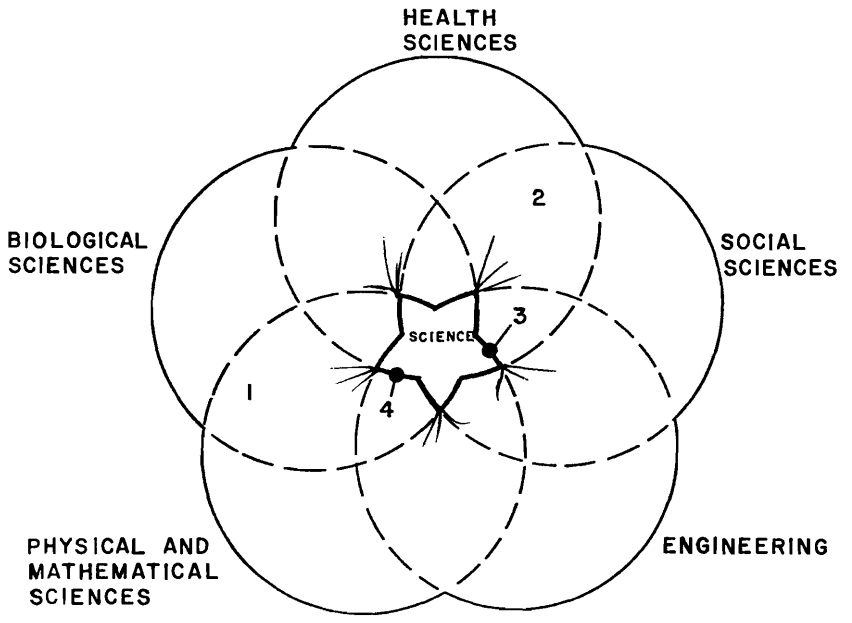
In this respect, it is the scientific community that is important, and any classification of the kinds of societies is of relative insignificance, unless one is to fail to see the forest because of the trees. Many members of the community have affiliated not with just one society, but with several. Commonly, a physicist will be a member of the Canadian Association of Physicists; he may also belong to the Canadian Aeronautics and Space Institute and/or to the Canadian Astronomical Society, have been elected to The Royal Society of Canada, and be an individual member of SCITEC.

The diversity of the community as it relates to societies can be illustrated in another way. Usually, a member of the Entomological Society of Canada will have joined because he works with and/or is interested in insects. However, he may label himself as a biochemist, physiologist, pharmacologist, organic chemist, meteorologist, biometrician, invertebrate pathologist, toxicologist, physicist, immunologist, microbiologist, anatomist, parasitologist, or cell biologist – and be a member of the relevant society. As will be discussed later, the diversity of interests among the membership of a society is a problem that confronts many organizations.

[3]Corry, J.A. *Farewell to the Ivory Tower*. McGill University-Queen's University Press, Montreal, 1970. Page 121.

[4]*Ottawa Journal*, 24 January, 1972.

Figure II.2 – Interrelations of Fields of Engineering and Science



Examples: *1.* Biophysics
2. Social Welfare
3. Urban Planning
4. Biomedical Engineering
Source: See Part I of this report, under the heading "Procedure" (pages 28-30).

Interaction is not limited to science and technology. The OECD report[5] discusses the impact of science on public affairs in terms of "interacting systems". It stresses that the total national activity or system can be divided into a number of sub-systems or sectors, including health, education, agriculture, industry, defence, social welfare and scientific effort, and each activity to some extent overlaps the others.

With groupings of societies there is a similar overlapping. This interaction is shown diagrammatically in Figure II.2.

Why Societies Are Formed

There are at least 125 national engineering, scientific and technological societies in Canada; the number varies according to stricture of definition. In addition, recognition must be given to the existence of more than 260 provincial, regional or local societies, and of special-interest groups such as Ducks Unlimited, the Canadian Wildlife Federation and the Canadian Forestry Associations; societies should develop a closer association with them than they have in the past. The concerned and sometimes vociferous

[5]Organisation for Economic Cooperation and Development. *Reviews of National Science Policy: Canada.* OECD, Paris, 1969. Page 386.

citizens' groups, such as Pollution Probe, Survival and STOP (Society to Overcome Pollution), constitute another sector of Society with which the scientific community should interact.

With few exceptions organizations, whether national, provincial or local, have come into being as the result of the convictions and initiative of small groups of individuals, sometimes of single individuals. There must, of course, be potential groups of members who will respond to this leadership.

Circumstances which have stimulated initiatives leading to the formation of new societies are varied and have changed to some extent over the years. One basic circumstance, however, has been the need for *communication.* Other reasons for the forming of societies are, in effect, set out in the preceding list of aims and objectives; again, two broad categories – scientific societies and professional societies – can be distinguished. Liaison between disciplines, among provincial societies and within the scientific community has been the motivation in some instances (the Canadian Federation of Biological Societies, the Canadian Veterinary Medical Association and SCITEC). Nationalism has clearly been a factor at times. The Canadian Phytopathological Association was formerly the Canadian Division of the U.S. parent body. The fragmentation of science into specialist areas, albeit at times interdisciplinary, has also been a contributing factor (e.g., the Canadian Medical and Biological Engineering Society).

Whereas provincial legislation has been directly or indirectly responsible for the formation of some provincial professional societies, few national societies have been born in this manner. The Chemical Institute of Canada and the Canadian Association of Physicists (originally Professional Physicists) are exceptions, having arisen as a result of federal collective bargaining legislation. A few organizations, such as The Royal Society of Canada, have been created by Acts of Parliament.

Several specific examples will illustrate some of the circumstances which have led to the formation of new societies:

1. The development of several small provincial and local mining groups, such as the Mining Association of Nova Scotia, led in 1898 to the formation of The Canadian Mining Institute. In 1920 the name was changed to The Canadian Institute of Mining and Metallurgy. The Metallurgy Section recently became a society, but remains within the Institute.

2. For a number of years The Engineering Institute of Canada (EIC) attempted to serve the interests of mechanical engineers as a Section. Dissatisfaction led to the formation of The Canadian Society for Mechanical Engineering, which affiliates with EIC as a Constituent society. The Canadian Geotechnical Society has a similar history in relation to EIC.

3. When the Canadian Physiological Society was formed in 1935, biochemists and pharmacologists joined enthusiastically. Growth in numbers in these disciplines led to the formation of the Pharmacological Society of Canada in 1956 and the Canadian Biochemical Society in 1957. The wheel came full circle with the establishment in 1957 of the Canadian Federation of Biological Sciences, formed primarily for the purpose of holding joint meetings of the physiological, biochemical and pharmacological societies, together with other specialist groups.

Organization and Operation of Societies

Some of the variables among societies have been listed earlier. Number of members, their employment and geographical distribution, and membership requirements are factors having a considerable influence on organization, operation and activities.

Range of size was mentioned earlier as varying from a low of 54 (Canadian Thoracic Society) to a high of more than 87 000 (Canadian Nurses Association); numbers of active members are given in Appendix A. The professional societies tend to be larger than the scientific societies. The explanation is in part an essentially captive membership in the first case, compared with a voluntary one in the latter.

The degree of organization and the level of activity and involvement by a society are not direct correlates of size, although the larger societies, with established Secretariats, tend to be more highly organized and to be active in matters other than holding meetings and publishing a Journal.

Since both distribution of employment of members and their geographical distribution are problems encountered by societies, these factors will be discussed in Part III of this report. It need be pointed out here only that the policies of societies with a preponderance of members employed in government, universities or industry may differ from those with a more balanced distribution of employment; geographical distribution may limit or determine the ways in which a society can operate.

Membership Requirements

Most societies have several categories of membership, commonly designated as member, associate, student and honorary member. At one extreme, a member can, essentially, be anyone interested in the purposes of the society (e.g., The Canadian Society of Plant Physiologists); at the other extreme, a specific degree and/or specified experience is necessary (e.g., the Canadian Psychological Association). Fixed requirements are found in societies associated with what are conventionally regarded as professions (doctors, engineers, veterinarians, etc.). Most of these are regulated by provincial societies and operate under provincial statutes; individuals must belong in order to practise their professions. It is at the provincial level that education and/or experience dictates must be satisfied. Membership in the national society requires being a member in good standing in a provincial organization (e.g., the Canadian Veterinary Medical Association).

The associate member category is usually reserved for individuals who cannot qualify as members (full member, regular member), but who are interested in the objectives of a society and may be in the process of acquiring the necessary qualification. Voting privilege is usually restricted to full members, who predominate in most societies. The Canadian Operational Research Society is unusual in that only approximately one-quarter of its 800-plus members are voting full members.

The greatest variability and inconsistency in membership requirements is found among the scientific societies. Two societies affiliated with the Agricultural Institute of Canada provide examples: anyone actively in-

terested in soil science is eligible for membership in the Canadian Society of Soil Science; in contrast, to be eligible for membership in the Canadian Society for Horticultural Science, one must be a graduate of a recognized university and have horticulture or a related field as a vocation. Although there is no definite trend, a commonly expressed opinion is that many of the scientific societies should consider relaxing membership requirements.

Organization

Most societies are incorporated under federal charter or letters patent at the time of, or shortly after, founding; they are registered under the Canada Corporations Act. Constitutions and/or By-Laws must be submitted for approval to the Ministry of Consumer and Corporate Affairs. Revisions to these documents must have the approval of the Minister.

Constitutions and By-Laws usually cover such matters as: name, objectives, location of Head Office, membership, setting and payment of dues, Governing Board or similar body, officers, management, standing committees, fiscal period, meetings, quorums, elections, signing officers, auditors and amendment of Constitution or By-Laws.

Possibly one-half of the societies that are at least 10 years old have revised recently, or are in the process of revising, their Constitutions and By-Laws. Reasons for revising include legalizing methods of operation that have developed, clarifying ambiguities, changing classes of membership or numbers of honorary members, changing the society name or the location of its Head Office, and redefining duties of officers and governing bodies. Specifying the election of officers by mail ballot as opposed to election by members in attendance at an Annual Meeting is a basic revision that several societies have made.

Presidents and Vice-Presidents are usually elected for one-year terms. Secretaries, Treasurers and Editors are usually appointed, and serve for five years or more. Members of Governing Boards (Councils) usually serve terms of two or three years; they may be elected by the membership-at-large, or appointed by provincial or regional bodies. In one way or another, an attempt is made to obtain geographical representation.

Operation

The affairs of a society are usually managed by the officers and a group of Directors, Councillors or Board Members. The frequency of Board Meetings may be laid down in a Constitution, but commonly is circumscribed by financial considerations. A Board reports to the membership at an Annual Meeting, where ratification of certain actions, such as a proposed increase in dues, may be required. Increasingly, regular communication with members is being achieved through Newsletters or Bulletins.

Fifty societies have some kind of a Head Office or Business Office, while 35 operate for the most part on benevolent time. Full-time Secretariats are characteristic of the large professional societies; benevolent time operations are characteristic of the smaller scientific societies.

Many societies have Divisions within the organizations in an attempt

to accommodate diverse interests; the Canadian Association of Physicists has nine Divisions. A number of societies have regional, provincial or local Branches which cater to the geographical dispersion of members; The Canadian Institute of Mining and Metallurgy has 52 Branches. As previously indicated, some national societies are federations of provincial bodies.

Business Affairs

The main business affairs of societies relate to collection of dues, Annual or other meetings, and publications. These affairs are conducted by volunteer effort (benevolent time) or by a Business Office. The latter may be within a Secretariat or may be contracted out to a commercial firm or to a liaison society. Increasingly, many societies are finding that, with growth in numbers, business affairs should be run by professionals.

Activities

As suggested earlier, the traditional activities of scientific societies have centred on holding meetings at which advances in a subject area are communicated and on publishing Journals; in contrast, the traditional activities of professional societies have related more to standards of the professions, the welfare of members, and protection of the public interest. Some evolution of these traditional roles has been taking place.

It is not the intent of this report to present a detailed examination of what will be called the internal activities of societies, nor to present detailed statistics. For most parameters, such as size, age, amount of dues, budgets and reserve funds, there are no consistent correlations. Similarly, activities do not fall into definite patterns in relation to the kinds of societies. However, a number of these will come under discussion in Part III of this report ("Problems of Societies and Some Possible Solutions"), which will in effect "assess the effectiveness of the present organizational framework". Rather, the particular concern of this study is directed at those externally-directed activities which, collectively, can be termed *involvement.*

There are two categories of involvement. One is largely self-centred and includes relationships with other scientific organizations, both national and international; the second covers activities which create external involvement – with governments, educational institutions, industry and, most importantly, with Society.

Inter-Society Affiliations

With very few exceptions, no Canadian societies operate in isolation; formal and informal associations with other societies and with other organizations are the rule.

Canadian Affiliations

The contacts of one organization from each of the five groups of societies depicted in Figure II.2 will serve to illustrate that cooperation is commonplace. In these examples, no attempt is made to list all affiliations.

The Canadian Association of Pathologists (Health Sciences) has affiliations with the Canadian Society of Forensic Sciences, the Canadian Society of Clinical Chemists, the Canadian Association of Medical Microbiologists, the Canadian Medical Association, the Canadian Society of Cytology (a Section of CAP) and the Canadian Haematology Society.

The Geological Association of Canada (Physical and Mathematical Sciences) is involved with the Canadian Geoscience Council, the Canadian Society of Exploration Geophysicists, The Canadian Institute of Mining and Metallurgy, The Mineralogical Association of Canada, and the Youth Science Foundation.

The Engineering Institute of Canada (Engineering) has involvements with the provincial licensing bodies, The Canadian Council of Professional Engineers, The Canadian Institute of Mining and Metallurgy, the Canadian Aeronautics and Space Institute, the Canadian Society for Chemical Engineering, and the Canadian Engineering Societies Committee.

The Canadian Botanical Association (Biological Sciences) maintains a close association with The Canadian Society of Plant Physiologists, and is affiliated with the Biological Council of Canada and SCITEC.

The Canadian Psychological Association (Social Sciences) is associated with the Social Science Research Council of Canada, the Biological Council of Canada, SCITEC, and the Canadian Mental Health Association.

In addition to affiliations with other societies, many organizations are involved with provincial and federal government committees and boards, and various volunteer, publicly supported groups.

Joint meetings are a regular feature of the Canadian scientific scene – the Canadian Political Science Association with the Société canadienne de Science politique, the Canadian Society of Clinical Chemists with the Canadian Association of Medical Microbiologists, the consulting engineers with the organization of professional engineers, and the Canadian Home Economics Association with The Canadian Dietetic Association. Furthermore, organizations such as the learned societies, the Canadian Federation of Biological Sciences and the Agricultural Institute of Canada hold Annual Meetings at which a number of affiliated societies meet concurrently.

In total, the picture is one of a healthy degree of inter-society reaction. Indications are that there is considerable interest in extending this reaction and that the scientific community, through its societies, is showing a desirable converging trend.

U.S. Affiliations

A close association of the Canadian societies with their American opposites is a natural phenomenon, one which is fostered by the fact that many Canadian scientists obtained their higher degrees in the United States. Because many Canadian scientists are members of both the Canadian and the U.S. societies of their disciplines, communication leading to the holding of joint meetings is relatively simple. Canadian members are often on the Governing Boards and committees of U.S. societies, and a significant number of Canadians have been Presidents of U.S. societies.

Joint meetings are held in both Canada and the United States. When

they are held in Canada, the attendance from the U.S. frequently "swamps" the Canadian membership, without causing objections. Such happenings are in themselves further evidence that Canadian societies are associations of substance.

A few examples of societies which meet at intervals with their American counterparts are those of: aeronautics and space scientists, physicists, foresters, meteorologists, plant pathologists, agricultural engineers, clinical chemists, veterinarians, geologists, political scientists and entomologists.

In addition to joint meetings, affiliation involves communication about who is doing what, via each others' Newsletters and Bulletins and joint committees, or at least through representation of a Canadian society on a U.S. society committee or vice-versa.

Although competition from the U.S. is a problem for some Canadian societies, as will be discussed later, it is generally agreed that this inter-society cooperation is a good thing and mutually beneficial.

International Affiliations

Most Canadian scientific and engineering societies have formal or informal associations with one or more international organizations. This international aspect of science, which has existed from the beginning, may be fostered by affiliation with an international association or, less formally, by the holding of international congresses, usually at four-year intervals.

A few examples of affiliation with international societies are: the medical association with the World Medical Federation; meteorologists with The Royal Meteorological Society; ophthalmologists with the International Association for the Prevention of Blindness; mining and metallurgy with the Council of Commonwealth Mining and Metallurgical Institutes; biochemists with the Pan-American Association of Biochemical Societies; consulting engineers with the Fédération Internationale du Ingénieurs-conseils; phytopathologists with the International Society for Plant Pathology; psychologists with the Inter-American Society of Psychology and the World Federation of Mental Health; and chemical engineers with the Inter-American Confederation of Chemical Engineers and the World Congress of Engineers and Architects.

International Congresses, characteristic particularly of the scientific societies, are hosted in a different country on each occasion. Competition for the privilege of being host is usually keen; Canada has hosted its share. Two, for geographers and for geologists, were held in Canada in 1972.

External Involvements

General

External involvements on the part of Canadian societies have taken the forms of briefs, position papers, letters and resolutions. Approximately one-half of the societies which have been a part of this study have been in some measure active in this respect. It is natural to find that this activity is generally more characteristic of the larger, professionally-oriented associations with permanent Secretariats than it is of smaller scientific societies, many of which operate on benevolent time. Contributions of the

latter have been by no means insignificant, however. Judging significance of a society's involvement by bulk would be comparable to assessing the worth of university teachers in terms of numbers of publications.

In many instances, emanations from societies are a reflection of the interest and activity of a few individuals, a subject that will be discussed in the next part of this report. However, these submissions have, overall, had the support of the scientific community. In the course of this study there was general agreement that increased activity in this area was presaged.

The extent of external involvement of the societies is indicated by the following list of bodies to which submissions have been made, a list which is by no means exhaustive. No attempt is made to identify particular societies with particular submissions.

Briefs, position papers, letters and resolutions have been submitted recently to: the Department of Agriculture, concerning agricultural R & D; the Senate Special Committee on the Mass Media; the House of Commons Committee on Taxation Reform; the Department of Indian Affairs and Northern Development, concerning the potential of lands on Indian Reserves; the Royal Commission on Bilingualism and Biculturalism; the Department of Industry, Trade and Commerce, concerning the economic significance of the participation of consulting engineers abroad; the Department of External Affairs, concerning the White Paper on Foreign Policy for Canadians; the Royal Commission on Health Services; the study by J.B. Macdonald *et al.* for the Science Council of Canada (which was published as Special Study No. 7, *The Role of the Federal Government in Support of Research in Canadian Universities*); Statistics Canada, on the 1971 census; the Department of Manpower and Immigration; the (Bonneau-Corry) Commission on Rationalization of University Research; the (Hellyer) Task Force on Housing; the (LeDain) Commission of Inquiry into the Non-Medical Use of Drugs; the Office of the Prime Minister, concerning the population problem and the War Measures Act; the Canadian Parliament Special Joint Committee (Senate and House of Commons) on Divorce; the Senate Committee on Banking, Trade and Commerce and the House of Commons Committee on Finance, Trade and Economic Affairs; the Minister of Indian Affairs and Northern Development, concerning the White Paper on Indian Policy; the Minister of Justice, concerning the composition of the Law Reform Commission; the (Croll) Senate Special Committee on Poverty; the Royal Commission on the Status of Women; and the Science Council of Canada.

Although this list may be impressive to some readers, there is general agreement that the overall effort of Canadian societies has not been sufficient. The demand for more involvement is being recognized; the question is whether sufficient cooperative action will accommodate this demand.

Briefs to the Lamontagne Committee

In the previous comments, reference to briefs submitted to the Senate Special Committee on Science Policy were omitted purposely. The call for expressions of opinion on science policy evoked for the first time a concerted (although not unified) response by the scientific societies. Some 37 societies involved in this study also presented briefs to the Lamontagne

Committee; in addition, a number of societies were represented through presentations by liaison organizations such as the Agricultural Institute of Canada, the Biological Council of Canada and the Social Science Research Council of Canada.

Four-fifths of the briefs had as a major recommendation increased federal financial support for science. It was variously suggested that this support be directed toward: applied research on specific Canadian problems (e.g., health care, transportation, communications); research in the universities; support for societies and for their publications, including translation costs; support of scientific and technical information services; and support for R & D and innovation in secondary industry.

Other pertinent opinions included recommendations on: a structure for science policy making (usually opposing a monolithic structure); advisory bodies (usually insisting on representation of working scientists and/or scientific societies); granting bodies (usually favouring more agencies); better communication within the scientific community and with government and the public; and better communication between government, industry and universities.

Overall, the briefs (particularly those of the scientific societies) tended to have an inwardly-directed view, concerned chiefly with the needs of the society and the discipline. There were a few notable exceptions in which broader outlooks were evident. It was these individual briefs, many of which covered essentially the same matters, that led to the call for a united voice of scientists.

Science Policy Committees

Several organizations have for some years had what could be termed science policy committees, but this has been the exception rather than the rule. In conjunction with the preparation of briefs for the Lamontagne Committee, starting in 1968, and with the preparation of responses to the Committee's reports[6], the establishment of a science policy committee has become a regular feature of the organization of societies. At least 25 societies have such a committee, and at least another 40 "speak" through the science policy committee of a liaison body. As might be expected, Annual Reports reveal that the degree of activity of these committees is extremely variable. Some committees are apparently concerned only with the Lamontagne Reports; encouragingly, others are making the issue of science policy a major involvement.

Other Activities

Many societies are active in an "outward" sense in a variety of other ways. A few examples will provide additional evidence that the societies are not entirely self-interest bodies. The Agricultural Institute of Canada acts in an advisory capacity to Canadian University Service Overseas (CUSO); the

[6]Senate Special Committee on Science Policy (The Honourable Maurice Lamontagne, Chairman), *A Science Policy for Canada*, "Volume 1: A Critical Review: Past and Present" and "Volume 2: Targets and Strategies for the Seventies", Information Canada, Ottawa, 1971 and 1972 respectively.

Canadian Aeronautics and Space Institute and other bodies sponsor seminars for university students; the Canadian Society of Allergy and Clinical Immunology cooperates with the federal food and drug laboratories regarding food labelling; and a number of societies support the Youth Science Foundation. Overall, Canadian societies have tended to sit back and wait to be asked; the need is for those societies to assume more of a leadership role. This is what the current challenge demands.

The Challenges

This inventory would not be complete without specific reference to the challenges faced by societies today. No member of the scientific community can have failed to recognize that scientists and technologists are being challenged to assume the obligation to interpret the consequences of their productivity, rather than, as Prince Philip said in Canada several years ago, "concerning themselves solely with practical reward".[7] The following randomly chosen titles and headlines emphasize the growing demand for involvement: "Social Control of Science and Technology", "Science and Society: Some Policy Changes are Needed", "Dictation to Science by Laymen", "Taming Technology", "What We Must Do – A large-scale mobilization of scientists may be the only way to solve our crisis problems", "The Political Use of Ecological Information", "The Community of Science and the Search for Peace", "Time to end the aloofness of scientists", "The Social Responsibility of Industrial and University Scientists", "Social role vital in northland development, miners told", "Give the public the facts on issues, mining urged", "The Biologists, the Psychologist, and the Environmental Crisis", "Can Science Survive in the Modern Age?". This list could be multiplied many times.

