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The Canadian Academy for the 21st Century

REPORT

of the

National Academy Review Panel

April 1994

April 1994

The Honourable John Manley
Minister of Industry
Industry Canada
235 Queen Street
Ottawa, Ontario
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Dear Minister Manley,

On behalf of the National Academy Review Panel, I submit this report which expresses our opinion on the need for and scope of a national academy for Canada. Our approach was to examine the role of a national academy in the Canadian context in the 1990s, rather than to focus on the traditional role and structure of academies established centuries ago in foreign countries.

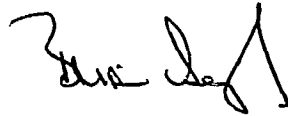
While we lacked the resources to carry out an extensive investigation of the questions before us, we have reflected among ourselves and with others, and have concluded that Canada does need a national academy. We recommend that you initiate a process to create what we call, for want of a better term, The Canadian Academy. To be effective, The Academy would be multidisciplinary and multisectoral, led by a limited number of highly regarded Canadians, be independent from government, and be able to operate as an open and public forum. Our philosophy is to build on the strengths of existing organizations, maximize the impact of scarce resources, and bring those most directly involved in research and the application of research around one table to do what individually they could not do.

The pivotal role of such an influential academy would be to identify, analyze and provide advice on issues of critical importance to Canadians. Such issues could be as diverse as the impact of technology on jobs, ethics and biotechnology, and sustainable development. It could play a critical role in the development of a new national science and technology strategy, an initiative announced in the February 22, 1994 Budget.

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You and your government would need to play a facilitating role in the creation of The Academy. Once The Academy is operational, we see the government's primary role as fostering an environment supportive of The Academy's investigations and deliberations. We believe that this investment will be repaid by a more open and informed society that is better able to make prudent choices in a rapidly changing world.

Yours sincerely,

A handwritten signature in black ink, appearing to read "Brian Segal". The signature is fluid and cursive, with a large, sweeping initial "B".

*Dr. Brian Segal
Chair
National Academy Review Panel*

c.c. The Honourable Jon M. Gerrard

The Canadian Academy for the 21st Century

TABLE OF CONTENTS

Background	1
Profile of Academies	2
The Canadian Context	4
Recommendations	5
Conclusion	7
Appendix	
A: Terms of Reference	
B: Biographies of Panel Members	
C: Executive Summary, National Academy Review (Goss Gilroy Report)	
D: List of Canadian organizations	
E: Executive Summary, ARA Report on the Evaluation of Support to The Royal Society of Canada	

BACKGROUND

In late 1992, the then Minister for Science, the Honourable William Winegard, established a panel of experts to advise the federal government on whether it should support the formation of a national academy in Canada, and what the scope of such an academy should be (Appendix A).

The Panel was also asked to consider whether the Royal Society of Canada is equipped or can be equipped to fill the role of Canada's national academy. The Government has supported the Royal Society financially since it was formed in 1883, and awarded it a grant of up to \$1 million per annum from 1989-90 to 1993-94. The grant was awarded in part to enable the Society to position itself to achieve the status of Canada's national academy. The Society used the grant to strengthen its organization and management, and to carry out plans for the evaluation of Canadian research, the advancement of women in scholarship and the promotion of science.

The National Academy/Royal Society Review Panel was chaired by **Dr. Brian Segal**, publisher of *Maclean's Magazine*, Toronto, Ontario, and former president of the University of Guelph. The members of the Panel were: **Dr. William Cochrane**, President, W.A. Cochrane & Associates Inc., Calgary, Alberta; **Dr. Bartha Maria Knoppers**, Associate Professor, Faculty of Law, University of Montreal, Montreal, Quebec; **Dr. Julia Levy**, Senior Vice-President Scientific Affairs and Chief Scientific Officer, Quadra Logic Technologies Inc.; Vancouver, British Columbia; **Dr. Arthur May**, President, Memorial University of Newfoundland, St. John's, Newfoundland; **Mr. John Panabaker**, Former Chief Executive Officer, Mutual Life of Canada, Waterloo, Ontario; **Dr. Jean-Guy Paquet**, President, Laurentian Life, and former Rector, Laval University, Quebec, Quebec; and **Dr. Mary Clutter**, Assistant Director, Biological Sciences, National Science Foundation, Arlington, Virginia, U.S.A. (Appendix B).

During its tenure, the Panel examined documentation on selected academies in Europe and the United States, reviewed the functions of a number of Canadian organizations, and considered the findings of Industry Canada's evaluation of its support to the Royal Society of Canada. The Panel also met with representatives of The Royal Society of Canada and The Canadian Academy of Engineering, and sought the views of selected Canadian academics and researchers.

