

INTERDISCIPLINARITY
FOR THE UNIVERSITY OF OTTAWA

a report by

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in collaboration with

LE GROUPE DE TRAVAIL SUR L'INTERDISCIPLINARITE

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le 15 septembre 2002

*M. Robert Major,
Vice-recteur aux études,
Université d'Ottawa.*

Monsieur le Vice-recteur,

Veillez trouver ci-joint le rapport du Groupe de travail sur l'interdisciplinarité que vous avez commandité au mois de mai 2002.

Le texte du rapport est de ma main, après consultation des membres du Groupe. Les recommandations sont, quant à elles, le résultat du travail commun du Groupe. Ni le rapport ni les recommandations ne répondent à toutes les questions que pose l'interdisciplinarité. D'ailleurs ce domaine est devenu lui-même un sujet de recherche, fort intéressant en soi. Notre équipe de travail n'a donc pu qu'effleurer ce vaste domaine où, de toute évidence, l'Université d'Ottawa a un rôle particulier à jouer.

Le texte et les recommandations de ce rapport proposent à l'Université des sujets de réflexion et des pistes concrètes à suivre. Mises en vigueur, ces recommandations devraient faciliter une expansion sérieuse et importante de la recherche et des programmes interdisciplinaires à l'Université d'Ottawa.

Je vous remercie de l'opportunité que vous m'avez offerte de travailler pour une institution qui m'est chère, à un projet si intéressant, avec des collègues sympathiques et dévoués.

Veillez agréer, Monsieur le Vice-recteur, l'expression de mes meilleurs sentiments.

Susan Mann C.M., Ph.D., F.R.S.C.

1. WHAT IS INTERDISCIPLINARITY?

Interdisciplinarity is not for the faint-hearted. The definition alone is multiple and complex. Implementation varies within and among universities and across continents. Such practice does not make perfect; no one size fits all. Even the promise of interdisciplinarity can cause vertigo: it will widen horizons, challenge the disciplines, unify knowledge, solve a problem, change the world. Enthusiasts see interdisciplinarity as the wave of the future; skeptics spot the way of fashion. Money lenders get in on the act as researchers dance to government, industry and granting agency tunes. Administrators fuss over how to channel an intellectual ferment that burbles over and through one hundred year-old disciplinary walls. In the linear land of academe, the overlapping circles of webs and networks challenge a way of thinking, a way of being. Matrix bumps up against hierarchy.

Almost all of us, as academics (and administrators too) have been trained in a single discipline. We think about things as historians or physicists, philosophers or sociologists. Some of us even look like our disciplines: watch the students at any graduation ceremony and marvel at both the attraction and the influence of single-discipline training. And almost all of us think that our way of thinking about things is, if not the only way, probably the best way. The larger world confirms our suppositions by ranking the disciplines: generally, the more mathematical and theoretical, the higher the status. And when that ranking accompanies, as it usually does, a gendered hierarchy – the more males per discipline, the higher the status – then we are very far indeed from rational, value-free, objective “science”. Disciplinary thinking is as socially

contingent as any other human activity.

Disciplinary thinking as we know it dates only from the nineteenth century.¹ In some ways, it is the academic arm of the industrial revolution. Knowledge, like a product, could be broken down into constituent parts; each part could be assigned to specialist workers who knew nothing of the other bits and a process (university research and training conducted largely by and for men) could link them loosely together in the name of progress and science. Like the industrial revolution, it worked. The dramatic changes of the twentieth century (primarily scientific, medical and technological) are a direct result of advances in specialized knowledge. And yet everything else of the nineteenth century – fashion, morality, behaviour, politics, industrial relations, medicine – we now regard with astonishment, even amusement. How could they have been so foolish? Our contemporary academic disciplines (and the structures within which they operate), for all their own internal changes over the century, are still caught in this double bind: they work but they are terribly up-tight. One hundred years from now they may even look silly.

Critics of the disciplines are almost as old as the disciplines themselves. No sooner did, for example, the social sciences establish themselves as distinct entities (history in 1884; economics a year later; political science in 1903 and sociology two years after) than the doubters emerged. They worried about the “fragmentation of knowledge.” They fussed over specialization. They were anxious about the limiting effects on young minds. They hankered for integration and may in fact have feared for the disappearance of the humanities in an increasingly mechanized world.

¹ Philosophy and mathematics are ancient branches of knowledge. Theology once considered itself the queen of the sciences. The physical sciences trace their origin to the 17th century and the natural ones to the 18th. But the professional organization of them all, the strict demarcations among them and their anchoring in university departments is much more recent.

Some of them traced their roots to Plato and Aristotle, took comfort from Descartes and came into their own in the twentieth century. Among their numbers were major philosophers of education such as John Dewey and among their early (1920s) institutional homes was the University of Chicago that still today considers interdisciplinarity to be part of the ethos of the university. The tide of that critique of the disciplines ebbed and flowed through the American, then French, then British twentieth century, the ebbing dictated by triumphs of science and psychology, the flow encouraged by cross-disciplinary issues of wartime, by the social ferment of the 1960s, the intellectual ferment of post-modernism in the 1980s and our present-day fascination with globalization.²

All manner of interdisciplinary experiments have been tried. From individual courses to particular programs to entire universities, proponents of interdisciplinarity have argued the overtaking of the disciplines, a new era of breadth and understanding, knowledge released from captivity, intellectual enthusiasm rekindled and social issues tackled and conquered. Some of this did happen. Much of it did not as the demands for specialized research, the politics of the disciplines and, in the 1980s, the cuts to university budgets combined to beat back the intruder. Two Canadian experiments are historically instructive. Simon Fraser's Faculty of Interdisciplinary Studies, created in advance of program offerings, fell to the axe of funding cuts in British Columbia in the 1980s. And although York University's new world of interdisciplinary studies, dating from the 1960s, is still larger and more comprehensive than elsewhere in Canada,

² J.T. Klein has an entire chapter, "The Evolution of Interdisciplinarity" in her book *Interdisciplinarity. History, Theory and Practice* (Detroit: Wayne State University Press, 1990): 19-39 to which I am indebted for the specific details of this paragraph and the phrase "fragmentation of knowledge" (21). The synthesis and interpretation are my own.

it has been whittled away, in practice and in prestige, by the traditional disciplines of the humanities, social sciences and science. Similar American tales could be told.