Is the scientific community responding to the demand for re-assessment and re-direction? A qualified "yes" can be given – qualified because, although individual members of the scientific community and a number of societies have started to respond, the overall reaction is anything but snowballing at the present time. It is encouraging that, with increasing frequency during the past several years, the addresses of society Presidents and the comments of other officials make a major point of the need for involvement.

Although the leadership will come from individuals, an organized national effort can result only from a cooperative society involvement. In this view it is then obvious that there is a need for the societies, and that they do have a role to play in the hopefully re-directed development of Canada's future. Although the societies are beset with problems, as will be all too evident from the following part of this report, the institution is an established one whose full, but yet-to-be-realized, potential should be fostered.

Apart from an overall concern with the future interrelation of science and Society, the scientific community has an obligation to respond through its societies to present and future issues. These issues are numerous; many dictate a cooperative input from several societies. Others will be the pro-

[7]Bachynski, M.P., "Socio-scientific Research: Orphan Among the Funding Agencies". *Science Forum*, Toronto, February 1970. Page 10.

vince of particular societies. Issues relating to the quality of life – the population problem, poverty, the quality of the environment – should call forth united approaches; interpretation to the public of the issues of smoking and health, thermal pollution and pesticide pollution would more properly be the province of particular societies, even though they concern many other scientists.

Canadian engineering, scientific and technological societies face these challenges potentially well equipped.

Part III

Problems of Societies and Some Possible Solutions

Introduction

In accordance with the Terms of Reference of this study, some attention has been devoted to assessing the effectiveness of societies with regard both to their stated aims and objectives and to their actual internal and external activities. An entirely objective assessment is not possible. In most constitutions, purposes are couched in general terms:

– "to further dissemination of technical information on.....";

– "to encourage research, development and the proper use of..... ....";

– "to promote ethical standards and practical efficiency in all branches of ..... as a profession and to increase the usefulness of ..... to the public";

– "to promote the growth of the ..... sciences in Canada";

– "to study, advance and promote .....".

According to such terms, any dissemination of information, any encouragement of research or any promotion of ethical standards could be judged as an achievement of purposes. In what follows it will be evident that most societies have at times grappled with the problems of achieving aims and objectives in order to serve the membership, and that most have encountered several or more of the numerous other problems that will be examined.

The possible solutions that will be or have been suggested for some problems will not provide a panacea; nor are placebos offered. Some problems are examined in the light of probable future developments; however, the writer makes no claim to being a modern-day Nostradamus.

The numerous sources of information (Annual Reports, Newsletters, correspondence, special publications, Journals and interviews, plus the recent SCITEC IV Workshop reports) suggest that, as a whole, the societies have been doing a reasonable job of achieving their stated purposes. There are, of course, numerous lacunae, possibly the commonest weakness being the giving of mere lip service to "serving the public interest", a frequently stated or implied aim. Today, achievement of stated aims is not in itself sufficient justification for the existence of a society, unless the aims take cognizance of current trends.

The changing science scene at home and abroad is all too familiar to require documentation. The increased awareness of science on the part of the public, and the emergent questioning by the public of the significance and role of science and technology in relation to the economy, the Just Society and the quality of life, demand a greater involvement by societies – involvement with governments, educational institutions, industry and, most of all, with Society itself. The need for the development of a *social consciousness* by scientists and engineers, individually and collectively through their societies, far overshadows any concern as to how well societies have done in the past in achieving their stated aims and objectives.

To examine in some detail the problems faced by societies, particularly in light of the foreseeably changing roles – changes that are already underway – is not to downgrade the successful aspects of these bodies. The number of joint meetings with foreign societies, particularly U.S.-based

ones, and the number of International Congresses that have been held in Canada offer proof, as suggested earlier, that Canadian scientific and engineering societies are organizations of substance. Additional evidence is provided by the regard in which many Canadian scientific and engineering Journals are held outside of Canada.

The Problems

A list of specific problems would be nearly as lengthy as a list of the societies. However, these problems are grouped under the headings of *Communication Problems*, *Operational* (*particularly financial*) *Problems*, and *Involvement Problems*. It will be obvious that the division is somewhat artificial (e.g., involvement problems concern communication) and that, within and between categories, particular problems and proffered solutions are not mutually exclusive. Some redundancy will be recognized. Since some readers presumably will not be concerned with the detailed supporting comments concerning some problems, part of this detail is relegated to Appendix C.

In the following sections on a variety of problems faced by societies, the nature of some *possible solutions* will be indicated. Since a particular possible solution (for example, increasing dues) relates to a number of problems, some of the recommendations for possible solutions will be summarized at the conclusion of this Part of the report.

Before discussing problems, it is in order to comment on the people who compose the scientific community and the membership of societies which have these problems.

What are the Scientists and Engineers Like ?

Commonly, members of the scientific community – engineers, scientists (*s.s.*), doctors. dentists, social scientists, etc. – are regarded as though they constituted a race apart from the rest of Society. Such is not the case, and scientists have all the human frailties of other segments of our population. They may be bigoted, lazy, ambitious, introverted, extroverted, fundamentalists, atheists, or given to petty jealousies. However, among the possibly 50 000 members of the scientific community, there are also the civic-minded citizens, authors, poets, musicians, painters, golfers and skiers.

The man-on-the-street may tend to regard the engineer and scientist as individuals with advanced education. The proper word is training; unfortunately there are among us large numbers of highly trained specialists, but all too few truly educated individuals.

Perhaps the only factor that really distinguishes us is our involvement with something called science and technology, which the public little understands but is starting to question. Members of Society, including scientists, commonly have some knowledge of and a degree of opinion on a wide range of topics, such as economies, politics, the arts and education. These same citizens (excluding scientists) have little understanding of things scientific and technological.

Communication Problems

Most societies feel that communication with the membership is a major problem, relating to rank-and-file interest and compounded by geographical distribution. Certainly, if societies are to become more active, more involved externally, improvement in communication with memberships is vital. Communication with the young is particularly important.

Intra- and inter-society communication must be fostered to a greater degree than has been evident to the present (considering the engineering, scientific and technological societies as a whole). Otherwise, the chances for improved communication with government, industry, universities, and particularly the public are discouragingly slim; improved communication with the public is vitally necessary if we are not to be engulfed by the monster of technology that science has, without malice aforethought, created.

As in relationships between husband and wife, labour and management, or citizenry and government, adequate routes and levels of communication for societies will do much to prevent problems from arising and to alleviate existing ones.

Lack of satisfactory communication may result from failure to recognize the need, but it arises more commonly from lack of personnel and money. In general, societies which maintain a paid Secretariat have a better opportunity to communicate – among the officers, via committees and to the membership-at-large.

A common failure is that routes of communication become interrupted. It may be expected, for example, that Directors, Board Members or Councillors will report to their constituents; it is an all too frequent occurrence that the "message" is not passed on, and actions that the membership should be aware of within a short time become known only much later. Obviously, where facilities permit, communications should emanate from the Head Office, Secretary, President, etc. directly to the audience (members, affiliated societies, Divisions, etc.). A greater degree of organization than exists in many societies is required. One organization recently sent a statement to various educational departments across the country, with an indication that there would be a follow-up by a member of the society. Through a lack of communication this follow-up did not occur and the society's image was tarnished.

Communication is not a one-way street. The individual member of a society must have the opportunity to express his views if he so desires. While it is not practical to submit all debatable matters to membership vote, certainly such operations as election of officers should be by mail ballot. The present procedure of SCITEC, in which voting for officers is possible only for those individual members and society delegates able to attend the Annual Meeting is highly undesirable.

Many societies are recognizing the necessity of finding the money that will permit more effective communication within and without the organization, but money alone will not solve the problem. Continued recognition of the importance of communication and the devotion of time and energy are musts if further progress is to be made.

Rank and File Versus "The Establishment"

Most societies were formed and remain viable because of the dedication of a few individuals. This is particularly true of the scientific societies. However, even among the larger, coordinating professional societies with well-established Secretariats, it will be found that at the core of an organization's activities there is usually a handful of concerned, dedicated individuals giving freely of their time and energy.

The dedicated few are usually the officers, supplemented by recent incumbents in office and career staff where such exist. It is generally acknowledged that these groups constitute "Establishments". Admitting that the word has derogatory connotations, particularly for the young in our present-day Society, it is nonetheless clear that few if any societies could operate without an Establishment.

For the newer societies (those formed within the past five years), the Establishment may have tended to remain unchanged. For older societies, a gradual change occurs over time, with the most evident transition resulting when the founding fathers are no longer "running the show". The status of a society at this point is perhaps a major test of how it is going to measure up in terms of its stated aims and objectives.

In spite of common democratic procedures of nominations and elections, Establishments frequently tend to be self-perpetuating. Usually a President appoints the Nominating Committee, or at least its Chairman. However, it is not uncommon for the President to discuss possible nominees for office with his Board (Council), or "inner cabinet", and to communicate with the Chairman of the Nominating Committee. Although few societies would admit it publicly, there may even be an unofficial list of recommended successors to the "throne". Possibly we are talking here of something analogous to the "invisible colleges" mentioned in connection with publication problems – and invisible colleges pre-date the founding of The Royal Society of London in the mid-18th century.

To ensure the likelihood of a pre-selected candidate's being elected, a common unofficial practice (where, for example, it is customary to nominate two candidates for a particular office) is to choose deliberately a relatively weaker candidate to oppose the pre-selection. To those who would raise an outcry against this system, a reminder: guidance of the destiny of a society today, particularly in view of the challenges facing societies, must be in the most capable hands available. The democratic procedure of allowing "grass-roots" nominations is a safeguard against abuse of power by the Establishment. As a case in point, just this past year in one society the "grass-roots" candidate was elected.

Perhaps by nature, engineers and scientists are not given to politiking and electioneering, and so societies are seldom faced with a plethora of candidates.

In order to avoid suggesting that all societies operate in the above manner, an example can be cited of one society President who confessed that probably he was in office because it was "my turn", and that his real allegiance was to a U.S. society somewhat removed in discipline and purpose.

And what does the rank and file think of the "Establishment"? It is

generally conceded that in most societies a large proportion of the rank and file have little interest in the operation and affairs of the organization. For example, a small scientific society recently polled its members for preferences regarding the site of an Annual Meeting. Approximately 20 percent of 321 members responded. When pressed for opinions, the rank and file, particularly if they are geographically far removed from the Head Office or centre of activities of a society, may grumble about a Head Office operating for its own benefit, about the society not catering to rank-and-file interests, about an increase in dues, and about the delay between submission of a manuscript and its publication. Views tend to be coloured to a degree, according to how recently and how frequently a member has attended meetings of his society, and to what extent the member has had an opportunity to contribute to the affairs of the society.

Recognition of the lack of rank-and-file interest has been mounting. Within the past few years a number of societies which did not formerly have a Newsletter (Bulletin) or news section in the Journal have initiated such an attempt to keep the membership informed. Editors have a certain amount of built-in material, such as Annual Meeting reports, but a very common plaint of editors is that the members submit so little material that frequently the Newsletter must consist of material gathered only by the editor himself (see Appendix C – 54).

No one would commit himself to an estimate of what proportion of the rank and file is disinterested. The degree of disinterest, however, would appear to be related in part to the kind of society and its activities. For example, the Agricultural Pesticide Society is a small (about 140 members) scientific group with a stated purpose of furthering the dissemination of technical information on pecticides and encouraging their research, development and proper use. It seems unlikely that anyone would join this excellent group without a specific interest.

The Alberta Society of Petroleum Geologists (a national society) is another example of an organization fortunate in having a high interest level among its members. The apparent reasons are that the membership is geographically concentrated and involved with a major industry. Because of the geographical concentration it is possible to hold luncheon meetings (two or more per month), with distinguished speakers invited. The interest of the members is shown by attendances of 400 or more.

In contrast, there are a number of societies with captive memberships. For example, The Association of Consulting Engineers of Canada represents some 17 000 engineers. There is no individual membership; an individual engineer is a part of the organization because his employing firm joined the association. The Canadian Council of Professional Engineers also does not have individual memberships, but represents some 65 000 engineers through the Constituent provincial organizations (e.g., the Association of Professional Engineers of Ontario and the Corporation des Ingénieurs du Québec). These provincial organizations administer the pertinent provincial statutes with regard to licensing. Accreditation and the right to practise as an engineer can be obtained only by joining the provincial society.

Members of the Canadian Veterinary Medical Association and of the

Agricultural Institute of Canada must be in good standing with a provincial veterinary association or agrology institute respectively and, with the odd exception, membership in the latter organizations is required in order to practise the profession. It would be surprising to find a consistently high level of interest in society affairs among captive memberships.

However, it may be more difficult to explain rank-and-file disinterest in societies in which membership is completely voluntary. Obviously, when membership is voluntary a lower proportion of eligibles may become members, although, as will be discussed later, a number of parameters such as age of the society may be factors.

A member of a chemical society has suggested that in some societies immigrants are a component of the member-interest parameter. Immigrants, particularly those from the United Kingdom, tend to retain allegiance to the societies of their native lands. A low level of society involvement by such individuals, who may be in positions of influence in universities and elsewhere, can be ill afforded. This situation is by no means peculiar to the chemistry groups.

Why do individuals voluntarily join societies? The answer is probably a combination of its being the thing to do and its being a means of communication. From the contents of Journals and of papers presented at meetings, one learns what *has* been done. By attendance at meetings and, to an increasing extent, through the medium of Newsletters, one learns who *is* doing what, and may have an opportunity to become involved in an "invisible college".[1]

Possibly, many scientists join Canadian societies out of a sense of duty. Most societies have membership committees which are active in varying degrees over a period of time. However, there is no evidence of any significant degree of pressure being applied to induce individuals to join particular societies, although it has been suggested that scientists may be urged to support organizations that they don't really need. The argument could be advanced that societies should exist only if there is a need for their services; presumably, founding fathers have felt that a new society would provide services that were needed.

The problem of the disinterest of rank-and-file members, and of their occasional disenchantment, is by no means a new one. It is, however, a matter of continuing concern to a number of organizations. There are several *possible partial solutions* to this problem. There is general agreement that an increased communication with members is an urgent necessity; Newsletters offer the most readily available medium. The soliciting of views and opinions by questionnaires and tear-off return sheets should be used more extensively, although it is agreed that a low return rate should be expected.

Although the proposal that more members should be involved on society committees has merit, most societies cannot afford the expense of convening committees; committee work by correspondence may do little

[1]As indicated earlier, this term has been in use for more than 200 years. Today it usually refers to a system of communication which is in a sense private. Researchers may distribute pre-prints of their work to members of a "college", thus reducing the delay that results in communicating through the usual channels of publication in Journals.

to stimulate the individual's interest in the activities of his organization.

Frequently, insufficient thought is given to appointments to committees. A practice followed by at least several organizations is to ask members to fill in a form indicating which committees, if any, they would prefer to serve on. Although an executive should not expect to be snowed under with volunteers, the procedure does frequently have the advantage of turning up interested individuals who might otherwise be overlooked.

In the larger societies which have Sections, Branches or provincial Constituents (e.g., The Engineering Institute of Canada, The Canadian Institute of Mining and Metallurgy and the Agricultural Institute of Canada), increased activity of the Sections can be promoted – preferably, only by suggesting definite undertakings. The routine holding of Chapter (Section, Branch) meetings in deference to custom may do more harm than good, as has been suggested by officers of The Engineering Institute of Canada, among others.

Representatives of many societies have suggested that the anti-"Establishment" feeling could probably be dissipated if an officer of a society could visit each unit at least once a year. It should hardly be necessary to point out the requirements of time and money involved.

In general terms, it is incumbent upon the Governing Boards of societies to be certain that avenues of communication are open, to permit the "grass-roots" voices, when and if they develop, to reach headquarters. Some additional comments on obtaining opinions from members are provided in Appendix C – 56.

Tunnelled Views and Restricted Careers

There is general agreement that the Canadian scientific community is, unfortunately but not surprisingly, burdened with many individuals whose views can only be described as "tunelled"[2] and whose careers have been all too restricted. Communication with these individuals is a challenge. Recognition of this situation should not occasion surprise. We should not be so naive as to suggest that all engineers and scientists are of one ilk, contrary to what would seem to be implied by some of Dr. Herzberg's recent public utterances in defence of basic research. There are a few outstanding scientists in Canada, many good ones, some more mediocre and, regretfully but not surprisingly, some poor ones. It is long past time for us to admit publicly to this distribution of abilities. Again, we are no different than plumbers, electricians, stonemasons, hewers of wood and tillers of the soil.

Tunnelled vision can in part be blamed on the faults of educational systems, although genetic inheritance must be balanced against the environment. Our university programs tend to turn out highly qualified technicians in specialized fields, whereas the need is for problem solvers.

Individuals with channelled views are those whose interests are restricted to their immediate area of expertise, and who, quite apart from innate abilities, tend to shun any other involvement. Part of the blame for this situation must be laid at the feet of employers, particularly govern-

[2]A term used by Environment Minister Davis to describe the planners of the Bennett Dam.

ments and universities. Until very recently, at least, when a new graduate was hired he was given completely free rein by the university and relatively free rein by government, insofar as the direction of his research activities was concerned. Unfortunately, far too many of these individuals have devoted their research efforts to extensions of Ph.D. thesis projects requiring little imagination.[3] A good case could be made for a regulation stipulating that a graduate could not continue research activity directly related to his degree for a period of several years. Admittedly, the enforcement of such an unpopular regulation would separate the wheat from the chaff, and some individuals would find themselves, as Shakespeare put it, part of "the chaff and ruins of the times".

All too frequently, one-track views are associated with restricted careers. Such careers are particularly characteristic of scientists in the employ of governments and universities; among non-university engineers, restricted careers are less commonly encountered. The engineer is usually doing things. Once a project is completed it is usually necessary to move somewhere else to do another thing. In contrast, the government laboratory worker may remain in one location and devote his efforts to a narrow channel of his discipline for a period of years. This has been characteristic of the post-World War II boom in government research. Fortunately, the pendulum has started to swing, at least in some segments of the Federal Government organization. "Relevancy" and "mission-oriented" have become key words. Canada Agriculture, for example, has within the past several years reviewed its research programs with a new criterion: what good is it for Canadian agriculture? As a result a number of proiects, in themselves soundly conceived, have been dropped and some of the individuals concerned have perforce undergone various degrees of "retreading". Such action cannot help but be of benefit to the societies, since it will tend to put an end to a number of restricted careers and so should produce a broadening of viewpoints. The shake-ups and shifts associated with the establishment of a Department of the Environment, again, should do a great deal to bring about changes in the tunnelled views-restricted careers syndrome.

The most serious situation is encountered in the universities; because of rapid growth during the past 15 years, there are too many members of the teaching staffs who have known nothing but academia. This criticism does not apply equally to all professorial staffs; in some areas, such as engineering and geology, professors are more likely to be involved in consulting work that takes them away from the crumbling ivory tower and into the real world of government, industry and Society. However, universities are currently taking a closer look at consulting activities, and some restrictions seem likely to be imposed in the near future. Also, consulting by professors may come under attack by organizations such as The Association of Consulting Engineers of Canada. Thus, a practice which can be

[3] "1. *narrowness in approach to physics*: with many job opportunities open to them physicists tended, after their Ph.D., to work in the same narrow subfield in which they were trained. This has led to a kind of 'pinch effect' within the subfields of physics in which the broad perspective is lost and, instead, games and fashions are constructed of ever narrowing interest and with little physical content." E.W. Vogt, "President's Address". *Physics in Canada*, 27(7), September 1971. Page 92.

justified in terms of potentially providing more knowledgeable teachers may become less common for pragmatic reasons.

The *possible solutions* to this problem are complex. Societies must become more involved with the universities in cooperative efforts to improve the quality of the university graduates, who in turn become the succeeding generations of the scientific community. Societies can be active in at least two ways. Studies such as those conducted by the Canadian Association of Physicists (CAP)[4] are to be commended. A number of universities already have advisory councils drawn from industry and government, which meet at intervals to review programs and faculties.

A more formal accreditation system, such as the one established by a special committee of the Canadian Council of Professional Engineers (CCPE) and known as the Canadian Accreditation Board, has considerable merit. It is of interest that the recent Study of Engineering Education in Ontario (Lapp Report)[5] recommends direct liaison between Ontario bodies and the Canadian Accreditation Board.

Other societies could follow the lead of the CCPE. Objective, independant evaluations by a central body, free of any regional bias, should come to be accepted by university faculties and departments. Again, it is emphasized that university programs must be directed toward producing engineers and scientists (as well as humanists) who are *problem solvers*, and who are concerned with the problems facing Canadian Society today and in the years ahead. Members of the scientific community, through their societies, have an obligation to contribute to the improvement of the university system of which they were once a part, an obligation which, in large measure, they have avoided until now.

Another measure that would do much to broaden channelled views and reduce restricted careers would be the organization of a university-government-industry personnel exchange system. Such exchanges might be arranged for periods of six months or longer. Obviously, a great deal of organization and careful selection of assignments would be required. The system being used by the Science Council of Canada in obtaining a series of one-year secondments to the Council staff should be examined. The National Research Council's senior industrial fellowship program is also a step in the right direction.

As with so many other possible solutions to societies' problems, the question of financing arises. However, failure to see immediately how a particular development could be financed should not militate against examining the possible significance of the measure.

The suggestion by the Senate Special Committee on Science Policy that more of Canada's basic research should be done in the universities, possibly implying some shifts of personnel (anti-restricted careers), is not a new one. The writer remembers Dr. H.M. Good of the Department of

[4]"Purpose and Choice in the Support of University Research in Physics". (The Laurence Report). *Physics in Canada*, 27(5), Special Issue, June 1971. Page 1.

"Student Attitudes Towards Science and Technology". A Report from a CAP Study Group. *Physics in Canada*, 27(6), July 1971. Page 73.

[5]*Ring of Iron: A Study of Engineering Education in Ontario.* A Report to the Committee of Presidents of Universities of Ontario (P.A. Lapp, Director). Toronto, December 1970.

Biology, Queen's University, arguing for this proposition at least 15 years ago.

Similarly, the remarks on restricted careers are not new. The author made essentially these same comments several years ago.[6]

Involving the Young

There is general agreement that involvement of the younger members is a problem for many societies. It should be recognized that these younger members may have something to say that is worth listening to – particularly their demands. Many young scientists indicate a desire to learn to act responsibly. They recognize that they will inherit the demands of a misled Society for miracle solutions to problems old and new.

The generation gap exists to a degree within the societies, as it does within other segments of our Society. The tendency to be guarded against is for the more senior citizens of a society to form the "Establishment". A member of one society complained that nominating procedures tend to exclude young members from high office. Among the smaller societies, however, it appears that involvement of the young – i.e., under 40 years of age – in a position such as that of Secretary is increasing in frequency.

In the numerous societies which annually award a prize or medal for outstanding contribution to the society's discipline area, care must be taken lest such recognitions become "senior citizen awards".

There is little evidence that, when young members are recruited to a society, any attempt is made to get them involved immediately. Limitations imposed by finances, geographical distribution and limited communication militate against this involvement, so that the stirrings of revolt by the young, evident in more than one society, should not be surprising. It is encouraging to find in the records of a few societies (e.g., the Canadian Society of Microbiologists) specific mention of the young members as a resource which must be exploited.

Involvement of the young is probably inversely related to the rigidity of membership requirements. Requirements such as a minimum age, a specific degree (or the equivalent), or proven competence in a particular field may discourage younger members from joining societies; while these individuals are meeting the requirements, they may come to regard the society as highbrow. Defenders of relatively strict membership requirements argue that, without such credentials, individuals cannot possibly be qualified to contribute to the aims and objectives of the society. On the other hand, several of the more "active" societies (e.g., the Canadian Institute of Food Science and Technology, and the Canadian Society of Soil Science) claim that their strength lies in wide open membership (full or regular plus associate); this tends to make for a broad-based society, with the resultant stimulation of communication among members with extremely diversified interests.

It is important to recognize that the person with the ability, interest

[6]See "Panel Reports of the Study of Basic Biology in Canada" by the Biological Council of Canada (BCC) and the Canadian Federation of Biological Societies (Kenneth C. Fisher, Study Director), Duplicated and distributed by the BCC, Ottawa, February 1970. Report of Panel No. 14, Invertebrate Physiology and Biophysics (A.S. West, Chairman).

and social consciousness which will lead to involvement for the good of Canadian Society is not necessarily a senior citizen, a renowned researcher or even a well-known name within or outside his society. In the universities, where student membership on Senates and on faculty and department committees is a relatively new development, many colleagues admit that some of the young do have worthwhile contributions to make.

Societies should review their membership requirements to determine if restrictions which hold back the young really can be justified, and specific efforts should be made to involve new and young members in the activities of a society. An example of what the American Association for the Advancement of Science is doing about young scientists is given in Appendix C – 60.

Geographical Dispersion

With very few exceptions (e.g., the Alberta Society of Petroleum Geologists, whose membership is concentrated in one province, and, to a lesser degree, the Canadian Society of Exploration Geophysicists, 80% of whose membership is concentrated in the West), geographical dispersion of memberships is recognized as a major problem by many societies. Not only are members distributed from St. John's to Victoria. An added problem is that membership is often heavily concentrated in Quebec and Ontario – as might be expected, since some 63 per cent of Canada's population lives in these two provinces. Table III.1 provides information on membership distribution in six national societies. The tabulation is based on the latest information available to the study, but is not up-to-date in all cases. For example, the Biological Council of Canada now has more than 5 000 members. However, past records indicate that there is no reason to expect any major shift in geographical distribution over a short period of time.

The Ontario-Quebec concentrations are all too obvious. This is shown in the following sampling of societies and the percentage of each one's non-student membership living in Ontario or Quebec; 79 per cent of CIC; 74 per cent of CAG; 75 per cent of CPA; 57 per cent of CIMM; 59 per cent of BCC; and 63 per cent of CVMA.[7]

Although percentages make an impact, absolute numbers are also significant. Whereas CIC has only 246 members (4%) in the Atlantic Provinces, CIMM has 585 (8%), which permits organization for greater involvement in the affairs of the society. CIC has one Atlantic Section, whereas CIMM has four Atlantic region Branches. Twenty-two of CIC's 34 Sections (65%) are located in Ontario and Quebec, whereas only 27 (52%) of CIMM's 52 Branches are located in Ontario and Quebec.

These comparisons illustrate that the nature of the profession involved is a factor of considerable significance in geographical distributions. The distribution of members of CIMM is as would be expected in light of its association with the mining industry. Whereas the membership of societies

[7]CIC – Chemical Institute of Canada
CAG – Canadian Association of Geographers
CPA – Canadian Psychological Association
CIMM – The Canadian Institute of Mining and Metallurgy
BCC – Biological Council of Canada
CVMA – Canadian Veterinary Medical Association

Table III.1 – Geographical Distribution of Canadian Membership of Six Societies

Province	Number of Members (Percentage in Brackets[a])					
	CIC[b]	CAG	CPA	CIMM	BCC	CVMA
British Columbia	357(6)	106(12)	47(6)	1 331(18)	380(11)	181(8)
Alberta	390(7)	68(8)	63(8)	889(12)	353(10)	253(11)
Saskatchewan	119(2)	17(2)	11(1)	111(1)	171(5)	124(5)
Manitoba	149(2)	25(3)	28(3)	314(4)	218(6)	75(3)
Ontario	3 100(52)	534(61)	404(50)	2 858(38)	1 360(39)	985(43)
Quebec	1 541(26)	114(13)	209(27)	1 451(19)	697(20)	460(20)
New Brunswick		0	24(3)	137(2)	106(3)	41(2)
Nova Scotia	246[c](4)	5(0.6)	17(2)	332(4)	149(4)	43(2)
Prince Edward Island		2(0.2)	4(0.5)	0	18(0.5)	17(0.7)
Newfoundland	0	9(1)	7(0.9)	116(2)	57(2)	
Totals	**5 902**	**880**	**814**	**7 539**	**3 509**	**2 295**

[a]Percentages rounded off to nearest whole number except where less than 1.
[b]CIC – The Chemical Institute of Canada; CAG – Canadian Association of Geographers; CPA – Canadian Psychological Association; CIMM – The Canadian Institute of Mining and Metallurgy; BCC – Biological Council of Canada; CVMA – Canadian Veterinary Medical Association.
[c]Maritimes.
Source: Data for Tables III.1 – III.11 were gathered from the selected societies during the course of this study. Details may be found in Part I, under the heading "Procedure" (pages 28-30).

such as CIC, CAG, CPA and BCC tends to be concentrated in the major urban and university centres, that of CIMM is much more dispersed. For example, only 14 per cent of the British Columbia members of CIC live outside the Vancouver area; 35 per cent of Ontario members are located elsewhere than Toronto, London, Hamilton and Ottawa; and 19 per cent of the Quebec members are in locations other than Quebec City and Montreal. In contrast, for CIMM: 35 per cent of the British Columbia members live outside Vancouver and Victoria; 50 per cent of Ontario members are found elsewhere than Toronto, London, Hamilton and Ottawa; and 41 per cent of Quebec members other than in Quebec City and Montreal.

When it is recognized that 76 per cent of 106 societies have a Secretary or Secretariat in Ottawa (41%), Toronto (13%) or Montreal (22%), and that many organizations have affiliations with coordinating societies whose Head Offices are in Ottawa (e.g., Agricultural Institute of Canada, Canadian Medical Association), one can see that references by Maritimers to seats of power in "Upper Canada" are not entirely tongue-in-cheek.

Geographical distribution is a problem because it:

a) adds to the always present problem of communication, particularly face-to-face communication;

b) tends to result in isolated pockets of members who feel cut off from, and sometimes abandoned by, the headquarters;

c) limits participation in meetings or committee deliberations because of financial considerations; and

d) at times is a convenient excuse for the failure of members to become involved.

This problem is of concern to most societies, but in varying degrees. The number of Chapters, Sections and/or affiliated provincial organizations and

their degrees of activity influence the seriousness of geographical distribution as a society problem.

Since Canada's geography cannot be changed, the problem will always remain to a degree. Most of the *possible solutions* that can be suggested involve time and money.

More frequent issuing of Newsletters would be of some help, providing members will contribute.

A greater use of the system of Branches (Chapters) can be recommended wherever viable groups can be formed in various parts of the country, providing the Branches have definite purposes or assignments. As indicated earlier, Branches frequently tend to have meetings simply because it is customary, and turn-outs to listen to invited guest speakers may be disappointingly small. As would be expected, there is a great deal of variation in the degree of activity of Branches of organizations such as The Engineering Institute of Canada (EIC), CIC and CIMM; these differences usually relate to the presence or absence of one or more dedicated souls. An examination of student memberships in relation to the sizes of universities clearly shows a lack of correlation; a relatively large student membership of a society in a relatively small university can be the result of only one or two active professors. The approach by CIMM to achieving greater involvement by a dispersed membership is detailed in Appendix C – 62.

Where provincial or regional bodies do not exist, the promotion of sectional meetings would be a move in the right direction. Most societies try to rotate the location of their Annual Meetings so as to serve the wide geographic spread of membership. The Entomological Society of Canada, for example, meets jointly with one of the seven provincial or regional entomological societies each year. The programming of meetings in various parts of the country (an operational problem) is not without difficulties. It is relatively easy for the entomologists to arrange a meeting in Ottawa, because of the local concentration of members of the society. On the other hand, holding a meeting in Saskatoon (and the last one was most successful) places an undue burden on the handful of entomologists located in the area.

Ideally, the President of a society should visit all the Branches (Chapters, Sections) or regional affiliates each year. Limitations of time and money militate against this. A President who is a university professor will probably be unable to get away frequently during the academic year. A President who is a member of a consulting firm will likely be able to devote travel time to society affairs, according to the degree of support by his colleagues and, commonly, according to how readily business and society affairs can be combined so as to reduce costs to the society.

Factions Within a Society

For numerous organizations, a major communication problem is that of attempting to accommodate the diversity of interests of various groups of members. In part, but not entirely, this problem relates to size. There are numerous kinds of engineers, physicists, chemists and other scientists. Within a society the diversity of interests is usually accommodated, with varying success, by the organization of Sections or Divisions (e.g., The

Chemical Institute of Canada and the Canadian Association of Physicists). However, the interests of members of a particular Division may be more closely allied to those of another society than to those of other Divisions within their own parent body.

For example, at least some members of the Division of Earth Physics of CAP have recently come to feel that the Division is "ailing". It has been pointed out that there are competing foci, such as the Canadian Society of Exploration Geophysicists, the National Research Council (NRC) Associate Committee on Geodesy and Geophysics, and the American Geophysical Union. The NRC committee has amounted almost to a society, but there is some suggestion that resources may dictate a reduction in size of this rather large body. The geophysicists in CAP are looking at their future. Should the Division be dissolved? Should the group remain as a Division of CAP, while affiliating with the American Geophysical Union and/or the Canadian Society of Exploration Geophysicists? Or should an independent Canadian Geophysical Association be formed, and affiliated with one or more existing organizations?

This is a case in which the existence of a problem should not be taken to connote dissention in the ranks. The CAP executive is appreciative of the problems of the earth physicists, and clearly wishes to help.

The Engineering Institute of Canada is attempting to cope with the "division of interests" problem by developing its "constituent society" concept. It may be difficult for the uninitiated to understand in what way a constituent society is different from a Division or Section. A parent body in a discipline with numerous subfields will usually have a traditional tie with a particular subfield, and yet it will try at the same time to speak for the entire society. A constituent society can have its own voice, can establish its own international associations, and so on, and yet still join with the parent body for a united front when the occasion warrants. Difficulties can arise at the Branch level when the parent body and the constituent society may be competing for dollars, meeting times and student interest.

The associations of the Canadian Society for Chemical Engineering with The Chemical Institute of Canada and of the Metallurgical and Petroleum Societies of The Canadian Institute of Mining and Metallurgy with the parent organization are in a constituent-society framework. The trend appears to be toward the formation of more affiliated societies within parent associations. To the writer this seems more desirable than unaffiliated independent societies.

In the smaller societies as well, diversities of interests exist; but usually, special-interest groups are not of sufficient size to consider forming an independent society. Accommodation of these special interests is attempted by way of meeting programs and a balance of Journal articles. For example, the entomologists may have submitted-paper sessions and/or symposia catering to the particular interests of forest entomologists, medical entomologists, taxonomists and insect pathologists.

Another way of catering to diversified interests is by joint meetings with other organizations. For example, The Canadian Institute of Mining and Metallurgy meets periodically with The Geological Association of Canada and the Mineralogical Association of Canada. Other examples of

joint meetings have been cited on page 43.

Diversity of interests within societies only re-emphasizes the lack of rigid compartmentalization of science, and the basic common bond of the scientific community – a bond that needs to be fostered by communication.

Bilingualism

All societies contacted through interviews agreed that bilingualism was a problem of at least a minor degree, and that communication in two languages costs money. A representative of only one society (the Canadian Psychological Association) maintained that the language problem was a major one, principally because of the costs.

Table III.1 shows that 13 to 27 per cent of the memberships of six societies selected as representative live in the province of Quebec. Not all of these of course are French-speaking and, on the other hand, there are French-speaking members living in other parts of Canada. For the engineering and scientific community as a whole, a rough estimate would be that about 15 per cent have French as their native tongue. (As a specific example, at a time when the Canadian Society of Microbiologists and a total membership of 623, 16.6% were French-speaking). All but a handful of these are bilingual.

Probably because of the language and cultural barrier, which is being dissipated gradually, the francophone scientific community has more provincial societies than are found elsewhere; as a liaison body, the Association Canadienne-française pour l'Avancement des Sciences (ACFAS) is unique in Canada. Of the approximately 40 societies associated with ACFAS, some 25 are scientific, according to our definition (e.g., Société canadienne de science politique, Société de chimie de Montréal, Société entomologique du Québec). In addition, there are still other societies (e.g., Société de microbiologie de la province de Québec) which are not currently listed as members of ACFAS.

Many of the francophone organizations have close associations with the corresponding national society. The association may be informal or, as is the case with the Société canadienne de science politique and the Canadian Political Science Association, a formal agreement detailing cooperation may exist. The Société entomologique du Québec (as well as other provincial or regional entomology societies) has a representative on the Governing Board of the Entomological Society of Canada. Periodically, the Quebec Society hosts a joint meeting with the national organization. In the fall of 1972 the Quebec and national entomological societies will jointly host a meeting with the Entomological Society of America, in Montreal.[8]

Many societies of relatively recent origin (e.g., the Canadian Society of Microbiologists, founded in 1951) have from the start operated under a French name as well, and use both languages in their communications – letterheads, Newsletter, ballots, membership application forms, etc. Older societies have in recent years moved in this direction if they were not

[8]For the reader who may feel that the Entomological Society of Canada is cited too frequently, the writer confesses that this society has none of its official documents in French, does not have an official French name, and rarely has a French-language article in its Bulletin.

already operating bilingually to a degree. Nearly all societies now have their Constitutions and By-Laws available in French and English.

At the meetings of most societies, papers may be presented in English or French. A few societies have tried simultaneous translation at their Annual Meetings, particularly when they are held in French Canada. With the odd exception, the cost has been found to be prohibitive. Since most francophones are bilingual, the trend is for presentation of papers in English, as a courtesy to those who do not understand French. Fortunately, the incident at one society's meeting, in which English-speaking members left the room when a paper was being presented in French, was an apparently isolated occurrence. Such hopefully rare behaviour is obviously not conducive to cementing good relationships. In their brief to the Royal Commission on Bilingualism and Biculturalism, the Canadian Society of Microbiologists (CSM) stated: "Ces difficultés peuvent et doivent être surmontées tout d'abord, par une attitude réciproque de compréhension et des efforts réciproques en vue d'une meilleure communication". Additional information from the CSM brief is given in Appendix C – 65.

Most societies today, and certainly those based in eastern Canada, have the capability of communication in both languages. The number of papers accepted by society Journals for publication in French and the French content of Newsletters and Bulletins are increasing. Although the picture suggests that the Canadian scientific community is moving in the right direction, there is need for further mutual cooperative effort.

Possible solutions to the bilingual problem are costly and will require time.

In some quarters it is felt that the provision of simultaneous translation services (by the government, since the cost is out of reach of most societies) at society meetings is a must to improve communication between the two major ethnic groups in Canada. Others argue that such a service would tend to encourage anglophones not to learn to use the French language.

Subject to limitations of costs, an argument can be advanced for producing all society materials (Journals, Newsletters, Position Papers, etc.) in both languages. Certainly, French summaries of papers printed in English, and vice-versa, should become the regular procedure, as it is in a number of Journals already.

Particularly in eastern Canada, individual members should be encouraged to make greater efforts to use the other language – for example, by using both languages on slides and other projected materials, and by providing abstracts of papers in both languages at meetings (or at least arranging for such abstracts to be provided). Greater demands should be placed on the younger members than on the senior citizens. The headline in the Montreal Gazette of 25 April 1972 – "French tongue loses ground across the nation" – should not be taken to suggest that bilingual problems for scientific societies will shortly disappear.

The Inter-Profession Gaps

In talks with some 140 individuals, singly or in groups, during the course of this study, only one person protested against the following thesis. Within

the scientific and professional community in Canada (and elsewhere), there exist certain gaps (barriers) in mutual understanding and communication. These gaps are contributing to the difficulty of:

a) organizing the desirable unified presentation to government of views on science policy;

b) developing involvement with universities and industry; and

c) most importantly, fostering any cooperative attempt to interpret to Society the impact of modern science and technology.

Somewhat simplified, the gaps are those existing among the adherents of medicine, science (*s.s.*), engineering and social science – the four "camps". These gaps are yet another example of the fact that members of the scientific community have the frailties of members of other segments of our Society.

The rest of the scientific community tends to believe that the medical people consider themselves a race apart; quite probably, envy of the generally better financial position of doctors conditions this view. Some medical people readily admit the existence of this situation.

Engineers are, or tend to be, regarded by the rest of the community as the doers – purely practical, too involved in building things and not qualified by education or temperament to be involved in the broader, more philosophical considerations and challenges of our modern Society. However, it is of interest to recall that "In 1771 John Smeaton formed the first association of engineers, a dining club in fact, with the ends 'that the sharp edges of their minds might be rubbed off by closer communication of ideas'."[9]

The rest of our community tends to feel that the scientists (*s.s.*), because many of them have Ph.D. degrees, apparently consider themselves to be seated next to the throne of heaven, with the right to be provided with funds for "basic" research without question, and to be allowed to be uninvolved.

Finally, all of us are "suspicious" of the social scientists, the newcomers – *nouveaux riches* of our community who seem to be getting into positions of influence and power, who have taken the lion's share of faculty appointments in many universities recently, and who speak a language that most of us don't (try to) understand.

Envy could be extended to the humanities as well. "Declarations by men of science abound in which they modestly betray their envy of the density, obdurate timeliness and also of the concreteness of literature."[10]

Described in this manner, the picture seems bleak. In truth, examples by the dozen could be cited, examples that might put the lie to this thesis. The National Research Council (NRC), the Medical Research Council (MRC) and the Canada Council all cooperate. In the course of this study, no difficulty was encountered in assembling individuals from the four "camps" for group meetings. The infant SCITEC furnishes another example of a degree of interdisciplinary cooperation.

[9]From an address by President D.J. McLaren to the Annual Meeting of the Alberta Society of Petroleum Geologists, Calgary. *Bulletin of Canadian Petroleum Geology*, 29(1), Preprint, March 1972. Page 1.

[10]Peyre, H. "What is Wrong With the Humanities?" *Ventures*, Fall Issue, 1969, Page 36.

However, a few examples will show that underneath the apparently unruffled exterior of the scientific community there exist elements of "jealousy", "envy" and "distrust". These opprobrious terms admittedly apply to a degree even within the four "camps", which is not to suggest that we are so bad as to belong to Milton's "dark, opprobrious den of shame".

The late J.A.F. Stevenson, in discussing the role of the Canadian Physiological Society in the Biological Council of Canada, commented that "One of the benefits from inclusion of some 'medical-type' biological societies is that a good deal of distrust and mutual criticism between medical and non-medical biologists has been broken down".[11]

In universities, individuals who obtain research grants under the aegis of NRC are envious of those who, by virtue of being in medical faculties, can obtain grants (often, larger grants) from MRC and, in some cases, are supported by NRC as well.

Societies in the science (*s.s.*) area "resent" the fact that some social science and humanities societies can obtain operating funds from Canada Council, while NRC limits its support to publications, symposia and congresses, and travel.

For many years, before the Canada Council was formed, the social science and humanities groups were envious of those members of the community who came under the wing of NRC and (e.g., in the case of university staff on sabbatical leave) could therefore qualify for senior research fellowships. Now the tables are turned; the latter fellowships are no longer available, and Canada Council support is the envy of the scientists.

Interdisciplinary conflict is mentioned in an unpublished report prepared by the Canadian Psychological Association in 1971 for the Science Council of Canada. "Predictably, other departments within the universities have had some difficulty adjusting to psychology's rapid growth and its shift in identity to a science department with all the attendant needs that this entails." The even more recent rapid growth of Sociology departments has also occasioned some "difficulty in adjusting".

During the postwar period and until quite recently, many of us envied the "golden-haired boy" position of the physicists in the sun of science. Physicists no longer occupy this favoured position, and are now "scurrying around" trying to find a "major project".

Government and industry employees have envied university staff who had the privilege of supplementing their incomes by doing consulting work.

Societies whose Journal is either published by or subsidized by NRC or other governmental agencies are the envy of those not in this favoured position.

The foregoing may suggest that what Senator Gratton O'Leary said recently about people, with reference to the Croll Report on Poverty, may apply to societies and the scientific community: i.e., "you can't achieve equality among men".

No simple *possible solution* to this problem can be offered. There is

[11]Hatcher, J.D., "Science Policy in Canada", Canadian Physiological Society, *Canada Physiology*, 2, Winnipeg, 1971. Page 34.

general agreement that the first step in eliminating these gaps is to admit to their existence, which we have been reluctant to do other than privately. Accepting that members of the scientific community have the frailties of other segments of our Society, it would be utopian to expect that all conflict could be eliminated.

Again, communication must play a major role. The scientific community needs to know what is going on where, and the requirement for a Canadian *Science* or *Nature* seems obvious. At the present time, *Science Forum* does not fulfill this need.

The burgeoning interdisciplinary areas of science and technology – team research, development research grants, mission-oriented research and, in particular, involvement in concern for the quality of life – should do much to eliminate the gaps. An environmental problem such as the James Bay hydro-electric development, involving as it does engineers, sociologists, biologists, economists and others, will bring the "camps" together.

Most of all, the development of a social consciousness by societies and in the scientific community – a development that cannot be legislated – is needed. At the Easter Season, when parts of this report were being written, we heard repeated reference to the brotherhood of Man; it is apt to suggest that we need to sponsor the brotherhood of the scientific community through its societies, and its hoped-for acceptance of responsibility in directing science and technology in the best interests of Canadian Society.

Employment

The potential problem arising in association with the employment distribution of memberships is, in a sense, a communications one. The voice of a society and the extent to which members will speak out on particular issues may be influenced according to employment. The employment

Table III.2 – Employment of Members of Canadian Psychological Association (CPA), Canadian Association of Geographers (CAG), Canadian Operational Research Society (CORS), Canadian Institute of Mining and Metallurgy (CIMM), Biological Council of Canada (BCC), Canadian Association of Physicists (CAP).

Society	Employment and Number of Members					
	Government		Education		Industry	Total
	Federal	Provincial	University	Other		
CPA[a]	31	44	580	85	193[b]	933
CAG[c]	31	5	227		4	267
CORS	146[d]		182		512	840
	63[e]	23	99		211	396
CIMM[f]	52	59	326		7 063	7 500
BCC[g]	696	98	1 851			2 645
CAP[h]	152		384		121	657

[a]1972 Directory; members whose employment was indicated.
[b]Includes hospitals and clinics.
[c]1969 Membership List; tabulation from those addresses which gave clue to employment.
[d]Provided by the Society.
[e]1971 Directory; tabulation from those addresses which gave clue to employment; comparison of two sets of data suggests sample revealed by addresses is reasonably valid.
[f]1971 Directory; members whose addresses did not indicate government or university were assigned to industry.
[g]1971 Directory.
[h]*Physics in Canada*, 21(3): 1965.
General Source: See Part I of this report, under the heading "Procedure" (pages 28-30).

problem could be discussed equally well under involvement, which as indicated is communication.