The outcome has been more realism and more accommodation on the part of interdisciplinarians and perhaps, in return, more tolerance of them by traditional scholars. No one now predicts the disappearance of the disciplines although there remains some hope that they might change as a result of interdisciplinary scholarship. Instead, the logic of interdisciplinarity has come to the forefront: it cannot be done without the disciplines. The disciplines are in fact the subject matter of interdisciplinarity; without them there is no interdisciplinary work to be done. At the same time, the interaction is reciprocal: many of the questions raised by interdisciplinary research or teaching lead to new areas of investigation for the disciplines themselves. Weaving these cross-currents together in either a teaching or a research mode is no easy endeavour for professor or student and it is now recognized that interdisciplinarity is not for everyone. A turn of mind, a quirky curiosity, a synthetic spirit, a taste for metaphor, a resistance to borders, an adventurer and a problem solver in one, a temperament that responds to A.S. Byatt's affirmation that "narration is as much part of human nature as breath and the circulation of the blood", a personality that sees an exploding rather than a "sinking star" of knowledge but who would, like Tennyson's Ulysses, follow it "Beyond the utmost bound of human thought."³ In short, someone who sees the poetics as well as the politics of academic work. Definitely not everyone's cup of tea.

What then is interdisciplinarity? Definitions abound and the work of clarification continues to

³ A.S. Byatt, *On Histories and Stories* (London: Chatto and Windus, 2000): 166; Alfred Lord Tennyson, "Ulysses" in R. Charlesworth and D. Lee eds., *An Anthology of Verse* (Toronto: Oxford University Press, 1964): 144

this day with ample scope for philosophers of knowledge to join the fray. At the University of Ottawa and elsewhere the term tends to be used rather broadly, interdisciplinarity becoming the generic term for any intellectual activity that embraces more than one discipline. But people who do interdisciplinary work and the increasing number of theoreticians who study that work make finer distinctions, the major (but by no means the only) ones being multidisciplinary, interdisciplinary and transdisciplinary. Multidisciplinarity seems, in fact, to be the more common practice in both teaching programs and research: the work of specialists in numerous disciplines is gathered around a topic of teaching or research. No one is called upon to question, confront or integrate the separate streams of specialist knowledge.⁴ That is the task of interdisciplinarity where the purpose and process is understanding and integrating the knowledge and insights of distinct disciplines in order to answer “a question of such scope that it lies outside the purview of a single area of knowledge.”⁵ When that process in turn results in something totally new – possibly in terms of solutions to problems but more often in ways of thinking about problems – then one has moved into the realm of transdisciplinarity.⁶ There is a slight tendency, born of our linear, disciplinary thinking, to see these three forms as sequential and hierarchical (multi being the lowest and trans the highest), but it need not be so.

⁴ The University of Ottawa’s new “programmes bi-disciplinaires” might be considered mini-versions of multidisciplinary in that they expose students to two disciplines without any required element of integration. But without the thematic, topical or problem orientation of multidisciplinary studies, these programs are really double majors.

⁵ W.H. Newell and W.J. Green, “Defining and Teaching Interdisciplinary Studies,” in W.H. Newell, ed., *Interdisciplinarity. Essays from the Literature* (New York: College Entrance Examination Board, 1998): 26

⁶ J.T. Klein elaborates on the distinctions in an entire chapter “An Interdisciplinary Lexicon” of her *Interdisciplinarity: 55-73*

The best illustration of all of the foregoing is Ottawa's own interdisciplinary field of women's studies because it combines elements of all three, both in a linear, chronological fashion and in an interactive manner. In the beginning, the same nagging question caused feminist academics in separate disciplines to stumble into interdisciplinarity. Each of us, tucked carefully into our disciplinary corners and glad to be there when so many of our sisters had been left at the door, gradually began noticing the same black hole in the subject matter of each of our intellectual homes: there were no women. The recognition was simultaneous and the effect electrifying. Not only did we discover ourselves as we burrowed into the hidden spaces of our disciplines but we discovered each other across the frontiers of those same disciplines. Moreover we needed all the help we could get to answer the fundamental question of WHY there were no women. Where the growing knowledge and understanding would take us we were neither sure of nor agreed upon but one of the results was an interdisciplinary program at the University of Ottawa (and elsewhere): Women's Studies. Although the topic was new and the purpose revolutionary – we were going to transform the disciplines and change the world! – the approach was fairly standard and one that has been followed by almost all interdisciplinary programs, no matter the topic of study: a collection of courses from a number of disciplinary perspectives. It was multidisciplinary and it worked, largely because there was so much to learn. Discovering women behind the blinkers of the disciplines was exhilarating. As it became evident, however, that new means of discovering those women were necessary and that behind the oblivion lay common patterns such as patriarchy and gender, methodology and theory particular to women's studies emerged. They did so as a result of the collaborative using and critiquing of our disciplines. We were doing, in today's parlance, boundary work. The jury is still out as to whether the outcome will be a new

discipline of women's studies – Ottawa has taken the route of creating an Institute of Women's Studies – but certainly the path has become increasingly interdisciplinary as specific courses took shape, with a distinctive course code and content and not housed in a disciplinary department. Among them, the methods course is perhaps the best example of interdisciplinarity in that professor and students have to grapple with the various disciplines' study of women, critique those approaches from feminist perspectives and develop methodological approaches that are specific to the study of women. Such new approaches border on transdisciplinarity but the more telling illustration of the latter is the whole domain of feminist scholarship itself, one of the major intellectual markers of the late twentieth century. One need not even read all this production to be convinced, an impossible task in any case because of the quantity; a mere glance at library shelves will suffice (HQ 1100-2000 is just the tip of the iceberg of the Morisset Library holdings). None of these books was there thirty years ago.⁷

An aspect, perhaps of transdisciplinarity, that has eluded women's studies is the transformation of the disciplines themselves as a result of feminist scholarship. History, political science, science itself ought to be done differently once women are half of any equation. That may well occur one day but in the meantime it reveals another aspect of the definition of interdisciplinarity. People are drawn to this way of studying for a purpose. Besides the character traits of the interdisciplinarian suggested above, there is also a (small p) political purpose almost always discernible in interdisciplinary work. Solve a problem, treat a patient, develop a policy,

⁷ Timing, money and the decision to begin at the research level with mutually agreed upon topics have permitted the more recently created Institute of Population Health to take advantage of definitional evolution and ambiguities and declare itself transdisciplinary from the outset.