Table III.2 provides a sample of employment of the members of six societies in the three categories of government, university and industry. It would appear that, among psychologists, geographers, physicists and particularly biologists, the academics could dominate the societies. However, psychology has a significant industry component (mostly hospitals and clinics) and biology has a significant government population, as does physics. Operational research predominates in industry, but with a significant government-employed component. In CIMM the industry-employed members swamp other categories. It might be expected that public policies which have an impact on government, university or industrial establishments would be reacted to differently according to the predominating employment of memberships. Obviously, there would be need here for intra-society dialogue and communication of all kinds.

Several contacts have suggested that relative freedom to speak out may at times be influenced by employment, a matter which will be considered further in the discussion of involvement problems.

It is perhaps well to remember that in most societies action arises from a relatively small group of individuals. These leaders will not necessarily always be from the predominating employment group. Hence, employment distribution may be more a potential problem than a real one.

Operational Problems

Operational problems faced by societies are multitudinous, and several of them are of concern to most societies. Many of these problems have been identified directly or indirectly already. The possible, intended or desirable activities of societies may be circumscribed by these problems.

Again, the somewhat arbitrary designation of problems under the categories of communication, operation and involvement will be evident. For the most part, operational problems differ in degree rather than in kind among the various types of societies. The Canadian Medical Association has a problem maintaining satisfactory contact with some of its affiliated societies; this is at once an operational and a communications problem. An individual society such as the Canadian Association of Physicists, as pointed out earlier, has a similar problem with some of its Divisions. The Canadian Council of Professional Engineers at times experiences some problems in dealing with provincial professional engineer associations.

Financial Problems

A detailed consideration of the financial operations of societies could be a long-term study in itself. In the present study there has been no attempt at a statistical analysis of society finances. Such an analysis would require an examination of financial records over a period of at least several years. The information available does not permit the striking of means and averages for several reasons. In a few cases, financial statements for 1971 have become available. Mostly, the records are for 1970 or the 1970-71 fiscal year,

and in a few instances they are for a 1969-70 year. Accounting methods are variable. A few societies provide separate financial statements for their publications. However, many of the costs of publications are "hidden"; it is impossible to determine, for example, what proportion of salaries and office expenses are assignable to publications.

It is not the purpose of the present study to dissect society expenses and play an Auditor General Henderson's role. In some cases, balance sheets show which expenses may be placing a society's financial position in jeopardy, but an examination of the justification or validity of particular expenses is beyond the scope of the present study.

One comparison will illustrate variability. A society with membership in excess of 8 000 reports Head Office expenses of $185 000, including $4 700 for travel, $127 000 for salaries and benefits and $16 000 for rent and taxes. Another organization, with a membership of over 6 000, reports Head Office expenses of $106 000, including $5 100 for travel, $69 000 for salaries, and $13 000 for rent. The first society showed a profit of $50 000, and the second, a loss of $9 500 during the fiscal year for which information was available.

Without exception, all societies consider that finances are a major, if not their most important, problem, and a few societies are in a serious financial plight. In a preface to the Canadian Association of Physicists' Annual Report for 1969-70, President D.D. Betts wrote: "Readers of the Annual Report will be stuck by two salient facts. The Canadian Association of Physicists has been a very active organization recently. The CAP is in serious financial difficulties." These "salient facts" apply in varying degree to a number of societies. Within the past year, CAP has improved its financial position by major economies and a continuous watch on the budget.

Summary figures are misleading. Of 64 societies for which information was available, 45 showed a combined profit of $480 000; 19 showed a combined loss of $87 000. These figures might suggest that, collectively, the scientific societies are well off, but a member of parameters must be considered. A major change in financial position can occur within a year. One society which operated $4 000 in the red one year reported a profit of more than $5 000 in the succeeding year. Another society reported a profit of $1 800, but this only slightly reduced a $16 000 deficit. The sale of publications, normally a profit item for one society, dropped drastically within one year.

The significance of the size of a profit or loss must be interpreted in the light of operating budgets and reserve funds. Table III.3 shows parts of the financial position for a selected sample of 12 societies. In this and other tables in which societies are numbered, the numbers are for text or appendix commentary purposes only; in the several tables, a particular number does not consistently refer to a particular society. In Table III.3, numbers 11 and 12 identify U.S. societies, introduced for comparative purposes. Explanatory comments are provided in Appendix C – 70.

Table III.4 provides examples of part of the detailed revenues and expenditures for eight selected, representative societies. The Table is intended to show simply some of the kinds of major revenues and ex-

Table III.3 – A Sample of Society Operating Budgets, Profits or Losses, Reserves and Publications Costs (dollars)

Reference Number	Operating Budget	Profit (+) or Loss (−)	Reserves	Publication Costs
1	170 000	+20 000	80 000	145 000
2	6 000	− 750	2 400	
3	125 000	+ 3 000	57 000	77 000
4	210 000	+50 000	350 000	70 000
5	378 000	−10 000	155 000	200 000
6	60 000	+ 1 800	20 000	15 000
7	26 000	− 2 400	5 800	15 000
8	57 000	− 2 500	13 500	29 000
9	101 000	− 3 000	35 000	8 500
10	4 300	− 1 200	4 400	
11	395 000	−18 500	60 000	251 000
12	1 000 000	−22 700	749 000	345 000

Source: See Part I of this report, under the heading "Procedure" (pages 28-30).

penditures. Several of the figures should not be taken as absolute, since they were arrived at by combining what appeared to be pertinent items. For comparative purposes, revenues and expenditures are given for two U.S. societies (numbers 7 and 8).

The profit/loss picture for these and other societies does not show any consistent correlation with class of society (Health Science, Social Science, etc.), type (scientific, professional), size, age, distribution of membership, or subsidies received. Neither does the financial situation correlate with whether or not a society has a Head Office or pays for business services. However, it is very obvious that a number of societies that do not now have a Head Office could not support one under their existing budgets.

Dues

Society membership dues range from a low of $2 to a high of $350. A comparison of dues in various societies is difficult. Commonly, dues include subscription to a society's publications. A publication may be self-supporting or it may be subsidized, by NRC for example. A few societies separate dues from Journal subscriptions. At least one society separates from dues an assessment for affiliation with a liaison organization.

Membership in a society may carry with it obligation to belong to a provincial organization, as is the case for the Canadian Veterinary Medical Association and the Agricultural Institute of Canada. Membership dues in AIC are $18.50; however, required membership in local and provincial organizations means a total fee ranging as high as $50.

Dues tend to be highest in the Health Sciences societies, although there are examples of dues of $4, $5, and $8. Dues tend to be lowest in the Biological Sciences societies, with a maximum of $25.

Table III.5 shows the range of dues for the various categories of societies, as well as the average dues per Canadian society, as determined from a survey of the staff of a University.

Since membership fees constitute the major source of income for most societies, and given the fact that most societies have financial problems, the apparently obvious solution would be increases in dues. Most societies have raised dues within the past few years, a doubling being common.

Table III.4 – Representative Revenues and Expenditures of a Sample of Societies (dollars)

Item of Revenue or Expenditure	Society[a]							
	1	2	3	4	5	6	7	8
Revenue[b]								
Membership Fees	15 000	11 100	16 700	28 500	133 600	29 100	6 800	156 000
Subscriptions	26 800		13 500	6 800	31 000	26 000	168 000	562 000[c]
Reprints and Page Charges	46 300		4 800			13 800	145 000	
Back Issue Sales	1 600						9 800	
Special Publications	97 100						14 000	
Advertising			2 000			46 100	2 100	
Investments	3 100	40	590	930	12 800	3 000	3 000	52 000
Newsletter				14 600[d]				
Annual Meeting			3 600	6 400	33 300	1 600	18 000	
Contracts and Grants							80 000	244 000
Expenditures								
Journal(s)	47 100	4 300	15 100	7 100	not available	55 300	177 000	345 000[e]
Newsletter	4 500	900		13 300			29 400	
Special Publications	80 000						11 800	
Reprints	8 000						16 500	
Liaison Societies	1 400	450				1 000		
Salaries and Honoraria	18 700	700		21 600	126 700	15 100	88 300	450 000
Business Services			8 100					
Professional Fees	450		250		2 400	400		
Office	1 600			6 000		8 900	17 300	71 000
Insurance	1 000						507	
Rent Taxes				1 700	16 000	3 700		14 300
Annual Meeting	1 500						12 400	41 400
Travel, Directors and Committees	6 200	850	2 500	2 400	4 700	15 300	3 900	29 600
Profit (+) or Loss (−)	**+20 000**	**+ 3 045**	**+ 3 100**	**+ 1 800**	**+ 50 000**	**+ 3 000**	**− 18 500**	**− 22 700**
Reserves	80 000	4 100	36 000	20 000[f]	340 000	57 400	60 000	749 000

[a]Numbers are for text reference purposes; they do not necessarily identify same societies as in Table III.3.
[b]Not included are a variety of miscellaneous sources of revenue such as a profit of $45 by the Beer Committee of one society.
[c]All publications income.
[d]Income includes advertising.
[e]All publications expense.
[f]This reserve is offset by a $15 000 accumulated deficit.
Source: See Part I of this report, under the heading "Procedure" (pages 28-30).

However, an increase is usually accompanied by a loss of members. For example, The Canadian Dietetic Association has a relatively large number of members, married women for example, who have retained an interest in the society although no longer working in the area. A recent dues increase from $25 to $40 was accompanied by a significant loss of professionally inactive members. Another society reports a 17 per cent loss in membership when dues were raised from $25 to $30. A depressed state of industry was also a contributing factor in this loss.

Table III.5 – Range of Dues for Various Classes of Societies[a] (dollars)

Category of Society	Annual Dues		Average Dues Per Canadian Society
	Minimum	Maximum	
Health Sciences	4	350	67[b]
Physical Sciences and Mathematics	10	50	22
Biological Sciences	4	25	11
Engineering	10	30	25
Social Sciences	10	75	19
Liaison Societies	3	10	

[a]Based on a survey at one university.
[b]M.D.s only; for non-M.D.s the figure was $22.
Source: as described in preceding text (pages 69-71).

The question asked frequently is "Are Canadians willing to pay dues of such a scale as to support their societies adequately?" When an individual protests against dues increases or is unwilling to support a society in which he is eligible for membership, the reason given is usually that he already belongs to a number of societies and pays, in total, a significant amount. Information furnished by the Canadian Psychological Association showed that, in a sample of 806 members, 30 per cent belonged to no other society, 29 per cent to one other, 23 per cent to two, 11 per cent to three, 5 per cent to four, and a scattering of individuals to five and eight other societies.

In order to check on this contention, a survey was made of the academic and senior administrative staff of an established university, the premise being the generally accepted belief that university people belong to at least as many societies as any other segment of the engineering and scientific community.

Questionnaires were sent to approximately 970 individuals, who were asked to list the societies of which they were members and the dues paid; 455 returns (approximately 47%) were received. A few tardy returns, which are still coming in as of this writing, have not been included in tabulations. The data are summarized in Table III.6. Average total expenditure on society dues of $65 in the Social Sciences, $54 in the Physical Sciences, $65 in the Life Sciences (Health and Biological Sciences, excluding M.D.s), and $75 in Engineering do not seem excessive in light of today's university salaries.

It is of interest that, except for Administration, Law and Medicine, the average number of non-Canadian societies belonged to is greater than the number of Canadian societies. The non-Canadian societies are predominately U.S.-based organizations. The resources of the present study

Table III.6 – Society Dues Paid by Academic and Administrative Staff of a University

Staff Category	Response		Average Society Memberships per Individual				Average Total Dues	Range of Total Dues
			Canadian		Non-Canadian			
	No.	% with no Canadian Society Memberships	No.	Total Dues $	No.	Total Dues $	$	$
Administration (includes Library)	49	20	1.6	43	0.8	18	61	0-200
Humanities	58	13	1.7	16	2.0	23	39	0-119
Education	18	28	1.3	14	1.7	30	44	0-85
Social Sciences (other than Law)	80	19	1.2	23	2.2	42	65	0-242
Law	16	19	3.1	138	0.5	6	144	0-306
Physical Sciences (includes Math)	75	27	1.0	22	1.7	32	54	0-199
Life Sciences (excludes M.D.s)	56	23	1.8	34	2.0	31	65	0-212
M.D.s	46	0	4.2	280	2.7	96	375	40-690
Engineering	47	21	1.6	40	1.7	35	75	15-220

Source: as described in preceding text (pages 69-71).

did not permit a more detailed analysis of the university survey data than is presented in Table III.6, although a few additional comments are provided in Appendix C – 75a.

For the Social, Physical and Life Sciences, and for Engineering, the unweighted average total expenditures on dues is approximately $65. In the writer's opinion, it would not be unreasonable to suggest that Canadian scientists and engineers should be willing and able to afford to pay an average total society dues of at least $150. This suggestion from an individual who has been a full professor for more than 20 years, is approaching retirement age, and has benefitted financially from a consulting income will certainly not be popular with younger scientists and engineers.

In all this discussion we must also remember to consider the level of dues paid to unions, both in the private sector and in government services. Many scientists and engineers are of course included in these groups, and the argument is advanced that the unions provide *services*.

In view of the facts that a major proportion of a society's revenue must come from membership fees and that most societies must increase their revenue, increases in fees would appear to be a simple answer. However, many societies have increased dues 50 to 100 per cent during the past several years (e.g., $9 to $18, $7 to $15, $25 to $50, $25 to $40, $11 to $19.50, $15 to $25, and $215 to $350). For those many societies whose dues were $10 or less, increases of this magnitude were accepted by memberships without major revolt in the ranks.

It is a generally-held opinion that additional increases will not be accepted (approved) as readily. Although recurring increases in fees impose a burden on the operation of a society, the consensus is that increases should be related to specific services and activities. An increase that provides a service to the member ("what is in it for me?") will be accepted more readily than one occasioned by a desire of the society to become involved in outwardly directed activities, desirable as they may be. Again, the inculcation of a social consciousness among members of our engineering and scientific societies is an obvious must.

Even when an attempt is made to detail the need for increased revenues, a proposal to raise fees may be rejected. One society, which has been described as being nearly bankrupt, recently proposed a dues increase. Sixty-four per cent of the members who voted favoured the increase. However, since the rules required a 66 per cent approval, the proposal was defeated.

Some additional comments on dues are provided in Appendix C – 75b.

Publication and Mailing Costs

For many societies the major expenditures other than for a Head Office (if such exists) are for publications. Ideally, publications should be self-supporting. However, for Canadian societies the publication picture is exceedingly variable. Some (e.g., the Canadian Physiological Society) have adopted an NRC Journal, which is provided to members at a highly subsidized rate. Other organizations receive the benefit of an NRC, Canada Council or other grant in support of publications, the amounts being highly variable. Some societies receive significant revenue from page and

reprint charges paid by government agencies. Others which publish their Journals without the benefit of subsidies receive significant amounts of revenue from advertising, whereas many publications carry none; naturally, advertising tends to be associated with the professional organizations. During the current economic period, advertising revenues in general have declined.

In spite of the mounting costs of publication, additional Journals are being proposed or actually started. The Canadian Psychological Association recently began the publication of a Journal covering the behavioural sciences. Individuals have complained that this venture is bankrupting the society. However, the situation has been alleviated recently by a Canada Council grant.

The Canadian Association of Physicists has explored the possibility of producing a Journal covering review articles in the areas of physics. Initial discussion with the NRC publications committee did not evoke a favourable response.

For many Canadian Journals, the national market simply is not of a sufficient size to support them without subsidies. The development of a non-Canadian subscription list requires time and the creation of a demand for the publication in question.

Table III.7 provides some typical publication revenues and expenditures, with an indication of the profit or loss and of the subsidy received, if any. Some explanatory comments are given in Appendix C – 76.

Table III.7 – Examples of Costs of Society Publications (dollars)

Society Number [a]	Revenue	Expenditure	Profit (+) or Loss (−)	Subsidy
1[b]	9 941	25 615	−15 674	
1[c]	27 794	32 933	− 5 139	
2	35 000	57 433	−22 433	
3	10 763	15 156	− 4 393	3 000
4	101 474	109 566	− 8 092	34 000
5	203 843	197 884	+ 5 959	27 000
6[d]	14 609	13 285	+ 1 324	
6[e]	7 766	14 609	− 6 843	
7	900	2 990	− 2 090	
8	132 757	120 065	+12 692	
9	311	42	− 269	
10	28 000	32 000	− 4 000	23 000
11	10 182	11 000	− 818	
12	7 515	8 882	− 706	5 200

[a]Numbers are for text reference purposes and do not necessarily identify same societies as in Tables III.3 and III.4.
[b]Journal
[c]Books and pamphlets.
[d]1970-71.
[e]1969-70.
Source: See Part I of this report, under the heading "Procedure" (pages 28-30).

It was difficult to determine publication costs and revenues from the information provided by many societies. Commonly, under "expenditures" in a financial statement, there will be an entry "Printing and stationery"; postage may not be indicated separately; the proportion of dues assignable

to publications is seldom indicated. It appears that, for most societies showing a loss on publications, there is also a loss on the overall operations. For example, society No. 1 (Table III.7) had an overall operating loss of $14 083, reducing its reserves from $91 152 to $77 069.

A major concern for most societies has been mounting postage costs, with the latest increase coming in January 1972. One society reported printing costs for its two publications as $10 915 and $35 829, with postage amounting to $1 441 and $3 538 respectively. Each of the last two increases in postal rates alone has meant an added cost to the society of about $300 for publications. Although this amount may seem trivial in an operating budget of approximately $74 000, mounting costs all along the line must be examined, including printing costs (one example: $16 per page in 1960; $46 per page in 1970) and the costs of other mailings.

Perhaps even more important than the postal rate increases have been the changes in regulations concerning second class mail. These changes have been in large measure responsible for the demise of a number of Canadian publications, and have affected the societies (e.g., The Canadian Council of Professional Engineers).

A consideration of the financial plight of societies in relation to publication costs requires a broader look at the whole question of engineering and science society publication – both a short-term and a long-term look. The information explosion and the growth of scientific literature should hardly need documentation. The quantity of information has been accumulating at an exponential rate, with a doubling time variously estimated at from 6 to 10 years. This growth of information reflects increases in the numbers of scientists and engineers. As Price[12] points out, there has been little change in productivity by scientists during a period of 300 years.

Neither has there been much change in the system of disseminating information by means of archival-type Journals. In the discipline of physics alone, it is estimated that the present rate of publication is about 60 shelf-feet of Journals per year. While societies are considering how to reduce the financial drain of publication in the immediate future, they must also be considering a long-term solution to the publications problem. Any easing of pressure on scientific publications which might result from the current general curtailment of research funds is almost certainly temporary.

a) Short-term Solutions:

One set of short-term solutions involves the obvious: where applicable, increase advertising revenues, increase subscription lists, increase or implement page charges, increase reprint charges, separate Journal charge from dues, and produce Journals by photo-offset reproduction rather than by typesetting. All of these have been or are being tried to varying degrees. An expansion of these proposals is given in Appendix C – 77.

Perhaps equally obvious is the suggestion that all societies should receive a government subsidy in aid of publication, although no one has yet provided a formula by which amounts of subsidies would be determin-

[12] Price, D.J. de Solla. *Science Since Babylon.* Yale University Press, New Haven 1961. Page 106.

ed. It is agreed that the present subsidy pattern is most uneven and without apparent rhyme or reason.

Still another proposal is that NRC definitely, Canada Council presumably, and MRC possibly should publish more Journals, in effect taking over the publication field from the societies, who would expect to be represented on editorial boards. The arguments for and against greater government subsidies will be dealt with presently. The volume of the Canadian Journals market makes it unlikely that publication could become a commercial venture comparable, for example, to Academic or Pergamon Press in the United States.

Unfortunately, societies seem to have been imbued with the idea that publication of a Journal, particularly one with an emphasis on "original" research, confers an aura of respectability on an organization, and that the provision of members with their personal copies of publications is an absolutely necessary service of a society. The continuation of this custom in the face of mounting costs (although few individuals could afford to pay the full cost of the Journals that they receive) simply amounts to courting financial disaster.

There is the question of who should pay for scientific publications, the subscriber or the author. If it is the author, then it should be accepted that the cost of publication is 2 to 3 per cent of research costs and payment should be made from research funds. Administration of such payment might pose a problem in the face of an apparent mounting resistance to page charges.

Several organizations with overlapping committee memberships, including NRC, The Chemical Institute of Canada (CIC) and SCITEC, have been considering short-term and long-term solutions to the publications problem. NRC's Dr. C.T. Bishop, Editor-in-Chief of the Canadian Journals of Research, was a member of the SCITEC committee. Dr. Bishop kindly made available his manuscript "Primary Publications", which forms part of CIC's "Communications Through A Crystal Ball". The CIC report and the SCITEC committee report contain numerous recommendations and suggestions which should be the subject of further study. Many of the ideas contained in the above two documents are touched on herein.

b) Long-term Solutions:

Two long-term solutions can be considered. One is to effect a combining of Journals; the other is to recognize the presence of the computer age and to speed the development of new methods of dissemination of scientific and technical information.

In 1968, the astronomers provided perhaps the first example of a large-scale merger of Journals. with five previously separate European Journals successfully joining forces to produce one Journal, *Astronomy and Astrophysics*.[13] In Canada we have the recent example of the Canadian Operational Research Society and the Canadian Information Processing Society joining to produce one Journal (INFORS), which incidentally receives a

[13]Steinberg, J.L., "European Astronomers Decide to Consolidate Their Journals", *Science 172*, 3982, 1971. Pages 451-452.

larger NRC subsidy than the Operational Research group formerly received for its own publication. In other respects, the two societies remain separate.

There have been numerous suggestions that the number of Journals could be reduced, although it does not necessarily follow that the total volume of material would be reduced. Lewin recently made a plea under the title of "Plethora of Phycology Journals"[14], arguing that there would be savings in personal funds, in organizational time spent maintaining subscription lists, and in mailing costs.

One of the arguments for amalgamation, as well as for publication of a series of Journals by a central agency, is that expertise in publishing (as opposed to amateurs doing the jobs of professionals) could improve quality in addition to bringing about economies.

Societies appear to be slow to recognize that the computer age, with its influence on dissemination of technical information, is with us. While no one would deny that Journals have been an integral part of the societies, it is imperative that changes be made in methods of information dissemination. The literature dealing with this problem is abundant. Brown *et al.*, in an article entitled "The Future of Scientific Journals"[15], argued for a system in which Journals would stop binding papers into issues and in which a subscriber would instead receive a "personalized" stream of papers, abstracts and titles. Computers would make such a system operable. It was suggested that this system would help meet competition from the increasing development of "Invisible Colleges" (pre-print exchange systems).

Modern technology makes it possible today (although not economically feasible at present) for a scientist to sit in his office or study and view a computer-produced list of titles and abstracts selected according to his designated "descriptors", thus keeping far better informed than under the system of scanning Journals. The scientist of tomorrow will be able to push a button and receive within seconds a copy of any material of particular interest. We have been moving in this direction gradually, first with the abstract publications such as *Excerpta Medica*, *Biological Abstracts* and *Chemical Abstracts*, then with key-words indices such as *Basic;* more recently, we have computer-produced lists of titles and, in some cases, abstracts.

In Canada we have had since the spring of 1969 a CAN/SDI information retrieval system operated by the National Science Library. Current information from Journals, Reports, books, etc. is matched against an individual's "interest profile". The subscriber receives a computerized list of relevant titles. A common criticism of the present system is that it is limited to titles only. The inclusion of abstracts would provide a more useful, but more expensive service. CAN/SDI has been described in a number of publications. A convenient summary of the system will be found in *Physics in Canada*, Vol. 27, No. 7, September, 1971.

These developments portend an end to the present Journal distribution system. Journals will still exist, but complete volumes will be found only on library shelves – and browsing will always be justifiable.

[14] *Science 173*, 1971. Page 982.
[15] *Science 158*, 1967. Page 1153.

Subsidies

The issue of subsidies has been mentioned several times. Subsidies, direct and indirect, are a factor of significance in the financial operations of many societies. Strongly opposing views on subsidies are held. One school of thought, to which the writer subscribes, maintains that societies must stand on their own feet and pay their own way, particularly if they expect to be listened to by government. The other school argues that all societies should be subsidized substantially by government.

It is a recommendation of this report that societies must strive to be self-supporting, while recognizing that certain capital expenditures (e.g., for the establishment of a "House of Science" for centralized services, or for the development of a computerized information dissemination and retrieval system) will require government assistance.

As indicated earlier, direct subsidies are for the most part in support of publications, and the pattern is most uneven. Subsidization of the general operation of a society is relatively rare; Canada Council does this to a limited extent. Support of symposia and conferences, particularly international conferences, is granted frequently by a number of government agencies. But for publication subsidies, the pattern is very uneven.

The financial value of indirect subsidies, which take many forms, is difficult to estimate. For those organizations which maintain full-time paid Secretariats, any indirect subsidies are usually of minor significance. However, a number of societies admit that if all indirect subsidies were withdrawn suddenly it would occasion a financial disaster. Indirect subsidies include secretarial services "donated" by employers, space and sometimes furniture for society files, and travel arranged so as to combine employer's business with society business. Comments on these subsidies are provided in Appendix C – 80.

The first step in any *possible solution* of subsidy problems is to try to reach a consensus, possibly through the offices of an organization such as SCITEC, on the need for, acceptability and nature of subsidies.

Certainly, if subsidies are to remain a way of life for societies, alternatives for developing a more uniform subsidy pattern should be explored. Such a development would help to eliminate existing inter-society and inter-profession gaps which were discussed earlier.

Head Office: Business Office and Part-time Help Costs

The operation of engineering and scientific societies is, collectively, big business. It is probable that an amount approaching $1 500 000 is spent yearly on salaries and benefits for full-time and part-time help. Salaries for a Head Office may total as much as $380 000. Contracts for business office services, covering principally salaries, range from a few hundred dollars to at least $8 000. Twenty-three societies which operate chiefly on benevolent time pay for secretarial and editing services amounts ranging from $18 to $18 683 and totalling at least $78 000.

Table III.4 (page 72) provides a few examples of some of the other costs associated with the operation of a Secretariat or an unofficial office. Examples of total yearly costs of Secretariats are: $11 663, $174 081, $106 428 and $39 352. Societies that are contemplating establishing Secre-

tariats are faced with major increases in expenditures.

In view of the amounts involved, it is not surprising that grumblings are frequently encountered among the rank and file, to the effect that Head Offices, whether Secretariats or benevolent-time organizations, are "empire builders" spending money to be busy for busyness' sake.

The *possible solution* to such a problem is two-fold: first, budgets should be reviewed closely to justify proposed expenditures and accounting procedures should be such as to permit a continual monitoring of expenditures; secondly, greater use could be made of the medium of Newsletters or Bulletins to explain Head Office (and other) activities. The need for increased content and frequency of Newsletters, for more substantial reserve funds and for payment of travel expenses that will be incurred with greater involvement can be justified, but the justifications must be communicated.

Benevolent Time – The Means Test

Even if all societies could afford Secretariats, there would still exist the need for numbers of individuals (the dedicated few) to give freely of their time and energy.[16] Some 35 national societies operate entirely on volunteer time. Dedicated individuals are commonly people with ability who, because of this ability, are busy with many commitments. When a person does a good job on one assignment, he is almost certain to be given another. There is no doubt that some of these "dedicated souls" should say no occasionally. There have been examples of individuals accepting the Presidency of a society when they really already had too many commitments. Fortunately, most Presidents give their society responsibility top priority.

This tendency to overload a few individuals has created what is sometimes called the "same old faces" syndrome, for example, in relation to symposia and conferences. The situation may be perpetuated to an unnecessary degree. Improved intra-society communication would do much to reveal the numbers of individuals who are capable of running the non-involvement affairs of societies. It is agreed that, in many areas, the individuals with foresight, imagination and understanding of the complex problems of today's technologically-dominated Society are few in number. These persons must be freed of concern with routine affairs of societies so as to devote their benevolent time more effectively.

Several examples of benevolent-time requirements by some societies are given in Appendix C – 81.

A feature of the benevolent-time syndrome, tied to finances, is what has been called the "means test". Perforce of circumstances, many societies have regularly chosen officers and other functionaries not because they were selected in the first place as the best candidates, but because they had the means to do the necessary work. The means may include physical location, as well as the command of indirect subsidies. This is not to suggest that many functionaries selected on this basis have been poor choices.

One society which was looking for a Secretary-Treasurer recently

[16]Several sources have suggested that once a Secretariat is established, it becomes more difficult to find members who will volunteer their time. This contention has been denied by other sources.

found the candidate with the necessary attributes. However, it was agreed that this individual would be unsuitable because he was not sufficiently senior to be able to command the needed (indirect subsidy) secretarial services. He failed the means test.

The Canadian Medical Association has a Council of more than 200. About 36 members of this Council are representatives of the medical specialist societies. It has been suggested that these specialist groups tend to appoint local (Ottawa-based) representatives who may not be the most knowledgeable members – an application of the means test. CMA has called for *active* representation from the specialist societies in order to permit more rapid response to government (e.g., CMA's recent comment on the LeDain Commission Report).

It is all too obvious that this system, which may at times result in inadequacies, will be perpetuated until such time as societies have sufficient funds to become truly independent; such independence must have rank-and-file support.

Proportion of Eligibles Belonging to Societies

A common problem for some societies is that a relatively low proportion of eligibles are members. This may make it difficult for a society to speak for its area, and a society thus foregoes the possibly more secure financial position accruing from a larger membership. Some of the reasons are relatively obvious, others obscure. Where membership through a provincial organization is obligatory for licensing purposes, the problem does not exist. Thus, the Canadian Council of Professional Engineers (CCPE) represents nearly all (65 000) the practising engineers in Canada, as the CVMA does most of the veterinarians. For those many societies in which membership is voluntary, the proportion of eligibles belonging is extremely variable, with estimates ranging from 1 to 99 per cent. As might be expected, age of the society is a factor. For example, it is estimated that only 10 per cent of eligibles are members of the Canadian Society of Zoologists. However, this is a young society (1961) and many potential members would already be members of other biological societies in Canada and/or the United States.

The Canadian Association of Physicists, which has approximately 1 600 members and is one of the most active of the scientific societies, estimates that there are 3 458 eligibles, of which only 46 per cent are members of CAP (1970). A realistic estimate of the potential membership is 2 300 and, on this basis, approximately 70 per cent are members. CAP is one of the few societies to have carried out a detailed study of eligibility and potential membership. One reason for the variation in estimates is the interpretation of eligibility. The Canadian Public Health Association, for example, estimates that 15 per cent of eligibles are members, but would argue that "eligibles" includes some doctors, dentists, entomologists, physiologists, engineers, etc. Other examples of estimates of proportion of eligibles belonging to societies are given in Appendix C – 82.

Most societies show a slow and relatively steady growth in numbers; all would like to reach their potential membership. This is a goal not only for practical financial reasons, but because of an apparently genuine concern that in order for a society to speak for its discipline or profession –

and recognizing that involvement is here to stay – it must represent the majority of the persons involved in the field.

Most societies have membership committees; periodically, membership drives are conducted, with varying degrees of success. The poor response commonly resulting from an "every member bring in a new member" drive is another illustration of rank-and-file lassitude.

Greater use could be made of brochures detailing the aims and objectives of societies and the advantages of membership. However, it is recognized that a common expectation is to receive in a tangible form (i.e., publications) dollar-for-dollar value for dues paid. There is general agreement that the rank and file of many, if not most, societies show marginal interest in having part of their fees going to support activities other than publications and meetings.

Competition from United States Societies

A majority of Canadian societies experience some degree of competition from societies outside Canada; for the most part, this is U.S. competition. In most fields competition from foreign societies is a relatively minor matter. Competition from U.S. scientific and professional societies is readily understandable for two main reasons.

First, some Canadians are members of U.S. societies because they feel that there is more to be gained (communication) from attendance at meetings in the U.S. and because of a belief, not necessarily always justifiable, that publication in a U.S. society Journal is more prestigious. There is nothing inherently wrong with accepting the fact that in some fields the American society, through its meetings and publications, will naturally have more to offer.

Secondly, the number of Canadians who took their higher degrees at universities in the United States undoubtedly contributes to associations with U.S.-based societies; immigration from the U.S., particularly in relation to the burgeoning gas and oil industry in the west, provides another example of American competition. Many of these individuals quite naturally retain their ties with U.S.-based societies, creating a problem of some weight for an organization such as the Alberta Society of Petroleum Geologists (which, on the other hand, does not have any problem arising from the geographical distribution of its membership).

There are of course a number of U.S. specialist societies with no Canadian counterpart (e.g., the American Society of Biological Psychiatry, the American Mosquito Control Association, the American Society of Limnology and Oceanography, the American Association of Physical Anthropologists and the American Society of Analytical Chemistry). Canadian membership in these societies has some influence on proportion of eligibles belonging to related Canadian societies, because of economic reasons, if not for reasons of interest.

Opinion expressed about the significance of U.S. competition was extremely variable in this study. But there was general agreement that for Canadian engineering and science as a whole the problem is a significant one, as would be suggested by the dues survey (Table III.6, page 74). Relatively few societies have gathered accurate data on how many of their

members belong also to the U.S. counterparts, or how many eligibles belong to the U.S. society but not the Canadian.

The physicists found that, of 745 Canadians belonging to the American Physical Society in 1970, 358 (48%) did not belong to the Canadian Association of Physicists.

The Canadian Society for Cell Biology provides an example of a society whose U.S. competition is related to age. As of 1969, the American Society for Cell Biology had more than one-third as many Canadian members as CSCB had total membership. However, the Canadian society was only three years old in 1969. CSCB and some other societies complain that some of the more prominent people in their particular fields are members of the American society but not of the Canadian sister society.

It is of interest that the degree of competition by a U.S. society may be related to its membership requirements. Any full member of the Canadian Physiological Society is accepted readily as a member of the U.S. counterpart. In contrast, it was reported that some of the best Canadian pharmacologists encounter difficulty in being accepted as eligible for membership in the U.S. counterpart of The Pharmacological Society of Canada. The Canadian Biochemical Society does not consider its U.S. counterpart any threat because the latter is "so exclusive".

There is no readily evident solution to the problem of competition provided by U.S. societies, and it is safe to predict that some degree of competition will always exist. The communication that can be provided by the usually larger U.S. society may be difficult for the Canadian society to match. It may be that, as in so many other areas of human activity, competition should be regarded as a healthy thing, although there is some feeling that it inhibits the development, strength and prestige of Canadian societies. Certainly, there exists in Canada the challenge to provide services that will attract members and to become involved externally, creating an environment that individuals will want to be a part of.

Involvement Problems

There are two categories of involvement problems. First, there are those related chiefly to the internal operations of a society – for example, the problem of getting the rank and file, and particularly the young, involved in the affairs of a society. Secondly, there are those related to external involvements, including inter-society and international association affairs and, most particularly, involvement in the interpretation of science and technology to government and the public. The issues of internal involvements have been adequately discussed already; the problems of concern here are those relating to external involvements, and especially those which relate to the recommendations that will form the concluding section of this report. The introductory section of this report has established that involvement of societies in interpretation, direction and control of the "Leviathan" created by modern-day science and technology is an urgent necessity, unless our societies are to become outmoded institutions. Such involvement will not come about without the creation of additional problems. The problems of solving some of the "ills" of societies must be faced.

Inter-Society Problems

Too Many Societies

To this writer it is abundantly clear that there are already too many Canadian national engineering, scientific and technological societies; still more are being created or being suggested. Across Canada there are many individuals who agree, but who also are pessimistic about the chances of bringing about any significant amount of amalgamation.

The argument for amalgamation is not complicated. Significant economies of dollars and effort could be effected. Amalgamation should provide a larger voice rather than what may at times be interpreted as a cacophony of smaller voices.

An examination of the few exploratory attempts at joining forces in Canada does not encourage optimism. As mentioned earlier, the Canadian Operational Research Society and the Canadian Information Processing Society are cooperating successfully in a joint publication venture (INFORS), but suggestions for amalgamation of the two organizations have fallen on barren ground. The Canadian Society for Cell Biology made exploratory overtures to The Genetics Society of Canada, but received a "cold shoulder". For several years, an argument has been advanced that there should be one major engineering society. The Engineering Institute of Canada and The Canadian Council of Professional Engineers have considered the proposal; no significant progress can be reported to date. A convincing argument has been advanced that the Canadian Society of Zoologists, the Canadian Society of Wildlife and Fishery Biologists, and the Canadian Committee on Fresh Water Fisheries Research (which practically amounts to a society) should join forces.

It has been suggested by several sources that amalgamations in any significant degree will be brought about only through pressure applied by government control of subsidies. It would be a sad state of affairs if Canadian societies were forced through an inability to accept the value of cooperation to bow to "dictation". Amalgamation would not mean the elimination of special-interest groups. Divisions within a larger society, or Constituent societies within a coordinating body, can accommodate these interests. The recently formed Canadian Geoscience Council would appear to be a step in the right direction.

It is necessary to look outside Canada to find examples of two or more societies joining forces. In the United States recently, the Marine Technology Society joined with the Oceanographic Society of America.

The amalgamation in England on January 1, 1972 of a group of four chemical societies furnishes the best example of what *can* be brought about; some 42 000 chemists have become fellows of the Chemical Society, which has retained its old charter but assumes a new role in uniting the members of the old Chemical Society (1841), the Royal Institute of Chemistry (1877), the Faraday Society (1903) and the Society for Analytical Chemistry (1874).[17] More than 90 per cent of the voting members of the four societies favoured the amalgamation. A majority of the members of a fifth society, the Society of Chemical Industry, favoured the idea, but

[17]Porter, G., "The Amalgamated Societies", *Nature 234*, December 31, 1971. Page 511.

for the present it remains outside the union. Five years of patient negotiation were required to effect the amalgamation. Some background information on this amalgamation is provided in Appendix C – 86.

It has been suggested that the amalgamation of five European astronomy Journals (see page 78) may lead to the formation of a European Astronomical Society, in much the same manner that a European Physical Society was created a few years ago.

It is safe to predict that amalgamations in Canada will be slow to develop, if they do at all, and that the proffering of subsidies is possibly the only way of inducing unions. Essentially, this is what led to the production of a common Journal by the operational researchers and the information processing group.

There are cooperative actions which, if encouraged, might well lead toward more serious considerations of unions. One move would be to hold more joint meetings; for this, long-term planning is required, since most organizations select the dates and places for their Annual Meetings four or five years in advance.

The holding of special meetings and of symposia and conferences with definite purposes where these can be financed (providing the principal figures are not "the same old faces") is a further way of encouraging cooperation. Increasing numbers of such meetings are being organized. As an example, a recent one-day (March 22, 1972) meeting with an international flavour was sponsored in Montreal by La société des ingénieurs civils de France, section canadienne, and the Montreal Branch of the Engineering Institute of Canada. The subject of the symposium was Human Ecology and Environment Techniques. Aside from the present context, here is an example of engineers expressing an interest in involvement. Possibly inter-society cooperation could be developed more easily at the provincial organization level and thus create a "grass-roots" demand for amalgamation at the national level.

In December 1971 a conference on The Social Responsibility of the Engineer was held at the University of Manitoba. The conference was sponsored by The Engineering Institute of Canada, Region II, and co-sponsored by the Association of Professional Engineers of Manitoba, the Manitoba Chapter of The Association of Consulting Engineers of Canada, and the Extension Division of the University of Manitoba. Speakers dealt with the engineer as a citizen, as an employee and in relation to the engineering profession.

There are numerous examples of briefs having been presented by individual societies without support from other organizations, support that probably could have been obtained and that would have lent more weight to the position taken. Briefs on the population problem by the wildlife and fishery biologists and by the entomologists furnish examples. A recent report by The Chemical Institute of Canada, calling for improvement in science education, surely could be supported by many societies.

Scientific Versus Professional Functions of Societies

This topic is discussed as an inter-society problem because, although it is and will be a matter for consideration by individual societies, a cooperative

consideration is advisable if not almost imperative. Earlier in this report it was indicated that "scientific" and "professional" are two broad categories of societies which can be recognized according to whether the chief aims are advancement and promotion of a discipline, or regulation of the profession and concern for the welfare of the members. However, it has been pointed out that the distinction is at times a fine one, and that increasing numbers of societies are becoming involved in both scientific and professional functions.

In keeping with the increased public interest in the impact of science and technology on Society, it is not surprising to find that a closer look is being taken at the professions, and hence at societies themselves. Two commissions whose deliberations have produced reports which will have some impact on societies are the Quebec Commission of Inquiry on Health and Social Welfare (Castonguay Report) and the Royal Commission Inquiry into Civil Rights (McRuer Report).

The Castonguay Report is quite specific in recommending a clear separation of scientific and professional organizations. There should be the professional corporation, a "public body, created by legislative action, in which membership is obligatory to practise a profession or to use a particular title and to which have (sic) been accorded powers of public authority as well as jurisdictional privileges, with a view of self-administration of the profession".[18]

Quite separate should be the professional association, a "private body created by letters patent or charter, in which membership is voluntary and which enjoys the powers provided for in the general law of limited companies, the Labour Code or in the law governing professional unions".[18]

Obviously, implementation of this recommendation would have a significant impact on societies. Although regulation of professions is under provincial control and exercised by provincial societies, the national societies will become involved in their role as coordinating bodies, particularly when and if, as appears likely, this movement spreads.

The McRuer Report is equally concerned with regulation of the professions, but it does not appear to pose any objection to the "learned society" aspects of professional organizations, providing the public interest is protected.[19]

Both reports express considerable concern for professional ethics and standards for admission to the practice of a profession.

The Draft Report of the Commission on Post-Secondary Education in Ontario (Wright Report) makes a number of references to the professions. It is of interest to note that submissions to the Commission included briefs from The Canadian Institute of Management and The Canadian Council of Professional Engineers, as well as from a number of provincial engineering and scientific organizations. The report recommends the establishment of three Boards, one for universities, one for colleges of applied art, and one

[18] *Health Insurance: Report of the Commission of Inquiry on Health and Social Welfare* (Claude Castonguay, Chairman). Government of Quebec, Quebec, 1967.

[19] *Royal Commission of Inquiry into Civil Rights* (J.C. McRuer, LL.D., Chairman). Queen's Printer, Ottawa, 1968. Volumes I-III.

for the open sector (museums, etc.). There is no provision for representatives from professional bodies.[20]

Closer regulation of the professions is clearly the coming thing; Manitoba already has established a legislative committee which is to take a look at professional organizations.

Quebec Bill 250, arising from recommendations of the Castonguay Report, would protect the public against fraud, malpractice and incompetence at the hands of some 34 professions – including doctors, lawyers, psychologists, agronomists, forest engineers, nurses, veterinarians, engineers, town planners and architects. The professional societies have expressed some concern as to the manner in which the act will be implemented, and will perforce be more involved with government.

In the course of the present study, there has been general agreement that the activities of many scientists will come under some form of control. One example will show how control may evolve. On the occasion of the last election in California, computerized predictions of voter preference proved to be far from right. An inquiry revealed that the computer programming had been done by an individual with practically no training, a novice. As a result, it is probable that in the interests of protecting the public the State of California will introduce legislation to regulate the information-processing profession. It can be predicted that the movement will spread not only throughout the United States, but also into Canada, where organizations such as the Canadian Operational Research Society (the computer is but one tool in operational research) and the Canadian Information Processing Society will become involved. CIPS has been involved recently in a major internal debate on accreditation.

These developments suggest that many societies should take a look at the possibly developing need for accreditation of their members. Many groups, such as geneticists, plant physiologists and biochemists, are technically professionals; but the earning of their livelihood is not considered to be associated with a profession in the legal sense, as it is for doctors, lawyers and engineers. Several individuals have agreed with the writer that some form of certification or licensing, other than the mere possession of a university degree, may become necessary in order to practise a "profession". Although there has not been general agreement, it is possible that a form of licensing may even extend to university teachers. At least a few individuals admit that it does not make much sense to assume (as we do) that the possession of a Ph.D. automatically qualifies an individual to be a university instructor. Protection of the public interest would seem to be disregarded here.

If more societies are to become involved in accreditation, then involvement with the educational programs that produce the potential members follows. Such involvement will create problems of time and money, and particularly problems of the credibility of societies. A united approach by coordinating, liaison societies is to be recommended, rather than action by numerous individual societies. Individual societies might then assume responsibility for their particular discipline or subject areas.

[20]*Commission on Post-Secondary Education in Ontario: Draft Report* (Douglas Wright, Chairman). Queen's Printer, Toronto, 1971.

Several individual societies have, without major problems, undertaken reviews of the pertinent departments in universities and colleges. However, the danger of possible interference and takeover has been suggested in some quarters. A major argument for involvement of societies with the universities is that we can ill afford not to use the accumulated knowledge and experience of the non-university scientific community; this experience is needed to help guide the course of the institutions that are turning out tomorrow's engineers and scientists – hopefully, a generation that will have a major concern for social responsibility in science.

Accreditation does not mean dictation. A sound argument has been advanced[21] that an accrediting agency should concern itself with specifying what the graduating student should be able to do (i.e., what constitutes competency in a particular field). Concern for physical plant, credentials of administrators and teachers, and course programs should be the responsibility of the educational institutions, which must provide the student with experiences that will fit him for specified performances. It is to be hoped that accrediting agencies would insist that the student should be able to be a *problem solver* and that he should be capable of taking "retreading" or even, initially, turning to a field other than the one he may have hoped to enter.[22]

It cannot be expected that we will produce many W.H. Audens (who went up to Oxford as a biology scholar and returned years later an honoured poet) or K.B. Quinans (the American chemical engineer who did much for the British production of explosives during World War I and later moved to South Africa, where his ingenuity had much to do with improving grape culture and developing an economically important industry), but there exists much more potential than has been made use of in the past. There has not been enough stimulation of students to probe what the late Leonard Brockington, in an address at Queen's University some years ago, called "this muskeg of mediocrity that I call my mind".