create a product, broaden students' training, understand a process or an area of the world, the common thread is an interest in action and change. That in turn raises the (equally small p) political issue of reaction to change. If women's studies and studies of the environment are the most politically charged, all the other problems, questions, topics or issues that spark interdisciplinary work and call upon certain scholars' passion and commitment, contain this element of change and hence of challenge. The conclusion to an entire book about interdisciplinarity is worth repeating here in terms of definitions:

Interdisciplinarity has been variously defined in this century: as a methodology, a concept, a process, a way of thinking, a philosophy, and a reflexive ideology. It has been linked with attempts to expose the dangers of fragmentation, to reestablish old connections, to explore emerging relations, and to create new subjects adequate to handle our practical and conceptual needs. Cutting across all these theories is one recurring idea. Interdisciplinarity is a means of solving problems and answering questions that cannot be satisfactorily addressed using single methods or approaches. Whether the context is a short-range instrumentality or a long-range reconceptualization of epistemology, the concept represents an important attempt to define and establish common ground.⁸

⁸ J.T. Klein, *Interdisciplinarity*, 196

2. INTERDISCIPLINARITY AT THE UNIVERSITY OF OTTAWA

Where does the University of Ottawa sit in the large and varied world of interdisciplinarity? With the acknowledgment that most of what goes on at Ottawa, as elsewhere, is in fact multidisciplinary, the University is barely visible in some areas and very far advanced in others. The timing, therefore, of the University's current interest in interdisciplinarity is propitious for an opportunity exists to take advantage of both locations and to link them into a coherent whole.

Compared to other universities in North America, Ottawa is a newcomer to interdisciplinarity. Only in the last two years has it begun to offer more than a handful of programs.⁹ It has yet to tackle general education ("formation générale") in any systematic manner, much less in an interdisciplinary one like Hartford's All University Curriculum. Nor does Ottawa have any courses that deliberately cross the humanities, social sciences and sciences. Are there any professors who would label themselves "interdisciplinary?" Unlike York's Division of Humanities and Division of Social Science or Calgary's Faculty of Culture and Communication,¹⁰ Ottawa has no structures that house interdisciplinarity. Yet to be fostered at Ottawa is an institutional culture that, as at York or Chicago, supports interdisciplinarity. Much remains, therefore, to be done to render Ottawa more visible in terms of interdisciplinarity. Being

⁹ See Appendix 4 for a listing of Ottawa's programs. More than half of them began only in 2000, 2001 or 2002.

¹⁰ Formerly known as the Faculty of General Studies, Calgary's interdisciplinary unit had a very rocky beginning as a service unit, then as the entrance and two-year general education provider for most incoming students, and now (2002) as a direct-entry route solely to interdisciplinary programs.

a newcomer could in fact be advantageous; Ottawa could do things differently.

From being barely visible in some areas, Ottawa is just like its sister institutions in other areas. Like other universities, Ottawa structures its interdisciplinary programs by means of courses from different departments with the occasional specific course, complete with distinctive course code, tailored for the program. Ottawa is also in the process of structuring its interdisciplinary research in a manner similar to that of other universities, in centres and institutes.¹¹ And, also like other universities, Ottawa is subject to the same internal scramblings and grumbings as interdisciplinary research and teaching make unusual calls upon units all across the campus.

And yet, in still other areas, Ottawa's differences from other universities put it in the lead in terms of interdisciplinarity. It has departments where other universities have only programs: religious studies, communications, criminology. The rationale for these particular departmental structures at Ottawa likely had nothing to do with interdisciplinarity but the outcome is there nonetheless, different from some other universities and providing, perhaps, the hint of a precedent for women's studies, were it not already ensconced in an Institute (like York's School). In terms of facilitating interdisciplinarity by appointing administrators with such experience, Ottawa has also taken a leading step in the person of its Associate Dean, Interdisciplinary Programs in the Faculty of Graduate and Post-doctoral Studies. Ahead of the University of Chicago, Ottawa has built a building in advance of the expected intellectual integration of the disciplines/programs of the School of Information Technology and Engineering. Like Chicago's

¹¹ See Appendix 5 for a list of Research Centres and Institutes, not all of which are interdisciplinary.

planned Interdivisional Research Building for that university's "Biophysical Dynamics" take on the future, the new building is intended to foster interdisciplinary work. Ottawa may also be in the lead in its very asking of the question, to which this report is a response: What does all this mean for the University? How do we cope with it? How do we foster it?

Another unusual step which puts Ottawa in the forefront but which is not yet directly linked to interdisciplinarity, is the University's defining of Strategic Areas of Development. One of the justifications for the current four is that Canada, Health, Information Technology and Molecular Sciences are "central for social well-being."¹² That justification owes much to a distinguishing characteristic of interdisciplinarity. Without the past thirty years of interdisciplinary nudges about the importance of contemporary social issues (and leaving aside for the moment the University's own spectacular rise to research prominence), it would likely have been impossible to define any strategic areas of development at all much less justify them in this manner. In the introduction to an early document announcing those areas, the University boldly claimed that "innovative interdisciplinary ventures flourish within this milieu" [that of a comprehensive university] but did not link that claim to the four areas.¹³ Indeed, the only direct links the University has made between its *axes de développement* and particular university activities are the Strategic Areas of Development pre- and post-doctoral awards and the criteria for university funding for research centres and institutes (if they want internal funding they have to show a link). In neither case, however, is anything said about interdisciplinarity. The University does nonetheless hint broadly that interdisciplinary research may be one of the more promising paths for pursuing the areas of

¹² University of Ottawa, Office of the Vice-rector Research, *A Wealth of Research*: 9

¹³ University of Ottawa, *Strategic Areas of Development*, 1998

development by describing its research centres as “with few exceptions ... interdisciplinary in character” and its institutes as “discipline-based or interdisciplinary” but it does not say so directly.¹⁴ It has developed unusually clear instructions for the creation of institutes and centres and equally clear expectations for their academic performance and contribution to the University but only by the most tortuous of syllogisms can one connect the Strategic Areas of Development with interdisciplinarity.

It is now time for the University of Ottawa to bring together all the different elements of interdisciplinarity that dot its intellectual and structural landscape and do so in a manner particular to the institution. That means going against the grain of theory and practice elsewhere and integrating rather than segregating interdisciplinary work. The University should take a leap into the future, acknowledge that interdisciplinarity, “neither a fashion nor a panacea,”¹⁵ is a new way of producing and transmitting knowledge and add it, in a complementary manner, to its existing strengths. Doing so will enhance the University intellectually and cause other universities to take notice.