International Involvement

Science has, since its beginnings, been international. Given the limitations of communication and transportation, there has been a degree of cooperation from the start. Cooperation has never been without its problems. The first international meeting of chemists was held at Karlsruhe in 1860 for the purpose of trying to reach a common understanding about atoms and molecules. There were strong differences of opinion and an inauspicious ending to the meeting, which was nevertheless to have "a decisive influence on the progress of chemical theory".[23]

Over the years, a number of international organizations have been established, examples of which were cited earlier in this report. Canadian societies in varying degree became associated with these groups. Degree and multiplicity of involvement relate in part to the size of a Canadian organization and to whether or not it has a Secretariat. The Chemical

[21]Creager, Joan G., "Professional Accreditations: Objectives and Objections". *Bioscience 21* (16), 1971. Page 868.

[22]Vogt, E.W., "President's Address", *Physics in Canada, 27*(7), September 1971. Page 92.

[23]Hatley, H., "A Century and a Half of Chemistry". *Nature 234*, 1971. Page 153.

Institute of Canada, as indicated earlier, maintains association with an extensive array of international bodies, accommodating the interests of chemists, biochemists and chemical engineers.

The problems associated with Canadian societies' involvement in international groups are primarily financial, both the problem of obtaining funds for travel to international meetings and that of obtaining funds for a Congress held in Canada. Given the current economic situation, these problems are more pressing at the present time than at some periods in the past. A regular procedure has been for some level of government of the host country to underwrite a social gathering or a banquet. Industry has commonly contributed to the support of Congresses (as well as purely national or provincial meetings) in the past. Currently, such support is much more difficult to arrange.

Another problem, less readily admitted, is that the "same old faces" tend to make the journeys to international meetings. Not infrequently, the administrator gets the nod over the man at the bench. The unacceptable excuse sometimes offered is that the man at the bench will one day be the administrator and enjoy these "fringe benefits". A more conscientious effort must be made to expend travel funds on the individuals who will benefit most directly, and who in the long run will contribute to the involvement of the scientific community and of societies in the development of a social consciousness.

The growth over the years (particularly since World War II) of international organizations such as the World Health Organization, the Food and Agriculture Organization, the International Atomic Energy Commission and various Pan-American organizations has led to a considerable involvement of individual members of the Canadian scientific community; the record speaks well for the reputations of Canadian engineers, scientists and technologists. A problem is that relatively rarely is a society approached to recommend candidates for international assignments. Individuals are approached because they have established reputations through their publications, attendance at meetings and activities in society affairs, or more commonly on the recommendation of governmental bodies. The tendency has been for the government to recommend its own employees, although there have been many exceptions.

In part, the problem is one of communication; frequently, societies may know nothing about a development until after all arrangements have been completed. The need for a national body in Canada to provide an information service is all too obvious. It is suggested that here is one area of activity in which SCITEC should logically become involved.

Another area of international involvement relates to programs and conferences of wide scope. Canadians, in part through their societies, but in large measure as individual members of the scientific community, are making a significant contribution to the 10-year International Biological Program (IBP).

On the other hand, because of an apparent lack of communication, many organizations were not aware of the establishment of a Canadian Committee for the Man and the Biosphere (MAB) program. NRC will be responsible for the Committee, and a Secretariat will be located in the

Department of Environment. At an organizational meeting in the spring of 1971, various societies, groups and individuals were represented. The arrangements for contacting possibly interested parties appear to have been somewhat haphazard. Again, the need for an information dissemination service is obvious. International involvement and involvement with government are, understandably, clearly overlapping here.

The development of a Canadian position paper for the United Nations Conference on The Human Environment (Stockholm, June 1972) has occasioned a large measure of dissatisfaction. A position paper was drawn up before the Department of Environment was established. Subsequently, the Minister of Environment called a meeting of a National Preparatory Committee for a review of the position paper. Again, the committee was established without any widespread advertising and several Canadian societies were unable to obtain representation on the review group. It is of interest that the government did seek the advice of concerned citizens' groups, and that these made perhaps the most effective critical impact on the government's position. Public hearings were then held in a number of locations across the country.

A problem for most societies is that they are not organized for immediate involvement when a rapid response is required, whether on an international or a national matter. The tendency has been for most societies to sit back and wait to be asked for advice. Engineers and scientists tend to hedge their opinions until all desirable information is at hand. Politicians are unwilling to wait. The concerned citizens' groups will take a position without all the facts at hand; admittedly, because their pronouncements are given frequently in an emotional context, they are being heard – and apparently listened to.

With limited time and money at their disposal, societies wishing to become involved, whether on the national or international scene, may have to reassess the distribution of their resources. Perhaps the time has come for the effort devoted to classical meetings to be re-directed. The substitution of working parties, assigned to specific tasks and expected to produce authoritative reports, should be considered. The distinction between committees and working parties is worth noting. Commonly, committees carry on their deliberations over a period of time, by correspondence and a series of meetings; a working party usually convenes for a brief session of concentrated effort. Frequently, material prepared by individual members of a party is distributed in advance.

Involvement with Universities, Industry and Government

The problems of involvement with educational institutions will largely be those relating to accreditation and the organization problems associated with the suggested university-government-industry exchanges of personnel, in which societies should play a leading role. Involvement with industry will pose problems as well, particularly because many organizations, such as the smaller scientific societies, have paid scant attention to the admittedly small industrial component of their membership. In contrast, organizations in which the major portion of the membership is in industry may have devoted too little attention to their university- and government-

employed members. Involvement with industry means getting the professors out of their crumbling ivory towers and the government employees out of their comfortable laboratories and into the real world of action. The problem for societies is to determine the role that they can play in this necessary development.

The major problems for societies have been and will continue to be those associated with involvement with government. Two of these problems are determining routes of input to government for effective impact and helping develop routes in government for the reception of inputs from the engineering, scientific and technological societies. Another problem is to determine to what extent, if any, the scientific community should develop a lobby. Some of the larger scientific and professional societies have in the past "had the ear" of government (e.g., the Canadian Manufacturers Association and the Canadian Labour Congress). Fear has been expressed by some engineers and scientists that a lobby might develop into a power structure, concerned only with promoting the interests of engineering, science and technology, and removing the scientific community even further than it now is from playing its proper role in relation to Society. Any such development would spell doom to the credibility that the scientific community must have with Society.

The all too common complaint of societies is that briefs or position papers presented to government "go underground", disappearing into the cavernous bureaucracy of government. A statement sent to the Prime Minister's office may receive a polite acknowledgement and an indication that the matter has been drawn to the attention of the appropriate Ministers. Anything up to a year may elapse before all the Ministers mentioned initially are heard from, and these answers are usually non-committal. Again, submissions to government would have a greater chance of making an effective impact if societies would join forces.

The Canadian Society of Wildlife and Fishery Biologists provides an example. Its resolution on the need for ecological input to the Saskatchewan-Nelson Basin Board brought an encouraging reply from the Honourable Jack Davis, but far less encouraging responses from the provincial Ministers under whose aegis the Board operates.

A resolution on the human population problem was forwarded by the same society to members of Parliament and to the Premiers of all provinces. Substantial acknowledgements and favourable comments were received. However, one reply may indicate the light in which the societies are regarded by some politicians. The Honourable Marcel Lambert, MP for Edmonton West, commented that "your Society could more properly be concerned with matters dealing with wildlife and fishery biology rather than trying to moralize the question of population growth within the country".[24]

The first step in any organized attempt to stimulate an effective input to government will be to find out what societies want to do. Within, as well as between, societies strong differences of opinion will be encountered. Representatives of several societies have expressed a feeling that concern should be only for the area of a society's technical expertise. Such opinions

[24] *Canadian Wildlife and Fisheries Newsletter*, 28(2). May, 1971.

do not necessarily represent a consensus, but do emphasize the problem of locating the outward-looking members of the scientific community.

Some concern has been expressed that, with increased involvement of societies with government, a conflict-of-interest problem may arise for society members who are government employees. Can a relatively senior government employee, or for that matter the most junior employee, publicly associated himself with his society's position if this position is in direct conflict with departmental policy? It is to be hoped that reason and a free exchange of opinion will prevail, with decisions being reached for the betterment of the Canadian public at large.

Hopefully, we will not have a situation in Canada such as the one reported at a recent U.S. conference on "Science in the Public Interest". One observer commented that " 'the vindictiveness of the scientific establishment' forces scientists to be over-cautious in order to retain their jobs". Instances were cited where scientists in government and industry "have been demoted, harrassed, or deprived of necessary resources when they took controversial positions or openly questioned employer policies and practices".[25]

The development of an effective cooperation between an enlightened group of engineering and scientific societies and government will no doubt be beset with problems. Rapid progress, although urgently needed, cannot necessarily be expected. The old Chinese proverb comes to mind. "A journey of a thousand miles must begin with one step". The formation of SCITEC may be that step.

Involvement with Society

If it is accepted that engineers, scientists and technologists have a moral responsibility for the impact of their science and technology on life in Canada today, then the scientific community, hopefully through its societies, must face up to a major problem. The public has come to believe that science and technology are responsible for many of the current crises facing Society. The remoteness from reality of which scientists are frequently accused, and their pursuit of knowledge for its own sake without regard to the possible uses of that knowledge, are charges which must be met. The public is concerned with the possible impact of still more undirected science and technology. It is probably in this context that the late Robert Oppenheimer once said "We need new knowledge like we need a hole in the head".

One problem is that having the scientific community react to the challenge of Society through its political bodies imposes undesirable strictures. There are many ways in which the scientific community can attempt to establish a rapport with the public; again, the problem of who has the time may seem to be a deterrent. Engineers, scientists and technologists could do much more as individuals, or as societies, by way of arranging talks to schools, service clubs and public assemblies, preparing presentations to the media and taking part in public forums. Not all

[25]Holden, Constance. "Public-Interest Advocates Examine Role of Scientists", *Science 175*, 4021, February 1972. Pages 501-502.

individuals are qualified by temperament or ability to be in the front line, but "stage hands" will be needed as well.

As Press[26], among others, has suggested, scientists should recognize and accept responsibility for such tasks as informing the public about the foreseeable consequences of technological developments, having regard for the social costs of new technology (e.g., pollution), ensuring that technical information given to the public is in its proper perspective and not presented as an appeal to the emotions, and preparing for the shift in emphasis in their careers (retreading) to meet the needs of Society. It is not suggested that, in relation to environmental problems, all engineers or even a majority should turn their energies to the solutions. Perhaps most important are the attempt to demonstrate how science and technology can reverse the present trend of deterioration of the environment, and the search to create a better world. "It is suggested ... that the commercial exploitation of new ideas to create wealth requires a climate in which the role of technology is understood and in which the risks of development are widely accepted as socially desirable and necessary; and that science is a necessary overhead activity to create the reservoir of knowledge from which new technologies can draw to satisfy these purposes. [Scientists] should also proclaim that high living standards can not be achieved, maintained, or shared more evenly, without a continuing increase in productivity which in turn must come from further technology and education with an associated need for still further technology to provide for an efficient recycling of products, or for more acceptable waste disposal and environmental protection in the course of manufacture. All this will become even more necessary to cope with the challenge of population 'explosion' ".[17]

It is to be expected that problems will arise from a conflict of "Doomsday" people, who tend to overstate their case emotionally, and those whom this writer regards as having a more rational view of Society's problems. The path to involvement of the scientific community with Society will be a rough one, beset with pitfalls; the best minds and energies of our scientific community will be required to cope.

A Summary of Some of the Possible Solutions to Problems Faced by Societies

The foregoing purposely extensive review is not intended to suggest that the societies have nothing but problems. If this were the case, they would be in the quandary of the centipede of Ogden Nash's ditty, who fell exhausted in a ditch, not knowing which leg to move after which. It is true that a number of organizations have major financial difficulties; others have awkward situations created by diversities of member interests; and the apparent disinterest of the rank and file impedes the activities of some groups. However, in spite of these difficulties, Canadian engineering, scientific and technological societies collectively have the potential to be a

[26]Press, R.A., "A Communications Gap Between Physicists and Society?" *Physics Bulletin, 23*, January 1972. Pages 11-12.

[27]Press, *loc. cit.*

force of influence in the currently demanded involvement of science and Society. The criticisms that have been implied in the preceding review should in no sense be regarded as denigrating. Rather, it is to suggest that societies must face up to the problems confronting them, particularly those problems that portend impediments to the expression of a social consciousness and an acceptance of a moral responsibility for the direction of science and technology.

A number of possible solutions to some of the problems have been proffered in the preceding pages. Many of these possible solutions would affect several problems. Some of the suggested solutions will be detailed in the following section of this report as a part of major recommendations. The order of the following comments, in which the words "involvement", "social consciousness" and "cooperation" occur repeatedly, does not relate directly to the order in which problems have been considered.

The more salient proposals for solutions to problems of the societies are as follows:

1. Improved communication is perhaps one of the most important suggestions. Within a society, communication can be enhanced by more frequent and more detailed Newsletters, by visits of officers to Branches and Chapters, and by concerted efforts to explain the actions and policies of the Governing Board. For the scientific community as a whole, improved communication could result from an enlarged and more frequently issued *Science Forum*, or from a Canadian *Science* or *Nature*.

2. The above suggestions involve an added drain on society finances. Scientists should if possible reach a consensus on whether societies should be for the most part self-supporting (the writer's view) or whether they should make a concerted effort to obtain a regularized government subsidy. Without improved financial positions, most societies will be unable to meet the challenge of involvement.

3. With or without government subsidies, societies should be supported to a greater degree by their members. A calculated campaign will be required to convince engineers and scientists that their social responsibility demands a greater sacrifice by way of greatly increased dues. A social consciousness can not be legislated. Involvement of members, particularly the young, might result in progress toward a greater concern for the relation of science to Society.

4. Member involvement must not create work for the sake of busyness. The interests and abilities of members must be solicited and exploited. Such action will require the volunteer efforts of many dedicated individuals; the major problem of finding the individuals with ability and time is not susceptible to an easy solution.

5. Societies must take a close look at all aspects of their methods of operation, and undertake long-term planning, as some have done or are doing. Within financial limitations, the present all-too-prevalent system of having jobs for professionals done by amateurs must be eliminated. The most effective use of society personnel must be given more attention. Whereas the present custom tends to be to give the outdoing President of a society an appropriate farewell, greater use should be made of the accumulated wisdom and experience that can be assembled in councils of past

Presidents.

6. The limited resources of societies must be recognized, and consideration given to the best disposition of these resources. Are classical meetings outmoded and should resources be devoted more to working-party assignments?

7. Societies must recognize the limitations of resources based on operations by benevolent time, and consider the ways in which, by inter-society cooperation, more effective involvement can be achieved. The gaps and inter-society "rivalries" must be acknowledged, and dissipated by cooperative involvement.

8. This cooperative involvement must include a recognition that there are in existence too many societies. Amalgamations could effect economies of money and effort, the latter being particularly important in view of the amount of benevolent time that is devoted to society activities.

9. Societies, through their coordinating and liaising bodies, must consider their roles in relation to input to government, universities, industry and, most importantly, Society. Any action which will encourage the development of an outward view among scientists must be prosecuted vigorously.

10. The changing scene must be accorded recognition. The likelihood of increased regulation of professions should encourage an examination of the advantages of self-accreditation. The increasing public awareness that science and technology have been impinging on the Canadian way of life without the producers of this science and technology expressing any apparent concern must be acknowledged; attempts must be made to activate an awareness by scientists and engineers of their social responsibilities.

11. Societies must recognize the need for some organization that can provide an information service, enabling the scientific community to be aware of public attitudes and government plans. Without denying the right of any organization to operate independently, it is suggested that SCITEC could, among other things, evolve into an information-providing and catalyzing organization, serving to channel lines of communication in both directions between government, universities, industry and Society.

The problems are many; the solutions are not simple. Those who, with the writer, agree that Canadian scientists collectively should have the ability, interest and conviction of moral responsibility to enable them to contribute effectively to the betterment of life for Canadians will not be discouraged by the multitude of problems, the probable slow pace of progress, nor the impediments that will inevitably occur.

Part IV

Recommendations and Conclusions

Introduction

"To have science deployed to best advantage in Canada it is important that all Canadians, whether scientist or not, appreciate the value of science, that scientists better recognize and accept the large economic role and responsibility of science and that government and industry in particular recognize the value of scientists in many activities which stretch far beyond the research laboratory."[1]

This report has attempted to establish that the scientific community in Canada, through its societies, has a valuable role to play in service to government, universities, industry and the public. It has been shown that there is a potential of real substance, as yet little realized. Admittedly, the societies are beset with many problems, not all of which are readily susceptible to solution.

Not the least of these problems involves the characteristics of the engineers and scientists themselves. The call is for the development of an outward view and a commitment to involvement.

Archilocus, the Greek lyric poet and satirist who lived in the seventh century B.C., wrote: "The fox knows many things, but the hedgehog knows one big thing". It has been suggested that human foxes pursue many ends, often unrelated and even contradictory, and that their thought is scattered or diffused; human hedgehogs, on the other hand, relate everything to a single central vision, a single universal organizing principle.[2]

Among Canadian scientists we have "foxes" and "hedgehogs", and, fortunately, a number who are by nature "foxes" but believe in being "hedgehogs". The "hedgehog" view must prevail, and the single central vision – the control and direction of science and technology for the goals of a better way of life for Canadians, with particular attention to what C.P. Snow has called "the primal things" – must remain clear.

A Consideration of Major Recommendations

A. Need for a Major Coordinating Organization

A major overall coordinating organization is needed, to act as a catalyst for the increasing involvement of scientific and engineering societies with governments, educational institutions, industry and Society.

In a number of places in this report, the need for inter-society cooperation in the direction of involvement has been emphasized. The suggestion that there is also a need for a major coordinating organization that could foster this cooperation throughout the science and engineering society hierarchy is not to imply that the present active roles of individual societies or liaison groups would be diminished in any degree. From the individual member of the scientific community to the major confederations, inde-

[1]Science Council of Canada, Report No. 4, *Towards a National Science Policy for Canada.* Queen's Printer, Ottawa, 1969. Page 9.

[2]See Simon, H.P. ,"The 'Fox' Versus the 'Hedgehog': An Historical Look at the Berlin-Carr Dispute". *Queen's Quarterly.* 78(1), Spring 1971.

pendence of action should still be encouraged as much as cooperative action, each as the particular circumstances dictate.

As one scientist has put it, "We must by dint of more voluntary effort provide a body of such stature and articulation that the public will accept its pronouncements on the same plane at least as those of Science Council".

Given this recommendation, the first step is to consider whether any existing body could adapt to the requirement. The venerable Royal Society, by agreement of a number of its members, cannot at the present time accommodate the need. It is clear that SCITEC, infant that it is, offers a possibility among existing institutions. One scientist has suggested that SCITEC, although a sophisticated structure is concept, is in reality a mendicant order; but it has struggled through its early existence, and the current trend is most encouraging.

This indirect approach to suggesting that SCITEC could become the needed coordinating organization has been taken deliberately, to emphasize that during the course of the present study SCITEC has been but one of the more than one hundred societies whose aims, objectives and modes of operation have been examined in varying degree. As the details below indicate, the challenge to SCITEC is little short of colossal, and anything less than a job that meets with general commendation, not only by the scientific community, but by government, educational institutions, industry and Society, will portend a *mementomori* – a warning to be prepared for death.

The objectives and proposed activities for SCITEC, both those defined on the occasion of the First National Science and Engineering Conference (Carleton University, July 31 to August 1, 1969), and the more recently defined short- and mid-term goals[3], in large measure circumscribe the tasks for a major coordinating organization as outlined herein.

Suggested Activities

Development of a program encompassing any major proportion of the following will not be accomplished overnight. SCITEC Council or Executive must consider the list in terms of priorities and resources. However, the writer suggests that the first two items should receive serious consideration for immediate implementation:

1. SCITEC should provide a service by developing an information centre to facilitate communication among societies, and between societies and government, universities and industry, with emphasis on expeditious responses. Channels of two-way communication need defining.

As a start, the file that has been established during the present study should be maintained, continually up-dated and expanded, as an aid to keeping in touch with which society is doing what. The expansion should include provincial scientific and professional societies as well as concerned citizens' groups. Subject to the limitation of resources, the maintenance of this file would be facilitated by having a representative of SCITEC attend as many Annual Meetings as possible. Success will not attend the creation of a "Great White Father", unreachable image.

Consideration must be given to ways and means of publishing a

[3]SCITEC *Bulletin*, 1(4), November, 1971.

Canadian *Science* or *Nature*, with emphasis on information communication, on what is going on. Exploratory talks between SCITEC and *Science Forum* are a step in this direction.

The information centre should be able to provide data on government activities of concern, and on international activities in the science and technology area. Societies, as individuals do, will expect service in return for support. Readily available information is such a service.

2. SCITEC should undertake a major study of the Journal publication problem. There has been no follow-up on the recommendations presented in the report by SCITEC's committee on publications, and CIC's "Communications Through a Crystal Ball" is still an internal unpublished document.

Since publication costs are a major factor in the finances of many societies, the proposed study should receive priority. Particular attention should be given to the separation of Journal subscriptions from society dues.

3. Other proposed areas of study are:

a) education of politicians in matters of science and technology (SCITEC is currently involved in such a program);

b) manpower studies in cooperation with government, another area in which SCITEC is already active;

c) consideration of the pros and cons of developing a science lobby;

d) exploration of possible avenues for arranging that the Presidents of major societies could obtain leaves-of-absence in order to devote full time to the office;

e) exploration of ways of arranging short-term "sabbatical" exchanges among government, university and industry personnel (OECD has suggested that such exchanges should be government-supported);

f) consideration of the ways in which the current number of societies can be reduced (fostering cooperation by encouraging societies to join forces on such matters as position papers might point the way);

g) the development of accreditation boards for the assessment of university programs (a related activity would be a consideration of the whole area of science education, at all levels. The encouragement of preparation for alternative careers should be a guideline);

h) detailed study of the advisability of adopting accreditation policies in societies whose members are not now under some form of registration or licensing;

i) major effort toward promoting government-contracted studies by societies;

j) continual exposure and definition of the issues with which societies should be concerned;

k) establishment of an informal committee, somewhat comparable to the Canadian Engineering Societies Committee, to provide for dialogue between the proposed major coordinating organization and those large professional groups which in the near future are unlikely to be formally affiliated with the former.

Implementation

In order to pursue even a fraction of these suggested actions, SCITEC must be funded at a many times higher level than at present. A full-time Secretariat, and limited-term, seconded, full-time science advisers and research assistants would be needed. In no sense can any significant proportion of the suggested program be undertaken mainly on benevolent time. Whereas some funding by government, particularly through the medium of contracts, will be suggested (see recommendation E) and the provision and maintenance of a physical plant by government will be proposed (see recommendation B), the scientific community must show its support of SCITEC in a concrete way. In order that many societies can support SCITEC financially at more than the present token level, increases in dues will be required (see under recommendation D). A "which came first, the chicken or the egg" situation seems inevitable. Many societies will be unwilling to pay substantial financial tribute to SCITEC unless they can receive some direct services in return; SCITEC will be unable to provide much in the way of services, such as those that could be provided by the proposed information centre, without financial support. A start could be made if SCITEC were able to obtain a contract for the maintenance of the scientific societies file compiled in the course of this study.