Everything in the current environment suggests the time is right for solidifying interdisciplinarity at the University of Ottawa and creating a foundation for future endeavours. Beyond the University, governments, industry and granting councils are all putting a premium on interdisciplinary approaches. Whether or not one sees that as undue political and financial

¹⁴ University of Ottawa, Office of the Vice-rector (Research), “Procedures for the Establishment of Research Centres, Institutes, and Chairs.” The French version uses the term *multidisciplinaire* when describing centres.

¹⁵ Centre for Educational Research and Innovation, *Interdisciplinarity: Problems of Teaching and Research in Universities* (Paris: OECD, 1972): 282

pressure on universities, one must also acknowledge that university graduates will be going into that milieu. They need some exposure to the thought-patterns, approaches and difficulties of interdisciplinary work. Within the University, colleagues see great promise for the training of students, the advancement of knowledge, the expansion of research, the shaping of the University's contribution to global issues, and even for their own sense of belonging to the entire University. What they need is institutional facilitation of interdisciplinary activity. For if anything stands out from the experience of interdisciplinarity at the university, it is the difficulty and fragility of these undertakings. Whether a teaching program or a research centre, they depend on individual champions, collective good will and constant negotiation. Compared to departmental functioning, everything involved with interdisciplinary activity is a chore. The challenge therefore is to make some comfortable space for innovation.

The University can do that by giving interdisciplinarity more prominence. It can strengthen the threads of interdisciplinarity now tentatively woven into its view of itself and pull them tightly around both what it is currently doing and what it wants to do. For interdisciplinarity fits the nature of the University of Ottawa like a glove. Bilingual and bicultural, situated in the national capital of a country with a privileged position in the world order, and advertising itself as "a meeting ground for two of the prominent intellectual and scientific traditions of the western world,"¹⁶ the University of Ottawa is the ideal place for interdisciplinary work.

As well as settling into the fabric of the institution as if it had always been there, interdisciplinarity will also enhance the University's current status. That status is the result of thirty years of traditional style "modernization" that Ottawa undertook on becoming a

¹⁶ University of Ottawa, Mission statement

provincially-funded university in the 1960s: enhancing research and teaching by hiring the best people. That meant strengthening disciplines with individual scholars of great merit and rewarding their achievements in research and publications. The result is a “research intensive” university with all the marks of external recognition and self-esteem implied by the term. The strengths of the disciplines are now recognized to be the *sine qua non* of interdisciplinary work. This is Ottawa’s advantage and challenge as it fits interdisciplinarity into its way of being.

In doing so, Ottawa can also attach interdisciplinarity happily to what the University wants to do. That sense of direction is currently defined in the Strategic Areas of Development, areas that will no doubt alter over time as new research strengths develop and as colleagues become more used to that kind of broad statement of purpose. It is the making of such a statement that has Ottawa standing out. Explicitly adding a tie between interdisciplinarity and the Strategic Areas of Development can only add to that stature. The University could, for example, state openly that all its internally funded and structured research endeavours be of a multi/ interdisciplinary nature and be linked to the Strategic Areas of Development.

Certainly for Ottawa, its very character and geo-political location as well as its current research strengths and its declaration of areas of development can all be tied to interdisciplinarity to make a very unusual combination, and a distinguished one at that. By acknowledging that interdisciplinarity is in a reciprocal not a competitive, much less hierarchical, relationship with the disciplines (and structuring it to reinforce that relationship) the university could not only be saying something different but doing something different, all the while avoiding the impression that it is abandoning individual scholars, interdisciplinary work not done in research centres, or, worse still, entire domains of study.

None of this requires major structural change at the University of Ottawa. Should new structures eventually be required they will follow the path scholars will have traced and the culture the institution will have developed with the increasing practice of interdisciplinarity. That path and that culture will be one of flexibility and ought not to need structural anchoring. Indeed, the University should avoid encumbering interdisciplinary activities with governance structures peculiar to them. That can only add to the burden of scholars interested in working in this way and risks casting in stone something that is, by definition, nimble and changing. On the contrary, the University is in a very good position to take the unusual step of integrating rather than isolating interdisciplinarity. Both the practice and the theory elsewhere suggests that interdisciplinarity requires new administrative structures, its own permanence, its own budget, outside traditional university patterns. The conventional thinking appears to be based on the presumed impossibility of fitting horizontally arranged study, knowledge, research and teaching into vertically arranged structures of power, status and prestige. I think the University of Ottawa can do just that. Better to link than to separate. Better to co-operate than compete. Better to share than hoard. A commitment to that approach, with a mandate and resources to go with it could go a long way to having interdisciplinarity flourish at the University of Ottawa.

3. THE WORK OF THE GROUPE DE TRAVAIL SUR L'INTERDISCIPLINARITE

At the request of the Vice-rector Academic, the Groupe de travail sur l'interdisciplinarité (GTI) began its work in May 2002 with a report expected for the end of September. In late May and through the month of June, it held a series of consultations with and received communications from people at the University of Ottawa who were involved in one way or another with interdisciplinarity.¹⁷ Reflections on the issues raised during the consultations, general reading about interdisciplinarity and investigation of practices elsewhere occupied the month of July. The GTI reconvened in mid-August to formulate its recommendations and again in early September to consider a draft of this report.

Beyond a general sympathy for interdisciplinarity, the members of the GTI had no preconceived notions about its place in the university. The working definition used by the GTI during its consultations was that interdisciplinarity had to involve two or more disciplines, it had to be centred around a topic, problem or theme, it had to be developing “a new intellectual space”¹⁸ and, at the program level, it was likely beginning to create courses specific to the theme

¹⁷ See Appendix 1 for a list of the members, Appendix 2 for the mandate and Appendix 3 for a schematic presentation of the activities of the GTI.

¹⁸ Professor Barbara Crowe, formerly with the University of Calgary's Faculty of Culture and Communication and now at York, provided this happy phrase in conversation with the author.

with new course codes. Without claiming exclusivity,¹⁹ this definition allowed us to get on with our task. Admittedly a different approach would have raised different questions and perhaps led to different recommendations. For our purposes, the general working definition enabled us to eliminate what some of our interlocutors took as interdisciplinarity: the general education requirements or the out-of-faculty requirements of any degree program, any specific field of training already organized in faculty structure, a general first year for all students, any minimal exposure of humanities students to science, as well as the claim of many disciplines that they had already become interdisciplinary through their exposure to and borrowing of different research methods and questions. The GTI is not querying the legitimacy of any of these activities (indeed there is room for university initiatives in a number of them); it simply did not consider them to be interdisciplinary.

As a result of its consultations, deliberations, reflections, readings and enquiries, the GTI has adopted a particular approach to the question of interdisciplinarity at the University of Ottawa. It is suggesting that the university fit innovative approaches to teaching and research into the culture and traditions of the institution. If disciplines are to be interested in interdisciplinarity, the two entities/undertakings have to be in close proximity, rather than in isolation. The GTI thus proposes closer links to disciplines, departments and faculties. Collaboration, co-operation, even mutual reinforcement are the likely outcomes. Illustrations of this already exist at the research level. No sooner was an interdisciplinary Institute of Population Health created than ties with

¹⁹ “interdisciplinarity will not be a matter of agreement, conceptually, practically or politically,” J.T.Klein and W.H.Newell, “Advancing Interdisciplinary Studies,” in W.H.Newell, *Interdisciplinarity. Essays from the Literature* (New York: College Entrance Examination Board, 1998): 9

faculties and disciplines began to centre around a new Ph.D. program in Population Health in the Faculty of Graduate Studies. One could foresee a similar impact at the teaching level. New interdisciplinary graduate programs, for example, initiated in centres and attached to Faculties and the Graduate School, with the students doing their research in centres, could well inspire researchers and graduate students alike to approach undergraduate teaching from an interdisciplinary perspective. Already the potential links between the Centre for Research in Biopharmaceuticals and the interdisciplinary undergraduate program in Biopharmaceutical Sciences are discernible and one could imagine, for example, summer internships in the Centre for students in the program. And if ever the University undertook to provide its graduate students with some preparation for university teaching, interdisciplinary formation at both the research and teaching levels could be a decided advantage. The GTI foresees the growth of precisely those kind of ties and specifically recommends more of them.

Another part of the overall approach of the GTI is that interdisciplinarity can no longer be done on the cheap. Gone are the days of “doing more with less.” One can no longer expect interdisciplinarity to be an add-on to professors’ time and departments’ resources. If the University wants more of it, and everything in our social, political, intellectual and international environment suggests it should, then it must provide the means.

And finally, in terms of general approaches, the GTI recognized that the practical problems associated with interdisciplinary work appeared to be far more numerous at the program than the research level. More issues need to be resolved at that level if existing interdisciplinary programs are to flourish and new ones develop at the University of Ottawa. Research appears to be both more serendipitous in origin, easier to organize and somewhat less demanding in terms of inter-

faculty co-operation than do teaching programs. Admittedly, structured interdisciplinary research is a more recent development than interdisciplinary teaching programs at Ottawa and problems could well arise with time.²⁰ It may also be that the framework that is partly in place for interdisciplinary research will facilitate the resolution of problems (eg. the presence of participating faculties within the governing structure of the Institute for Population Health). The university should certainly continue to put energy and resources into centres and institutes as the framework for interdisciplinary research and it needs to do the same for teaching programs. The variety of existing and potential such programs precludes anything as precise as centres and institutes and hence the greater number of program-related recommendations.

Included as Appendices 6 and 7 of this report is a summary of the issues concerning teaching programs and centres and institutes as discerned during the work of the GTI. Besides providing a glimpse into the inner workings (and worries) of interdisciplinarity at Ottawa, those summaries could be used as a yardstick for measuring progress, both by the university and by individual units. If, ten years hence, few of these issues are raised by the more numerous people engaged in interdisciplinary activity, then the University will know it has done well. Similarly it will know it has done well if an equal number of different issues are raised a decade from now. For the one certain thing about interdisciplinarity is its effervescence. As I read some of the material over the

²⁰ An instructive and sobering account of the particularities of research centres is J.T. Klein's chapter 8, "IDR: Problem-focussed Research," *Interdisciplinarity*, 121-39. Equally informative, from a more specific point of view, is Stephen Schneider's, "Evolutionary Organizational Models for Interdisciplinary Research and Teaching of Global Environmental Change," in David J. Waddington ed., *Global Environmental Change Science: Education and Training* (NATO ASI Series, Berlin: Springer 1995): 9-40

summer,²¹ I caught myself saying, “Oh, I’d like to be back in the classroom, as either student or teacher.” Indeed, as I understand the interdisciplinary ethos, it would in fact make of me both teacher and student. Which is also, of course, a definition of a university researcher.

4. RECOMMENDATIONS

As a result of its deliberations, the GTI recommends **that the University of Ottawa accord a high priority to the pursuit of interdisciplinarity in research and education** and that it do so in the following manner:

- I. by providing a framework for its existing and potential interdisciplinary activities;**
- II. by expanding its interdisciplinary activity;**
- III. by investing financially in interdisciplinary activity and**
- IV. by resolving practical issues.**

Within each of these four major areas of proposed activity, the GTI has enumerated specific recommendations. Tackling any one of them is bound to make a difference; taken as a whole, they should provide both stability and coherence (and possibly some excitement) for current and future interdisciplinary activities.

²¹ See Appendix 8 for a brief bibliography

I. The GTI recommends the following in order to

PROVIDE A FRAMEWORK FOR INTERDISCIPLINARY ACTIVITIES:

1. That the University's interest in promoting and facilitating interdisciplinarity be clearly indicated by a formal mandate of responsibility to the following people :
 - Vice-Rectors (Academic and Research);
 - Assistant Vice-Rectors (Academic and Research);
 - Deans of faculties;
 - Vice-Deans (Programs and Research)
2. That the University community be kept informed of progress in interdisciplinarity through an annual report to Senate from the vice-rectors (Academic and Research).
3. That the vice-deans (programs and research) individually, and in concert across faculties, be the facilitators and problem-solvers for interdisciplinarity.
4. That all University administrators with responsibility for promoting and facilitating interdisciplinary activity be required to meet together at least twice a year for purposes of co-ordination and collaboration.
5. That regularly reviewed Strategic Areas of Development serve as an important vehicle for the promotion of interdisciplinary research
6. That the University continue to promote organized interdisciplinary research activity in the form of Institutes and Centres, and ensure their quality and visibility.
7. That the collaborating units of all interdisciplinary programs, institutes and research centres specify their on-going commitment (professors, courses, credits, space, labs, equipment, etc.) in formal contracts.