SCITEC can develop to fulfill a major need by way of providing services, on one hand, to individual members of the scientific community and to individual societies and confederations and, on the other hand, to governments, educational institutions, and industry. Through this role SCITEC can become a catalyst in promoting the necessary developments that will contribute to the achievement of Canada's stated national goals, particularly in relation to the "Just Society" in a non-deteriorating natural environment.

The gauntlet has been thrown down, initially by the Senate Special Committee on Science Policy and latterly by individual members of the scientific community and by some engineering and scientific societies. In a phoenix-like manner, SCITEC must rise from the ashes of its retarded childhood and, with renewed youth, take up the challenge.

B. Need for a House of Engineering, Science and Technology

There is a need for a centralized "House of Science", to serve a number of societies.

The idea of a centralized home in Ottawa for scientific societies is not new. It has been discussed in SCITEC circles (e.g., at the recent SCITEC IV Workshops and in the President's message in the November 1971 SCITEC Bulletin), as well as among members of the scientific community and by a number of societies.

The argument for such a centre is a simple one. A centralized home for the Secretariats and/or business offices of a number of societies would contribute to greatly improved intra-society communication, and should do much to dissipate some of the existing gaps (see page 65). The merging of housekeeping functions (e.g., duplicating facilities, mailing lists, Journal editing, dues invoicing, accounting and secretarial services) would result in

significant economies of time and effort and, more importantly for a number of societies, would mean that jobs now being done by dedicated amateurs would be done by professionals, hopefully equally dedicated. The merging of functions in no way implies that societies would lose their individual identities.

How Many Societies Would Be Interested?

In the course of the present study, representatives of a number of societies have expressed an interest in the establishment of a House of Science. Such interest does not constitute implied commitments. A guess would be that, initially, possibly as many as 50 societies might be interested to the extent of joining in exploratory talks. It can be predicted that the major stumbling block will be finances, although the details of cooperative housekeeping will generate extended discussion. A guess would be that initially 10 or 12 societies might actually join in the proposed venture.

Reasons for interest in a joint venture are several. Some societies are in the size range where operation on benevolent time is unsatisfactory, and yet cost of even a modest Secretariat cannot be financed (on the present scale of dues); others are faced with losing the indirect subsidy facilities under which they have operated over a period of years. Only 13 of 118 societies have or represent over 5 000 members, a figure that has been suggested as the minimum to permit support of an independent Secretariat. Having 5 000 or more members does not automatically confer freedom from financial problems in the support of a Secretariat.

What Facilities Are Needed?

The physical plant envisaged would have to be one capable of expanding as more organizations joined in the joint venture. Each society involved would require its own office(s), of a size according to the size of its Secretariat. Space for shared facilities such as mailing and duplicating rooms would be required. There should be a council chamber capable of accommodating up to 100 people, and it should be provided with recording, public address and simultaneous translation facilities.

How Would a House of Science Be Funded?

It would be totally impractical to suggest that a group of the likely-to-be interested societies could finance the purchase or rental of adequate facilities. The alternative is to request provision of the facility by the federal government. It is not the present purpose to document a case that should be presented to government. It would be hoped that government already recognizes the past contributions of the societies to the Canadian scene.

The existence of a precedent for the government to furnish facilities for a group of organizations does not confer on the societies an inalienable right to similar treatment. However, in the spring of 1970 the establishment of an Administration Centre for Sports and Recreation in Ottawa was announced by the Minister of National Health and Welfare. As of the spring of 1971, twenty-five member organizations in a "priority one" category had offices in the building provided, and others have been accommodated during the past year. The Centre is operated by The Fitness and

Amateur Sport Directorate, which provides the following free of charge to the affiliated national organizations: space and furnishings, office equipment and supplies, conference costs, and salaries of some support staff and of national executive directors to a maximum annual salary of $12 000 each. An organization wishing to exceed this limit must provide the difference from its own resources. Travelling expenses of national directors are paid. The Department of Public Works provides maintenance services.

Each organization submits an annual proposed budget, which is forwarded for Treasury Board and Privy Council approval. Requisitions for approved expenditures are handled by a Finance and Administration Section of the Directorate. For the 1970-71 fiscal year, the budget for the Administration Centre was over one million dollars.

In addition to those organizations in the "priority one" category, other organizations have been designated as eligible for more limited support. It is the intent that the voluntary organizations should eventually set up their own national administrative system, which should encourage further a sense of autonomy within each member organization.

Proposed Action

Informally, SCITEC already has explored the House of Science concept with the Ministry of State for Science and Technology, and the matter has been raised recently in a formal submission to the Minister.

If discussions with the Ministry are in any way encouraging, SCITEC should canvass the societies for expressions of definite interest and begin a documentation of a formal request. The services provided to sports organizations would seem a logical point of departure. However, the ear of government is likely to be more sympathetic if it can be shown that scientists and engineers are willing to support their organizations in a substantial manner, which dues of $5 to $25 would not suggest. As a point of discussion, it is proposed that any society wishing to affiliate with a House of Science should assess its regular (full) members fees of at least $30 per year, apart from any charges for publications.

In addition, any action leading to a reduction in the present numbers of societies, as well as affiliations with liaison bodies, would most certainly be taken as an indication of a spirit of cooperation in the scientific community, and of an interest in more than self. Any proposal to government must make it abundantly clear that the engineering and scientific societies are not just looking for a hand-out, but are requesting support which will enable them to perform a more effective role on the national scene.

C. Need for a Forum

A forum should be organized, composed of individuals whose particular charge would be a viewing of the broad aspects of relationships between science and Society.

The need exists for a forum of non-government, appointed scientists who are qualified by ability and inclination to deal with the broad aspects of inputs by societies to government, universities and industry, and to assess the social-responsibility role of engineering and scientific societies and of

the scientific community as a whole in contributing to the betterment of Society. This forum should attempt to inculcate a response to the growing demand by the public that science and technology respond to social needs.

In essence, a "think tank" is suggested. This forum would differ from the Institute for Research on Public Policy which was announced by the Prime Minister in early March 1972. The latter, which the press at least is comparing to "think tanks" in the United States, is designed to carry out research and analyses for the purpose of clarifying public issues for both government and the public. The proposed forum would be, hopefully, a catalyzing advisory body.

Although such a body could arise *de novo*, as for example the British Society for Social Responsibility in Science, greater credibility may result from its being under the aegis of an existing organization.

The organizations which can be considered are The Royal Society of Canada, the Science Council of Canada and SCITEC. The Royal Society does not have the confidence of the scientific community, which is not to impugn the reputations of members of the society. The Science Council is, quite without justification, "suspect" because it is a government-appointed body; as a Crown Corporation, the Science Council cannot identify against government nor deliberately create a political stir. The idea of affiliating the forum with an independent organization such as SCITEC seems to have merit, although SCITEC itself does not presently command the confidence of the entire scientific community. However, this is not to suggest that The Royal Society, the Science Council or, for that matter, a variety of other bodies including concerned citizens' groups might not take under consideration the areas which have been suggested as the particular terms of reference for the proposed forum.

As a point of departure for discussion, the following organization of a forum is suggested. There might be 15 members, each appointed for a three-year term, with the initial appointments being five for one year, five for two, and five for three, in order to provide for continuity; possibly, terms would not be renewable until a lapse of at least one year.

Nominations, which should be accompanied by an agreement to serve and a biography, could arise from several sources. They might be made by any society affiliated with SCITEC, by any group of members of a society, or by SCITEC Council. Suggestions for nominations could be received from any or all sources, and individuals might even be encouraged to volunteer for consideration. The needed individuals would not necessarily be found among the great and well-known scientists. The young with vision should be sought out.

In contrast to the Science Council, in which an attempt is made to balance membership (i.e.: as to geographical distribution; among university, government and industry; between anglophone and francophone; and among scientific disciplines), the composition of the forum would not necessarily have any balance policy. The members should not be chosen as representatives of geographical areas, employment sectors, cultures or disciplines, but rather as individuals with peculiar talents – and there may be all too few such people in Canada.

Appointments to the forum might be made by the Executive of

SCITEC. The President of SCITEC and its Executive Director could be ex-officio members; at any one time, possibly no more than one-fifth of the forum membership should be members of SCITEC Council.

The forum could elect its own Chairman annually from among members starting the third year of their term. The body might meet at least four times a year, possibly with at least two meetings being held in Ottawa. Meetings, which might be two-day affairs, could be scheduled a year in advance.

The forum should probably report to SCITEC Council on its deliberations; it should operate without fanfare. With Execuitve approval, it should be able to make approaches to, for example, the Science Council, The Association of Universities and Colleges of Canada, and governmental bodies. Conceivably, it might on occasion hold small study sessions with philosophers and other humanists.[4]

The suggestion has been made that there should be no need for a special group, that SCITEC Council could assume the responsibility for the charge. The answer must be blunt; the composition of the Council, excellent though it is in terms of individuals of considerable ability, collectively does not fill the bill. It is in theory possible that, over a period of time, Council might evolve in a direction which would allow it to perform the functions of the proposed forum. However, Council is and will be occupied with many operational matters; this would preclude concentration in an area where SCITEC would have to succeed lest a Society for Social Responsibility in Science arise instead.

D. Needed Changes in the Organization, Mode of Operation and Scope of Activities of Societies

A number of changes in the organization, mode of operation and scope of activities of scientific and professional societies are suggested, including a reduction in the number of societies and, in many cases, a major increase in society dues.

In the section of this report dealing with problems of societies, an impressive number of difficulties, affecting operations in varying degree, were examined. For many of these problems, one or more possible solutions were suggested. These suggestions, which amount to recommendations in many instances, are summarized on pages 94-96. It is obvious that there is considerable scope for societies to review their methods of operation and to consider changes. Solutions are easier to suggest than to implement. Many require additional input of time and money, neither of which many societies have.

It is encouraging that a number of societies have taken during the past few years, or are currently taking, a hard look at both their current operations and the years immediately ahead. Several societies have found that such examinations, when followed by appropriate changes, can make for a significant improvement in financial position.

Most of the suggested solutions do not require further elaboration.

[4]See Predmore, R.L., 1968. "What Role for the Humanist in These Troubled Times?". *BioScience*, 18(7), 1968. Pages 691-693.

However, additional comment is advisable in several areas that relate particularly to the preceding recommendations.

1. It has been emphasized that few scientists and engineers appear to be on the way to the poor-house because of dues paid to their scientific and professional societies. Members of the scientific community who are required to belong to provincial organizations in order to practise a profession generally pay significantly higher total dues than do scientists who may belong to one or more societies entirely by choice. It is the societies whose members are in the latter category which will, for the most part, be interested in becoming affiliated with a House of Science. It is these societies particularly which should consider dues increases.

A somewhat arbitrarily selected standard of $30 annual dues was suggested earlier. Adoption of a $30-fee guideline would mean an increase of fees for 11 of 20 Health Science societies, 10 of 14 Physical and Mathematical Sciences societies, 15 of 15 Biological Sciences societies, 4 of 6 Engineering societies, 4 of 6 Social Science groups, and 5 of 5 liaison groups. Average total dues would not approach the figure of $150 which, as was proposed on page 75, most scientists and engineers should be capable of paying without undue hardship. Unless the members of societies can be convinced that these increases are demanded in order that the societies may play an involvement role, there is little hope that societies will rise to the challenge of the times. This challenge is amounting to a demand that the creators of science and technology be held accountable for the impact of their productivity on Society.

2. In order that any reduction in the numbers of societies may be brought about, it will be necessary to side-track the "little minds" whose only interests are associated with inward thinking – what is good for, or what can be obtained for the society. The outward-thinking – what can the society do to assist in the betterment of Canada for all Canadians and, indirectly, for people elsewhere – must prevail. Hopefully, two or more societies will set an example by joining forces. If British chemists could buy the idea, why not Canadian scientists and engineers?

3. Many societies must recognize that the complexities of operations today require cooperative effort to take advantage of expertise as well as to effect economies, particularly economies of benevolent time which could be better devoted to involvement than to routine business operations. The possible establishment of a House of Science will provide an opportunity for cooperation without loss of identity. On the assumption that SCITEC would be the "managing director" of the House of Science, individual societies will view the operation with a critical eye. With adequate funding, SCITEC should be able to obtain the professional capabilities to ensure the success of the venture.

E. Need for Government Commitments

Certain financial commitments and cooperative efforts on the part of the Federal Government are suggested, including a liaison committee involving the Ministry of State for Science and Technology and the proposed overall coordinating organization.

The proposals that have been advanced require a commitment by government not only to the funding of such operations as a House of Science, but also to a mutual give and take with the organizations of the scientific community; in this way, the particular areas of expertise of societies may be put to full advantage. Although confederations, individual societies or even individual members of the scientific community should continue to relate to government as they have in the past, it should also be recognized that there is some indication of a wish on the part of government to deal with a single organization in the scientific and engineering community. Again, SCITEC should develop to fill this need, with the always-present reminder that it should function mainly as an information centre, at least initially, funnelling requests to and from proper sources.

To facilitate this function, it is suggested that an informal liaison committee composed of members of the Ministry of State for Science and Technology and of SCITEC should be established. Through this committee, it should be possible to develop the needed degree of rapport between government and the engineering and scientific societies.

In addition, SCITEC should establish firm channels of communication with the Science Council. In fact, if it were practical, the proposed House of Science should be located physically close to the Science Council.

A major area for discussion between government and societies concerns the development of a system of contractual work for needed studies. In contrast with the situation in the United States, where over a period of years numerous societies have quite regularly undertaken studies as arranged through government contracts, very little of a similar nature has developed in Canada. The tendency here toward in-house studies should be examined in light of the possible value of externally-conducted studies. A word of caution is in order. No society should build its Secretariat solely on the expectation of a continuation of government contracts. The vagaries of politics, as influenced at times by economic conditions, may result in a sudden discontinuation of contracts. This has happened in the United States within the past year. A National Register of Scientific and Technical Personnel has been maintained over a period of years through the participation of a number of societies under contractual agreements. The register was discontinued recently, apparently with little advance notice.

Commitments by government will always be subject to the uncertainties of the political world. Nonetheless, the engineering and scientific societies must accept the idea that a firm rapport with government is a necessity. The extent to which this rapport can be established without resorting to direct lobbying (even though that was invited by Senator Grosart) is uncertain. As in so many other areas of human activity, more progress may be made through informal personal relations than by way of formal committees.

Postscript

A review of the original Terms of Reference of this study, particularly those relating to input by societies, may make it appear that the responsibility to be guided by these Terms of Reference has been abrogated. The

reader is reminded that the original Terms of Reference were expanded, and for this reason the report deals at some length with the responsibility of scientists for the interpretation of science and technology to Society. The initial charge to recommend ways in which societies can relate to government requirements and respond more expeditiously to matters of public concern cannot be satisfied in a more specific manner until the societies accommodate to the challenge presented – a challenge to be concerned with the betterment of the Canadian way of life in a non-deteriorating environment.

Appendices

Appendix A – List of Societies Contacted

Explanatory Notes

In this list, as throughout the report, every attempt has been made at accuracy of information. The writer assumes entire responsibility for any inadvertent errors.

An attempt was made to determine the numbers of active members of societies resident in Canada. Several societies were unable to provide this figure. However, we believe that it was obtained for those societies having a large non-Canadian membership. For example, the Entomological Society of Canada has a total membership of about 764; approximately 400 are Canadian residents. With few exceptions, student members have not been included in the head counts. The list has been qualified by the following symbols.

*These societies do not have individual members. Figures given are for numbers of members represented through affiliating organizations. For example, The Canadian Council of Professional Engineers is a federation of eleven Provincial and Territorial Associations of Professional Engineers in Canada.

†The Canadian Council on Urban and Regional Research is an appointed body, and membership in The Royal Society of Canada is by election.

‡SCITEC is an exception; whereas most of the 45 000 members are represented through affiliated societies, there are between two and three hundred individual members. Similarly, ACFAS has both affiliated societies and individual members; the figure given is for the latter category.

Classes of societies are somewhat arbitrarily designated as: B – Biological Sciences, E – Engineering, H – Health Sciences, L – Liaison Organizations, P – Physical and Mathematical Sciences, and SS – Social Sciences. Several anomalies will be apparent; for example, The Canadian Council of Professional Engineers might more properly be assigned an L. The Arctic Institute is given an L because its scope of interests encompasses all categories of science. The assigning of societies to the six classes has been discussed in Part II of this report. Again, the reader is reminded that some societies might well be listed under more than one category.

Societies for which an X is indicated are those which provided detailed information such as membership figures and financial statements. Several societies were contacted at too late a date to provide an opportunity for input.

Blanks (–) simply indicate that limitations of personnel and time precluded searching out existing information which, unfortunately, a number of societies failed to provide.

Name of Society	Founding Date	Number of Members	Class	Input
Agricultural Institute of Canada *L'Institut agricole du Canada*	1920	5 250	B	X
Agricultural Pesticide Society	1953	140	B	X
Air Pollution Control Association (Canadian Chapters)	–	–	P	X
Alberta Society of Petroleum Geologists	1928	1 500	P	X
The Arctic Institute of North America	1944	1 200	L	X
Association of Canadian Law Teachers	–	–	SS	
Association Canadienne-française pour l'Avancement des Sciences (ACFAS)	1923	1 200	L	X
The Association of Consulting Engineers of Canada *Association des Ingénieurs-conseils du Canada*	1925	17 000*	E	X
Association des Médecins de Langue française du Canada	1902	8 500	H	X
Biological Council of Canada *Conseil canadien de Biologie*	1966	5 526*	L	X
Canadian Aeronautics and Space Institute	1953	1 300	E	X
Canadian Agricultural Economics Society	1930	–	SS	
The Canadian Anaesthetists' Society *La Société canadienne des Anesthésistes*	1943	–	H	
Canadian Association of Anatomists *Association canadienne des Anatomistes*	1956	–	H	
Canadian Association of Geographers *Association canadienne de Géographes*	1951	600	SS	X
Canadian Association of Information Scientists	1971	–	P	
Canadian Association of Medical Microbiologists *Association canadienne des Médecins microbiologistes*	1961		H	

Name of Society	Founding Date	Number of Members	Class	Input
Canadian Association of Occupational Therapists *Association canadienne des Ergothérapeutes*	1926	–	H	
Canadian Association of Optometrists	1946	–	H	
Canadian Association of Pathologists *Association canadienne des Pathologistes*	1944	500	H	X
Canadian Association of Physical Medicine and Rehabilitation *Association canadienne de Médecine physique et de Réadaptation*	1952	94	H	X
Canadian Association of Physicists *Association canadienne des Physiciens*	1946	1 460	P	X
The Canadian Association of Radiologists *L'Association canadienne des Radiologistes*	1937	1 150	H	X
Canadian Association for Research in Toxicology *Association canadienne pour la Recherche en Toxicologie*	–	–	H	
Canadian Association of Social Workers	–	–	SS	
The Canadian Association of Teachers of Social and Preventive Medicine	–	–	H	
Canadian Astronomical Society *Société astronomique du Canada*	1971	–	P	
Canadian Biochemical Society *La Société canadienne de Biochimie*	1957	710	H	X
The Canadian Botanical Association *L'Association botanique du Canada*	1965	450	B	X
Canadian Cardiovascular Society *Société canadienne de Cardiologie*	1947	476	H	X
The Canadian Council of Professional Engineers *Le Conseil canadien des Ingérieurs*	1936	65 000*	E	X

Name of Society	Founding Date	Number of Members	Class	Input
Canadian Council on Urban & Regional Research *Conseil canadien de Recherches urbaines et régionales*	1962	60†	SS	X
Canadian Dental Association *L'Association dentaire canadienne*	1902	6 600	H	X
Canadian Dermatological Association	1926	–	H	
The Canadian Dietetic Association *L'Association canadienne des Diététistes*	1935	1 755	H	X
Canadian Economics Association *Association canadienne d'Économique*	–	–	SS	
Canadian Federation of Biological Societies *Fédération canadienne des sociétés de Biologie*	1957	2 000*	L	X
Canadian Geotechnical Society	1971	–	P	
Canadian Geoscience Council	1972	–*	L	
The Canadian Historical Association *La Société historique du Canada*	1921	2 002	SS	X
Canadian Home Economics Association	1939	1 140	SS	X
Canadian Information Processing Society *L'Association canadienne de l'Informatique*	1958	1 800	P	X
Canadian Institute of Actuaries *Institut canadien des Actuaires*	1907	600	P	X
Canadian Institute of Food Science & Technology *Institut canadien de Science et Technologie alimentaire*	1947	1 182	P	X
Canadian Institute of Forestry *Institut forestier du Canada*	1908	2 000	B	X
The Canadian Institute of Management *L'Institut canadien de Gestion*	1942	4 500	P	X
The Canadian Institute of Mining and Metallurgy	1898	7 500	E	X

Name of Society	Founding Date	Number of Members	Class	Input
Canadian Institute of Traffic Engineers			E	
Canadian Mathematical Congress *Société mathématique du Canada*	1945	850	P	X
Canadian Medical Association *L'Association médicale canadienne*	1867	24 000	H	X
Canadian Medical and Biological Engineering Society	1965	175	E	X
Canadian Meteorological Society *Société météorologique du Canada*	1967	475	P	X
The Canadian Neurological Society *La Société canadienne de Neurologie*	–	–	H	
The Canadian Neurosurgical Society	–	–	H	
Canadian Nurses Association *Association des Infirmières canadiennes*	1908	87 127	H	X
Canadian Operational Research Society	1958	840	P	X
Canadian Ophthalmological Society *Société canadienne d'Ophthalmologie*	1937	463	H	X
The Canadian Orthopaedic Association *L'Association canadienne d'Orthopédie*	1948		H	
Canadian Otolaryngological Society *Société canadienne d'Otolaryngologie*	1968	280	H	X
Canadian Paediatric Society *Société canadienne de Pédiatrie*	1922	–	H	
Canadian Pharmaceutical Association, Inc.	1907	–	H	
Canadian Physiological Society *Société canadienne de Physiologie*	1935	501	H	X
Canadian Physiotherapy Association *L'Association canadienne de Physiothérapie*	1920	–	H	
Canadian Phytopathological Association *Société canadienne de Phytopathologie*	1929	275	B	X

Name of Society	Founding Date	Number of Members	Class	Input
Canadian Political Science Association *Association canadienne des Sciences politiques*	1913	668	SS	X
Canadian Psychiatric Association *Association des Psychiatres du Canada*	1951	1 100	H	X
Canadian Psychoanalytic Society *Société canadienne de Psychanalyse*	1952	95	H	X
Canadian Psychological Association *Société canadienne de Psychologie*	1939	1 000	SS	X
Canadian Public Health Association *L'Association canadienne d'Hygiène publique*	1910	2 500	H	X
Canadian Rheumatism Association	1936	–	H	
Canadian Society of Agricultural Engineering	1958	495	E	X
Canadian Society of Agronomy *La Société canadienne d'Agronomie*	1954	247	B	X
Canadian Society of Allergy & Clinical Immunology	1947	116	H	X
Canadian Society of Animal Science	1951	387	B	X
Canadian Society for Cell Biology	1966	300	B	X
Canadian Society for Chemical Engineering *La Société canadienne du Génie chimique*	1966	2 180	P	X
Canadian Society of Clinical Chemists *La Société canadienne des Clinico-chimistes*	1957	255	H	X
The Canadian Society for Clinical Investigation *La Société canadienne d'Investigation clinique*	1961	471	H	X
Canadian Society of Exploration Geophysicists	1949	898	P	X
Canadian Society for Horticultural Science	1956	294	B	X