8. That all interdisciplinary programs be attached to one or more Faculties.
9. That each interdisciplinary program have an active program committee with set guidelines for its operation.
10. That each interdisciplinary program (or group of programs) have a designated student advisor.
11. That the functions of an interdisciplinary program director be akin to those of a departmental chair in the following regards :
 - presence on faculty/ies' executive committee(s)
 - participation in hiring
 - participation in tenure and promotion recommendations
 - determination of courses to be offered by program and who will teach them
 - time-tabling of program course offerings
12. That the University ensure that cross/jointly appointed professors working in interdisciplinary areas have equitable workloads.
13. That the University foster a sense of belonging among students in interdisciplinary programs
 - a) by providing student space (*Recommendation # 25 below*);
 - b) by creating a "virtual home" for students in each interdisciplinary program;
 - c) by ensuring that throughout the three or four years of an interdisciplinary program, courses or sections of courses be reserved for students in that program;
 - d) by encouraging students in an interdisciplinary program to form a student association;
 - e) by providing student advisors for interdisciplinary programs (*Recommendation # 10 above*).

II. The GTI recommends the following in order to

EXPAND INTERDISCIPLINARY ACTIVITY:

14. That individual interdisciplinary courses (topical, team-taught, problem-oriented, involving perspectives and integration of at least 3 disciplines) be developed as optional courses for any program and that students be encouraged to include some such courses in their programs.
15. That FESP create individualized interdisciplinary programs of study at M.A., M.Sc., and Ph.D. levels.
16. That FESP encourage existing interdisciplinary research centres to develop graduate programs that correspond to areas of interest and work in the centre, the practicalities / modalities of such programs to be specified in collaboration with FESP and participating faculties.
17. That the University consider developing a University of Ottawa-specific honours undergraduate interdisciplinary program for a select group of highly motivated, unusually curious, bilingual students (including international ones) who want a broad interdisciplinary, inter-faculty education at the B.A. level in preparation for high level public service and international agency careers. Such a program should be in the image of the University of Ottawa, draw on and combine its strengths and ensure that the graduates appreciate global issues from a variety of perspectives. The program and its students could be “housed” in a virtual or real “college” (Bytown College?) which might in turn develop into the University’s College of Interdisciplinary Studies.

III. The GTI recommends the following in order to

INVEST FINANCIALLY IN INTERDISCIPLINARY ACTIVITY:

18. That at least 10 of the 25 internal “University Research Chairs” have interdisciplinary teaching and/or research as the main criteria for allocation.
19. That the University add new positions to Faculties for the express purpose of being partly in a interdisciplinary program and partly in an disciplinary program; that candidates be sought specifically for such collaborative ventures and that the collaboration be specified in the hiring contract.
20. That the University create an Interdisciplinary Program Development Fund to enable such things as the following to happen :
 - faculty training in interdisciplinary teaching;
 - interdisciplinary course and curriculum development;
 - visiting experts in interdisciplinarity (e.g. Schneider, Newell, Klein, Browne);
 - “graduate workshops” (modelled on those of the University of Chicago and perhaps as an elaboration of the existing *conférence interdisciplinaire annuelle de l’Association des Étudiants gradués*).
21. That the University double its contribution to the Interfaculty Collaborative Research Initiatives and that some of that money be earmarked for seed grants for the preparation of major interdisciplinary research grant proposals to outside agencies.
22. That the University reward interdisciplinary work with prizes (perhaps as part of the “Excellence in Education prizes”) and awards for outstanding achievement in interdisciplinary teaching, research, program development, thesis preparation.
23. That the current needs and future potential of interdisciplinary programs and research be part of the initial planning and design of any new building at the University of Ottawa.

IV. The GTI recommends the following be undertaken **within the next two years** in order to

RESOLVE PRACTICAL ISSUES:

24. In order to facilitate collaboration among participating units in an interdisciplinary program, the University should review the distribution of BIUs between “corridor” and “teaching” for such programs.
25. That existing interdisciplinary programs acquire some designated student space.
26. That the University ensure due recognition at the individual, unit, and grants administration levels of out-of-department thesis supervision and research collaboration.
27. That all space allocation decisions take into consideration
 - a) the needs of existing interdisciplinary programs and research;
 - b) the potential for interdisciplinary development when people and units are placed in non-traditional proximity.
28. That the interests of interdisciplinarity be an additional incentive to the University’s on-going efforts at harmonization of all academic program requirements, rules and procedures with a view to fewer and simpler such requirements, rules, procedures and more flexibility between and among faculties and programs.
29. That revisions to the collective agreement be undertaken to allow for / ensure
 - a) joint chairs and joint appointments for those professors who wish to be formally attached to two different faculties;
 - b) sensitivity to the nature and demands of interdisciplinarity in hiring, evaluation, tenure and promotion procedures and decisions.

APPENDIX 1

MEMBERS OF THE GROUPE DE TRAVAIL SUR L'INTERDISCIPLINARITE

Susan Mann, Chair

Ian Clark

Ruby Heap

François Houle

Yvonne Lefebvre

Peter Walker

Jean-Sébastien Kennedy, Secretary

APPENDIX 2

MANDATE OF THE GROUPE DE TRAVAIL SUR L'INTERDISCIPLINARITÉ (extract of memorandum from Vice-Rector, Academic to Deans, Department Chairs and Directors of Institutes and Centres, 7 May 2002)

During their retreat last December, the deans and the members of the Administrative Committee decided to form a special task force to study interdisciplinarity at the University of Ottawa.

The group has been given a fairly broad mandate, thus guaranteeing the most latitude possible in its assessments and consultations. Ultimately, the University wants the group to produce a discussion paper on the vision, coherence, objectives, relevance and governance of interdisciplinary programs and initiatives on campus.

Once discussed by the Academic Planning Committee of Senate and then approved by the Senate itself, the paper could serve as both a guide and template as we set our institution's future course in the management of interdisciplinary programs and research.

Specifically, the Task Force is responsible for:

- assessing the current situation at the University of Ottawa in the area of interdisciplinary programs, centres and institutes;
- examining what other institutions are doing in the area, to determine best practices;
- recommending the best way for both existing and potential interdisciplinary and multidisciplinary programs to reach their full potential and especially their teaching objectives, all on the strength of a coherent disciplinary core;
- recommending measures that will allow centres and institutes to operate in the most favourable conditions possible;
- stating the structural or administrative impact of the academic recommendations, and proposing governance models for programs, centres and institutes.

APPENDIX 3

ACTIVITIES OF THE GROUPE DE TRAVAIL SUR L'INTERDISCIPLINARITE

Rencontres

Administration centrale

Comité d'administration (avec S. Mann)

Recteur et Vice-recteurs (Etudes et Recherche) (avec S.Mann)

Comité de planification scolaire

St-Jacques, Raymond Agent de liaison et négociateur en chef

Wong, Henri Vice-recteur adjoint (Gestion des effectifs scolaires et registraire)

Doyens et vice-doyens

Aboulnasr, Tyseer	Doyenne	Génie
Alcock, Denise	Doyenne	Sciences de la santé
Andrew, Caroline	Doyenne	Sciences sociales
Bourdages, Johanne	Doyenne	Éducation
DeKoninck, Joseph	Doyen	Études supérieures
Detellier, Christian	Doyen	Sciences
Doutrieux, Jérôme	Doyen associé aux programmes	Gestion
Feldthusen, Bruce	Doyen	Droit, Common Law
Goudreau, Mistrale	Vice-doyenne et secrétaire	Droit, Droit civil
Kelly, Michael	Doyen	Gestion
Kleine, Leonard	Vice-doyen (études)	Sciences
Perret, Louis	Doyen	Droit, Droit civil
Staines, David	Doyen	Arts
Walker, Peter	Doyen	Médecine

Directeur de départements

Beyer, Peter F.	Sciences religieuses	Hastings, Ross	Criminologie
Daigle, Jean-Guy	Histoire	Murphy, Raymond	Sociologie

Directeurs de programmes

Durst, Tony	Sciences biopharmaceutiques
Ferrand, Dominique	E-commerce et E-business
Gray, Doug	Génétique humaine et moléculaire
Lagarec, Daniel	Sciences environnementales
Messier, Claude	Neurosciences du comportement
Necsulescu, Dan	Gestion de projet en technologie de l'information et gestion en ingénierie
Stuart, Meryn	Études des femmes (programme de maîtrise)
Robin, Michel R.	Sciences environnementales

Thizy, Jean-Michel Sciences des systèmes

Directeurs de centres et instituts

Dillon, Jo-Anne Centre de recherche en biopharmaceutiques
Gaffield, Chad Institut d'études canadiennes
Losos, Joseph Institut de recherche sur la santé des populations
Martinez, Andrea Institut d'études des femmes
Narbaitz, Roberto Centre international de ressources en eau
Sattar, Syed A. Centre de recherche en microbiologie environnementale
Scott, Phillip Institut Ottawa-Carleton, Département des mathématiques et statistiques
Wallot, Jean-Pierre Centre de recherche en civilisation canadienne-française

Soutien administratif

Legault, Édith Adjointe scolaire, Sciences
Pagé, Lucie Responsable des archives, CRCCF

Professeurs

Bouchard, Louise Sociologie / Santé des populations
Masson, Dominique Études des femmes
Mendes, Errol Common Law
Sethna, Christabelle Études des femmes

Étudiants

Chin, Ami Sciences biopharmaceutiques
Holtzman, Jennifer Sciences biopharmaceutiques
Mekhail, Karim Sciences biopharmaceutiques
Senn, Bill Études des femmes

Correspondance reçue

Aboulnasr, Tyseer Génie
Bourgault, Yves Mathématiques et statistiques
Downing, Marymay Etudes des femmes
Durst, Tony Chimie
Findlay Scott Biologie
Fowler, Anthony Sciences de la Terre
Jay, Paul SITE et Canasic Communications
Longtin, André Physique
MacKay, Ian Linguistique
Mendes, Errol Common Law
Rancourt, Denis Physique
Swiderski, Marie-Laure Girou Lettres françaises
Thibault, Yves Génie chimique

Universités contactées (en personne, par téléphone, par courriel ou via l'internet)

Universités canadiennes :

University of Calgary
Concordia University
Dalhousie University
Simon Fraser University
University of British Columbia
University of Victoria
York University

Universités américaines :

Rutgers University
Stanford University
University of California, Berkeley
University of Chicago
University of Hartford
University of Illinois at Chicago
University of Texas at Houston
Yale University

Universités britanniques: University of Oxford

En plus, le GTI a tenu **dix** fois ses propres réunions.

APPENDIX 4

LISTE DES PROGRAMMES INTERDISCIPLINAIRES

Premier cycle

Administration des Arts	Arts: concentration
Administration publique	Sciences sociales: spécialisation
Développement international et mondialisation	Sciences sociales: spécialisation
Didactique des langues secondes	Arts: concentration; spécialisation
Etudes canadiennes	Arts: concentration; Sciences sociales: 2 ^e concentration
Etudes de la langue française	Arts: concentration; spécialisation
Etudes de l'environnement	Arts: concentration; spécialisation
Etudes des femmes	Arts: concentration; Sciences sociales: concentration
Etudes en mondialisation	Sciences sociales: 2 ^e concentration
Etudes internationales et langues modernes	Sciences sociales: spécialisation
Etudes médiévales	Arts: concentration
Géomatique et analyse spatiale	Arts: concentration
Gérontologie	Sciences sociales: 2 ^e concentration
Gouvernance et politiques publiques	Sciences sociales: 2 ^e concentration
Intervention sociale	Sciences sociales: 2 ^e concentration
Sciences biopharmaceutiques	Sciences: spécialisation
Sciences environnementales	Sciences: spécialisation

Deuxième et troisième cycles

Affaires électroniques	Certificat
Biostatistique	M.Sc. (en collaboration)
Commerce électronique	Certificat
Etudes canadiennes	Ph.D. (en collaboration)
Etudes des femmes	M.A. (en collaboration)
Génétique humaine et moléculaire	M..Sc.; Ph.D. (en collaboration)
Génie de l'environnement	M.Sc.A.; M.Ing., Ph.D.
Génie logiciel	M.Ing., M.Sc.A.; M.C.S. (en collaboration)
Gestion de projet de technologie de l'information	Certificat
Gestion ingénierie	M.Ing.
Neuroscience du comportement	M.Sc.; Ph.D. (en collaboration)
Santé des populations	Ph.D.
Sciences des systèmes	Certificat; M.Sc.; M.Sc.Sys.
Technologie de l'Internet	Certificat
Toxicologie chimique et environnementale	M.Sc. (en collaboration)

APPENDIX 5

RESEARCH CENTRES AND INSTITUTES

(** indicates interdisciplinarity)

Centres

Canadian Centre for the Study of Capital Cities **
Centre for Advanced Research in Environmental Genomics
Centre for Catalysis Research and Innovation
Centre for Clinical Transfusion Research
Centre for Interdisciplinary Research on Citizenship and Minority Studies **
Centre for International Health and Development **
Centre for Neuromuscular Disease
Centre for Photonics **
Centre for Research in Biopharmaceuticals **
Centre for Research on Canadian Sport
Centre for Research on Community Services
Centre for Research on Environmental Microbiology
Centre for Research on French Canadian Culture **
Centre for Trade Policy and Law **
Centre on Women and Politics
CGA Accounting Research Centre
CGA Tax Research centre
Human Rights Research and Education Centre **
International Water Engineering Centre **
Kidney Research Centre **