Name of Society	Founding Date	Number of Members	Class	Input
Canadian Society for Immunology *La société canadienne d'Immunologie*	1966	354	H	X
The Canadian Society for Mechanical Engineering *La Société canadienne de Génie mécanique*	1970	1 900	E	
Canadian Society of Microbiologists *Société canadienne des Microbiologistes*	1951	580	B	X
The Canadian Society of Plant Physiologists *La Société canadienne de Physiologie végétale*	1958	204	B	X
Canadian Society of Plastic Surgeons *La Société canadienne des Chirurgiens plastiques*	1947	–	H	
Canadian Society of Rural Extension	1960	285	B	
Canadian Society of Soil Science *Société canadienne de la Science du Sol*	1954	321	B	X
Canadian Society of Wildlife and Fishery Biologists *Société canadienne des Biologistes de la Faune*	1958	268	B	X
Canadian Society of Zoologists *Société des Zoologistes canadiens*	1961	510	B	X
Canadian Sociology & Anthropology Association *Société canadienne de Sociologie et d'Anthropologie*	1965	138	SS	X
Canadian Thoracic Society *Société canadienne de Thoracologie*	1958	54	H	X
Canadian Union of Graduate Students	–	–	–	
Canadian Urological Association	1944	–	H	
Canadian Veterinary Medical Association *L'Association canadienne des Vétérinaires*	1949	2 100	B	X
The Chemical Institute of Canada *L'Institut de Chimie du Canada*	1945	6 402	P	X

Name of Society	Founding Date	Number of Members	Class	Input
College of Family Physicians of Canada	1954	–	H	
The Engineering Institute of Canada *L'Institut canadien des Ingénieurs*	1887	13 000	E	X
Entomological Society of Canada	1863	400	B	X
The Genetics Society of Canada *La Société de Génétique du Canada*	1955	443	B	X
The Geological Association of Canada *L'Association géologique du Canada*	1947	2 005	P	X
The Institute of Textile Science	1955	–	P	
The Institution of Production Engineers, Canadian Council	–	–	E	
Marine Technology Society (Eastern Canadian Section)	–	90	P	X
The Mineralogical Association of Canada	1954	–	P	
The Nutrition Society of Canada *La Société canadienne de Nutrition*	1957	213	H	X
The Pharmacological Society of Canada *La Société de Pharmacologie du Canada*	1956	239	H	X
The Royal Architectural Institute of Canada *L'Institut royal d'Architecture du Canada*	1907	3 200	P	X
The Royal Astronomical Society of Canada *La Société royale d'Astronomie du Canada*	1890	–	P	
The Royal College of Physicians and Surgeons of Canada *Le Collège royal des Médecins et Chirurgiens du Canada*	–	–	H	
The Royal Society of Canada *La Société royale du Canada*	1882	628†	L	X
SCITEC	1970	45 000‡	L	X

Name of Society	Founding Date	Number of Members	Class	Input
Social Science Research Council of Canada *Le Conseil canadien de Recherche en Science sociale*	1940	6 787*	L	X
Société canadienne de Science politique	1963	300	SS	X
Société de Protection des Plantes du Québec	–	300	B	X
The Society of Obstetricians and Gynaecologists of Canada *La Société des Obstétriciens et Gynécologues du Canada*	1945	539	H	X
Spectroscopy Society of Canada *Société de Spectroscopie du Canada*	1957	380	P	X
Technical Section – Canadian Pulp & Paper Association	1950	3 105	E	X
The Textile Technical Federation of Canada				
The Town Planning Institute of Canada *L'Institut d'Urbanisme du Canada*	1923	800	SS	X
Youth Science Foundation	–	–	–	

Appendix B – To the Secretaries of Science-Based Societies

This memorandum is a follow-up to recent letters from Dr. Berlinguet and myself, concerning the SCITEC study of science societies.

I hope that you will not find this request for certain specific information and documents too burdensome; your cooperation will be very much appreciated.

During the past several years a number of you may have had requests for some of this information from a Mrs. Margot Wojciechowski and/or a Mr. Peter Aucoin who were working under the supervision of Prof. J.W. Grove of Queen's University. The files on Prof. Grove's studies have been made available for the present study. Insofar as possible, I am avoiding requesting information which is already at hand.

An X in front of a requested item means that the particular request should be disregarded.

Would you kindly provide the following:

1. A copy of your society's constitution and by-laws.
2. A copy of the Minutes of your most recent Annual Meeting.
3. A copy of the program of your most recent Annual Meeting.
4. A copy of your most recent financial statement.

NOTE: financial information will be considered *confidential*, and in the study report specific finances of particular societies will not be mentioned.

5. Single copies of the last 2 or 3 issues of your Bulletin or Newsletter.
6. The name(s) of the Journal(s) and any other publication of your society.
7. Copies of any briefs or position papers submitted during the past 5 years, *other than briefs to the Lamontagne Committee*, since a file of the latter is at hand.
8. Membership figures: total; active members resident in Canada (estimate satisfactory); student members (if this category exists). Have you any estimate of what proportion of eligibles belong to your society?
9. Annual Dues, and any changes within the past 5 years.
10. Association with other Canadian science-based organizations, by way of affiliation, joint meetings or joint submissions etc.
11. What standing or ad hoc committees does your society have, dealing with Science Policy, Public Relations, or involvement in scientific-social problems? Receipt of any reports which give an indication of the degree of activity of such committees would be appreciated.
12. Association with International Organizations, by way of affiliation or participation in conferences, symposia etc.
13. What direct or indirect government subsidy, if any, does your society receive? e.g. publication of journal, use of secretarial service, storage space for society files and publications. Your wish to have information on indirect government subsidy treated as confidential will be respected.

Thank you

A.S. West,
Study Leader

Appendix C – Comments on Text Material

The material in this appendix provides more detailed information or explanatory comments on various sections of the text. For ease of reference, each item is numbered according to the pertinent page in the body of the report.

(54) The editor of the Canadian Psychologist (January, 1971 issue) wrote as follows concerning the problem of gathering material for a bulletin:

"As editor let me tell you that most CPA members are poor communicators at the level of the interaction of national issues and the discipline. Scanning of the American Psychologist, the Bulletin of the BPS, Australian Psychologist and the various provincial Journals, Bulletins and Newsletters demonstrates how well psychologists of different backgrounds and vocations can exchange views in print. The Canadian Psychologist, by comparison, receives little important (unsolicited) material concerning the state of psychology in Canada. It is necessary often for the editor to pursue contributors, and not always successfully."

Here the editor is calling for a particular type of information. Other Newsletter and Bulletin editors are pleading for contributions of any sort; an example will be found in the May 1971 Newsletter of the Canadian Society of Clinical Chemists.

(56) Many societies agree that a major operational problem can be that of obtaining the opinion(s) of the membership. Returns on questionnaires and ballots are frequently disappointingly low, an evidence of the rank-and-file lack of interest already cited. Members of Canadian societies are not peculiar in this regard. During the recent election of officers in the American Chemical Society, 44 300 (approximately 40%) of 110 000 members voted, and this when a hard-fought election campaign had been conducted for the first time. Participatory democracy should provide the channels whereby members can make their views known, but the officers of a society, by virtue of their election or appointment, must be able to form the "Voice" of that organization. There is agreement that except for the most exceptional circumstances a consensus is unlikely to be reached, and that where significant minority views exist these must be given expression. Obviously, the earlier suggested improvement of communication (e.g., by society officers visiting provincial groups, Chapters, etc.) might do much to improve the opportunity for a free exchange of opinions.

Proferred solutions such as use of Delphi Conferences have not met general acceptance.

(60) The problem of involving the young is not peculiarly Canadian. In the United States the AAAS recognized the problem by setting up a Committee of Young Scientists (see *Science*, 13 November 1970). This Committee has recommended action in a number of areas, such as supporting "multiple experiments in education concerning the responsibility of scientists, their varied roles in Society, and interdisciplinary approaches to major problems". Structural changes in the AAAS to provide a less cumbersome

organization, expansion in *Science* of debate on controversial matters concerning science and Society, and the formation of a committee of minority-group scientists were recommended. The Board of Directors has acted on several of these suggestions, and the young scientists are being involved in specific AAAS projects.

(62) The Canadian Institute of Mining and Metallurgy is conducting an experiment this year, the aim of which is to get a better input from the "grass roots".

Each Branch has been directed to have an annual discussion group to consider what the society should do for members, students, industry and the public. The consensus (and presumably minority opinions) from the discussion group goes forward by a representative to a District discussion group, the latter chaired by a Vice-President of the society. The Vice-Presidents present the results to a discussion meeting at the Institute level. The President, President-Elect, the incoming President-Elect, all the Vice-Presidents, the Secretary-Treasurer and the General Manager review the input from the District discussion groups. What survives is sent forward to the Institute's Council, where decisions and recommendations are made. In theory, this procedure, the idea for which came from the American Society of Mechanical Engineers, should promote the development of a "grass-roots" voice. As of the present writing, the indication is of a favourable response by the CIMM membership.

(65) In printed programs of meetings, papers are frequently designated by French titles even though presentations may be in English. Information presented to the Royal Commission on Bilingualism and Biculturalism by the Canadian Society of Microbiologists is of interest. During a 12-year period (1951-1963), the proportion of presented papers whose titles were listed in French varied from a low of 7.1 per cent (meeting in Winnipeg) to a high of 30.3 per cent (meeting in Quebec City). At times, the proportion of French titles has exceeded the proportion of French-speaking members of the Council (23.5% in 1963-64) or of the membership-at-large.

(70) The following explanatory comments elaborate on the financial position of the sample of societies in Table III.3 (page 71).

Society No. 1 publishes its own Journal and a series of special publications. Most of the special publications and a majority of the articles in the Journal are authored by government employees. Hence, in effect, the federal government indirectly subsidizes the society according to the use made of its publications. This society is faced with the probability of having to provide its own quarters in the very near future; thus, a profit of $20 000 and reserves of $80 000 do not represent complete financial security.

Society No. 2, relatively young, has adopted an NRC Journal which is available to its members at a highly subsidized rate. Reserves of only $2 400 obviously will not permit deficits of $750 very long.

Society No. 3 is a coordinating body for a group of provincial societies representing one profession. Its publication carries advertising and shows a

profit. Reserves, however, do not meet the rule-of-thumb of being approximately equal to a year's operating expenses. Few societies are in this desirable position.

Society No. 4 is one of the few with reserves larger than its operating budget; these reserves are, however, heavily committed to a variety of projects. Although one of its publications receives a federal government grant in support, the publications show a $40 000 loss overall.

Society No. 5 is an example of one of the larger organizations that is in a serious financial position. Reserves simply are not sufficient to support losses over any period of time.

Society No. 6 also has financial problems. An accumulated deficit of $16 000 is being reduced only by stringent measures. This organization is one of our more active scientific societies, and in many respects could be cited as a model with regard to its internal activities and external involvements. The relatively recent establishment of a national office, fully justified, has been a major factor in the financial picture.

Society No. 7 is, again, in a weak position, with insufficient reserves to support continued deficits. Its position may be improved as a result of a recent development involving a joint publication with another organization and a larger federal government publication subsidy.

Society No. 8 receives a publication subsidy, but obviously has problems. Like Society No. 1, this organization may be faced with providing its own quarters soon.

Society No. 9 is in a somewhat sounder position, but deficits of $3 000 cannot be accepted indefinitely.

Society No. 10, a relatively small specialist group without a publication, obviously cannot expand its activities without financial reorganization.

Societies Nos. 11 and 12 are U.S. organizations in the 6 000-8 000 member range. The reserves for No. 11 may be somewhat greater than indicated. This society owns its own quarters. Society No. 12 is obviously in a sound financial position. It has the advantage of having had its quarters acquired as a gift, and in addition has had the same Executive Director for more than a quarter of a century.

(75a) A somewhat surprising finding in the survey of dues paid by the staff of a university (see Table III.6, page 74) was the significant proportion of individuals who did not belong to any Canadian society. Since the questionnaire allowed anonymity, a complete run-down on age and educational background of the individuals involved was not possible. However, from the information that could be assembled, it is evident that a predominately young group (under 35) is involved, in which the highest degrees were obtained for the most part outside Canada. There was a particular concentration in two departments, one falling within the scope of this study, one outside. No ready explanation presented itself.

Another surprising result was that eleven individuals who do not belong to any learned or scientific society took the trouble to report the fact.

(75b) A number of comments on the dues question have been provided. Several sources have suggested that discounts might be available for members belonging to several related societies. The argument is that overall total membership might be increased. However, the fear has been expressed that for some societies a drop in revenue might result from such an arrangement, or that increased bookkeeping costs might offset any increased revenue.

Reduced fees for membership in U.S. counterpart societies have been negotiated or are being negotiated for the members of several Canadian societies (e.g., the Canadian Association of Physicists and the Canadian Psychological Association).

A few societies have lower dues for younger members. Commonly, 30 years is the age at which full fees are assessed.

A suggestion that all engineers and scientists should be assessed a standard fee, possibly scaled according to age or years of professional experience, does not seem practical.

Similarly, a suggestion that fees might be part of payroll deductions, while having merit (you don't miss what you never have), is impractical, unless employers are willing to subsidize a large number of societies.

Still another suggestion is that voluntary contributions to a society, beyond normal dues, should be encouraged. This idea is unlikely to produce much, particularly under current income tax regulations, whereby most scientists and engineers are limited as to what dues may be claimed as tax deductions.

(76) The following notations are made concerning the publication costs shown in Table III.7 (page 76). Society No. 6 provides an example of what can be done. This society was in serious financial trouble, with a deficit nearly equal to its reserves. Switching its publication from red to black was accomplished by a change from type-setting to photo-offset printing, and by increasing advertising and subscription revenues from $7 766 to $12 100.

It does not follow that a profit on publications means an overall profit for the operations of the society. For example, society No. 5, with a publication profit of $5 969, had an overall deficit of about $10 000; and society No. 8, with a publication profit of $12 692, had an overall deficit of approximately $19 000.

(77) The following comments relate to the short-term solutions to the "cost of publications" problem set out on page 77. The advertising revenue is of course not open to all societies; in the current economic clime, advertising drives are unlikely to be highly productive. The price of Journals to subscribers (e.g., libraries) is commonly significantly higher than to members, and can constitute a significant source of revenue.

Most societies have recently increased charges for reprints in keeping with increased production costs, but not all societies look on reprints as a possible source of profit. The introduction of page charges is a relatively recent phenomenon in Canada, but is becoming increasingly common, here as well as in the United States. Several societies have suggested that introducing page charges would "drive manuscripts to the competitors".

There is a considerable body of evidence to suggest that page charges are being resisted and that this is not necessarily a dependable source of income. This subject is dealt with in an unpublished Chemical Institute of Canada report "Communications Through A Crystal Ball".

The suggestion that dues and Journal subscriptions should be separate is not popular with those societies which now include the Journal as a part of the dues. Fear is expressed that an insufficient number of members would subscribe to the Journal. However, there are a number of societies for which the system does work. Savings in handling and postal charges may be considerable.

The days of glossy Journals may be numbered, and the economies of photo offset reproduction will result in a much greater use of the method.

(80) The following comments will show how indirect subsidies (see page 80) operate:

1. With rare exceptions, society Presidents, Secretaries, Treasurers and Editors are employed elsewhere, and use the services of their employers' offices to varying degrees in carrying on the society affairs. For example, a great deal of correspondence is typed by government, industry or university secretaries. It is an unwritten rule, mostly adhered to, that such activities should not interfere with normal duties, and overtime work is commonly paid for from society funds. Employer support of extra-curricular activities is an accepted way of life and is by no means confined to indirect subsidization of engineering and scientific societies. Many individuals in government, industry and universities are involved with the work of numerous committees, such as NRC and DRB advisory groups, WHO and FAO committees, and civic organizations. Employers recognize unofficially that some of their employees devote official time to outside commitments. Again, there is an unwritten agreement that, within reason, this "donation of time" is a gesture of good will, and is a form of recognition of the professional status of individuals, which is a credit to the employing organization.

There are rumblings of change, particularly in university circles because of the current period of financial adversity. Universities are having to consider more closely their resource utilization. When proposed increases in teaching loads are objected to, it is natural that the university administration should enquire into the amount of time devoted by academic staff to non-university commitments. In at least one university it is currently being suggested that staff may have to obtain administration approval before taking on outside commitments. It is quite probable that a university or a government organization might find that in a particular department or unit the equivalent of one secretary's time is being devoted to outside activities. The need to effect economies may dictate a withdrawal of such subsidies.

2. The provision of space for a society's files, reprints, back issues of Journals and editing activities – in effect an office – has been and is being accorded to many societies, seldom as the result of any official arrangement, but rather as a situation that grew like Topsy. Circumstances such as pressure of space may dictate an end to such arrangements. At least one

society which for many years has had its office provided by a university, and another whose office has been provided by a government agency, are having to face up to probable eviction in the near future, and to the accompanying financial drain of renting office quarters.

3. Another form of indirect subsidy more common formerly than currently, particularly for government personnel, is the arrangement of travel on official business at the employer's expense – travel that will permit society business to be transacted. For example, a government employee in British Columbia may have reason to go to Ottawa on official business at intervals. He will try to time a trip so that it will permit him to attend a meeting of the Board of Directors of his society. Society members in industry also try to combine business affairs with society affairs so as to reduce expense to the society.

(81) The following comments provide some indication of the importance of benevolent time (see page 81) and some current problems relating thereto.

A small (300-400 members) scientific society may have 6 to 10 committees. One active society in the 1 500 size range has 19 standing and 12 ad hoc committees. In addition there are 11 Divisions in the organization, which operates with a very small Secretariat. It is not surprising to find that a number of names appear on several committees. For example, one member was on five committees and was also the society's delegate to two other organizations; another was on six committees and a delegate to another organization.

Larger societies, although they may have full-fledged Secretariats, still require the involvement of many members. The Chemical Institute of Canada has one Constituent Society, 13 Divisions, 34 Local Sections, and 25 standing committees, plus 10 advisory committees of Councillors.

It has been suggested that acceptance of multiple commitments to a society by individuals may result at times from a "desire for power". The more usual explanation, as suggested previously, is that the person who does a good job at one assignment will be asked to do something more.

Many societies are finding that it is becoming increasingly difficult to find individuals who will accept a major responsibility, such as that of becoming a Secretary. There are two explanations. Some employers are starting to take a hard look at the indirect subsidy that a volunteer commitment to a society may involve. In this economic period, employers may be making more demands on their staff. One society recently located a member who would have made an excellent Secretary and who was willing to accept the assignment. His superior, the Director of a government laboratory, vetoed the proposal, possibly quite justifiably. Secondly, increased involvement activity is not a peculiarity of societies. Many organizations in government, universities and industry which in years past were run effectively, although perhaps at times autocratically, are now swamped with committees. Nowhere is this more evident than in the universities. Thus, a society member who a few years ago might have been available for society activities may now be burdened with a number of departmental, faculty and university assignments.

(82) A few other examples of estimates of proportion of eligibles belonging to societies (see page 82) are: The Chemical Institute of Canada – 55 per cent; The Geological Association of Canada – 25 per cent; Spectroscopy Society of Canada – 50 per cent; Canadian Society of Exploration Geophysicists – 65-75 per cent; Canadian Society for Chemical Engineering – 35 per cent; The Canadian Society for Mechanical Engineering – 14 per cent (but the society was founded only in 1971); Canadian Association of Pathologists – 60 per cent; Canadian Society of Clinical Chemists – 75 per cent; The Canadian Society for Clinical Investigation – 95 per cent; The Pharmacological Society of Canada – 85 per cent; Canadian Society for Cell Biology – 75 per cent; Canadian Institute of Forestry – 50 per cent; Canadian Psychological Association – 45 per cent; The Canadian Institute of Management – 1 per cent; and the Canadian Psychoanalytic Society – 99 per cent.

(86) Details of the union of four chemical societies in the United Kingdom are of interest particularly to show why the union was thought to be desirable. Such reasons as greater operation efficiency, economy of staff and buildings, and a wide range of services to members were accepted. However, two further reasons were perhaps more influential (see the following quotation, from the work cited on page 85).

"First is the divisive effect of quite independent societies representing the different branches of chemistry. One frequently hears of the gulf between the academic chemist and his industrial counterpart and this has not only been reflected in the different membership and activities of the five societies but, it could well be argued, has been exacerbated by this very separation of the societies. Furthermore, the division of chemistry into separate disciplines such as physical and organic and analytical is more noticeable in Britain than in countries such as the United States and can hardly be conducive to the development of a subject where these distinctions have become artificial and the inter-disciplinary areas are often the most fruitful.

"The second reason why a society of all chemists is desirable has become increasingly apparent during the past few years and even during the course of the negotiations. Chemistry is now the concern of everyone because it has an impact on all our lives. It is a recognized profession practised by a large number of people and it is one of the principal subjects taught at nearly all levels of our educational system. The public rightly expect to be advised by the profession on all matters where chemistry affects their lives – on the chemistry syllabus for schools and universities, on the use of natural resources and the products of chemical technology. They also expect the scientist to explain and interpret his work to the non-scientist and to become involved in the problems of protection of the environment. Government departments are increasingly expecting scientists to explain and justify their requests for financial support. And the chemists themselves, concerned about the conditions of employment – or unemployment – are expecting their professional body to study and advise on these problems. All these things are matters for the chemistry profession as a whole, and can be dealt with most effectively by an organization which

speaks for all chemists."

The amalgamation was not accomplished without thought being given to possible disadvantages, such as size of the new organization, interference with the "folksy" meetings of specialists' groups, and the difficulty of a learned society coping with a developing demand for the involvement of societies in professional matters (remuneration and working conditions). It is hoped that these possible objections have been avoided to a large extent by the organization of the amalgamated society. Space does not permit a review of this structure. Dr. Porter's article is recommended reading for anyone who, with the writer, believes that a serious attempt should be made to combine some Canadian societies. An accompanying article reviews the histories of the four societies which have joined forces. The degree of success of this venture (and currently there are some minor problems) should be watched by all engineers and scientists.

Publications of the Science Council of Canada

Annual Reports

First Annual Report, *1966-67* (SS1-1967)
Second Annual Report, *1967-68* (SS1-1968)
Third Annual Report, *1968-69* (SS1-1969)
Fourth Annual Report, *1969-70* (SS1-1970)
Fifth Annual Report, *1970-71* (SS1-1971)
Sixth Annual Report, *1971-72* (SS1-1972)

Reports

Report No. 1, **A Space Program for Canada** (SS22-1967/1, $0.75)
Report No. 2, **The Proposal for an Intense Neutron Generator: Initial Assessment and Recommendations** (SS22-1967/2, $0.25)
Report No. 3, **A Major Program of Water Resources Research in Canada** (SS22-1968/3, $0.75)
Report No. 4, **Towards a National Science Policy for Canada** (SS22-1968/4, $0.75)
Report No. 5, **University Research and the Federal Government** (SS22-1969/5, $0.75)
Report No. 6, **A Policy for Scientific and Technical Information Dissemination** (SS22-1969/6, $0.75)
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