Institutes

Centre on Governance **
Industrial Membrane Research Institute **
Institute of Canadian Studies **
Institute of the Environment **
Institute of Population Health **
Institute of Women's Studies **

APPENDIX 6

Issues concerning interdisciplinary programs (raised during the work of the GTI)

1. How to fit interdisciplinary programs into university structures?

- theory and practice of interdisciplinarity do not fit disciplinary structures
- disciplinary structures themselves are very rigid
- no common model for interdisciplinary programs
- courses and course codes specific to interdisciplinary programs
- autonomy vs. support
- reporting lines
- approval structures (“multitude de règles, d’autorisations”)
- politics (representation)

2. How to staff interdisciplinary programs?

- few people willing or able to work interdisciplinarily

- source of professors
 - borrowing
 - ▶ to borrower
 - ▶ to professor (graduate supervision outside department)
 - compensation
 - hiring
 - ▶ by whom?
 - ▶ in consultation with whom?
 - ▶ type of appointment
 - reliance on part-time professors

- workload of professors with ‘joint’ appointments
 - who assigns?
 - risk of overload
 - ▶ administrative
 - ▶ teaching
 - comparability/equity among jointly appointed professors in the same unit
 - avenue for complaint resolution

- career path/tenure/promotions

- collective agreement

- one “filière de promotion”; joint appointments not feasible
- hiring to a program possible if program is attached to a faculty

3. How to manage interdisciplinary programs?

- director: source? compensation ? (course releases?) powers?
- administrative support
- continuous negotiation among constituent units and among decision-making bodies
- timetabling of courses
- enrollment caps on courses
- space
 - 2 campuses
 - offices/laboratories for professors
 - student space
- development and growth of program

4. How to finance interdisciplinary programs?

- is existing university budget a barrier?
- BIU distribution within university
- differing resources of constituent units
- differing patterns of financing
- operating budget
- \$ to unit offering course

5. What academic issues are specific to interdisciplinary programs?

- students' prior preparation
- does teaching remain at a general level?
- prerequisites for certain courses
- existing courses not always appropriate to interdisciplinary programs/students
 - ▶ taught from a disciplinary perspective
 - ▶ disciplinary specific concepts, theories, jargon
- where to place the interdisciplinary focus: at the beginning of a program? in each course? in entire program? at the end of a program? only at the graduate level?
- streams within interdisciplinary programs?
- recognition of graduate courses from another discipline for a given interdisciplinary graduate program
- what constitutes an interdisciplinary thesis?
- where do students go after completing an interdisciplinary program?
- how findings of new interdisciplinary areas filter back to disciplinary programs?

6. How to ensure ‘presence’ of interdisciplinary programs?

- visibility, recognition, understanding, awareness
- identity, standing, attention
- sense of belonging for professors and students: “appartenance”; “le nôtre”
- who “looks after” students in interdisciplinary programs?

APPENDIX 7

Issues concerning interdisciplinary research centres (raised during the work of the GTI)

1. How to define interdisciplinary research centres?

- criteria to ensure centre (size), research and interdisciplinarity (approach)
- mandates
 - collect all topic-related research in centre
 - foster topic-related research in faculties or departments
- specificity of topic(s)
- specificity of outcome(s)

2. How to fit research centres into university structures?

- the research crosses disciplines, departments, faculties but draws on people, equipment, laboratories, space and support from departments, faculties
- mini-replicas of university structures and administration within centres
- vulnerability of centres to changes in university sourcing of infrastructure: people, equipment, space, laboratories

3. Membership in research centres

- criteria, numbers
- researchers
 - source
 - ▶ borrowing
 - ▶ hiring: to centre? to departments?
 - how many centres can/should a researcher be realistically attached to?

4. How to manage research centres?

- creation and demolition
- reporting lines
- directors: source? compensation? powers/autonomy?
- advisory groups
- administrative support: by staff (source? compensation?); by professors who also have responsibilities in home units?
- grants and grant proposals
 - assistance with grant requests
 - administration
 - consultation
 - authority
 - attribution of credit and monies

- equipment
- space

5. How to finance research centres?

- sustaining (core) versus episodic funding
- external funding
 - channels for, distribution of
- internal funding
 - source
 - differing budgets of centres
- expectation that they become self-sufficient
 - time-frame
 - realism

6. External relations of centres

- links to national/international bodies
- links to government(s)
- links to service providers
- links to industry
 - structural
 - financial
 - intellectual

7. What academic issues are specific to research centres?

- links to undergraduate, graduate and professional development programs
- do centres drain resources from undergraduate teaching?
- the academic implications of contract research, of research “agendas”, of links to industry, of links to politics
- how participants remain strong in discipline and collaborate interdisciplinarily?

8. How to ensure ‘presence’ of research centres?

- visibility, recognition, understanding
 - within centre itself: cohesion, loyalties of centre researchers (split, shared, altered?)
 - within university
 - possible overlapping of centres’ interests and activities
 - outside university

APPENDIX 8

Select Bibliography

Resources

Fiscella, Joan B. and Stacey E. Kimmel eds., *Interdisciplinary Education. A Guide to Resources*. New York: College Entrance Examination Board, 1999

Klein, Julie Thompson, "Selected Bibliography," in J.T. Klein, *Interdisciplinarity. History, Theory, and Practice* (Detroit: Wayne State University Press, 1990): 229-325

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Centre for Educational Research and Innovation, *Interdisciplinarity. Problems of Teaching and Research in Universities*. Paris: OECD, 1972

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Seabury, Marcia Bundy ed., *Interdisciplinary General Education. Questioning Outside the Lines*. New York: College Entrance Examination Board, 1999

Articles

Gaspar, Des, "Interdisciplinarity. Building Bridges, and Nurturing a Complex Ecology of Ideas," Institute of Social Studies, Working Paper Series No. 331 (February 2001): 1-42

Schneider, Stephen, "Evolutionary Organizational Models for Interdisciplinary Research and Teaching of Global Environmental Change," in David J. Waddington ed., *Global Environmental Change Science: Education and Training* (Nato ASI Series, Berlin: Springer 1995): 9-40