PROFILE OF ACADEMIES

As a first step, the Panel analyzed a consultant's report on the functions, organization, funding and benefits of selected academies in the United States and Europe (Appendix C).

It is clear from this report that the countries studied do not have single national academies but rather several academies, each representing a different academic field, e.g. science, engineering, humanities, the arts. The fellowship of these academies, with the exception of academies of engineering, is predominantly comprised of academics and researchers. Most of these academies are independent of government by statute and historical precedent. However, many receive substantial funding from, and have formal links with, government.

The traditional role of these academies has been to foster the development of the arts, humanities, sciences and engineering by recognizing excellence in scholarship and research through the election of eminent scholars and scientists to membership; the awarding of prizes and fellowships; and the analysis and debate of important issues. According to the report, many of these academies have become sources of credible and independent advice to society and government. Generally, these academies act as representatives of the research community in their various disciplines by publishing research papers, taking part in national debates, and participating in international conferences and on international committees.

The consultant's report indicated that the impact of these academies on policy development varies from country to country. Academies that have been most successful in influencing public policy tend to have at least one of the following characteristics: a focus on the applied sciences; a prestigious reputation; a process for defining the content and assessing the quality of the studies they sponsor; some degree of financial independence; and high standards for election to the fellowship combined with a mechanism for involving non-fellows in their activities.

With the rapid social, economic and technological developments of the late 20th century, academies are recognizing the need to carry out analysis and develop advice for society and government within a multidisciplinary context. For example, the four academies in Great Britain recently established the National Academies' Policy Advisory Group, a multidisciplinary body that provides information to the public and independent advice to government, and that derives core funding from private sources to ensure its independence.

The consultants also found that some academies have begun to elect non-academics such as business people, medical practitioners and practising engineers to their fellowship, as well as to make extra efforts to elect women fellows.

Given this information, the Panel concludes that an effective national academy for a 21st-century Canada would carry out the following functions:

- act as a forum for the country's eminent scholars and researchers to present and debate new findings and to disseminate knowledge;
- recognize outstanding contributions in the natural sciences, engineering, humanities, and social sciences;
- encourage the development and full participation of highly qualified people, especially women and other groups that may be under-represented, in scholarship and research;
- foster scholarship and learning in the arts, natural sciences, engineering and humanities;
- promote the public awareness of and interest in higher education and research;
- represent the research community at the national and international levels;
- review and make recommendations on broad research directions, capacities in research, and the transfer/diffusion of research and discovery among academia, government and industry; and
- identify social, scientific, technological, economic and ethical issues of importance to society as a whole, stimulate public debate on such issues, and provide independent advice to Canadians and their governments on public policy, legislation and regulation.

THE CANADIAN CONTEXT

The Panel concludes that many of these functions are being undertaken by a variety of academic, scholarly, government and research organizations in Canada. The Panel recognizes that organizations such as The Royal Society of Canada, the Canadian Academy of Engineering, and the Association canadienne française pour l'avancement des sciences (ACFAS) are doing good work in the area of fostering, recognizing and supporting science, scholarship and research.

Research-oriented organizations and agencies, such as the Natural Science and Engineering Research Council, the Medical Research Council, the Social Sciences and Humanities Research Council and the National Research Council, set directions for and review the results of research, as well as encourage the transfer of research from university and government laboratories to industry and other organizations. Industry and professional associations also play a critical role by speaking for their members and promoting their field of expertise.

In Canada, as in other countries, these are times of dramatic social, economic and technological change. In particular, the rapid development of technology raises critical ethical and social questions. Canada's decision-makers are more than ever in need of considered, clear and independent advice that reflects multidisciplinary and multisectoral perspectives. The Panel concludes these broad perspectives are not available from any one existing organization in Canada. For example, The Royal Society of Canada has a multidisciplinary membership that is predominantly academic, while the Canadian Academy of Engineering's multisectoral membership is comprised of engineers.

The Panel also concludes that Canada does not have a credible non-governmental organization that understands what questions need to be asked about key policy issues and how to find the answers to these questions. While the National Advisory Board on Science and Technology provides solid advice to government, it is comprised of individuals appointed by the Prime Minister and provides advice to him, usually in confidence. The Science Council of Canada, which provided independent advice on science policy, has been disbanded. It is critical that Canadians have the benefit of advice developed by an organization that is able to debate key issues in a forum that is open to the public and the media, and not restricted by government.

Canada also lacks an organization that takes a strategic, long-term view of all aspects of research and its application in the universities, government laboratories and industry. Several organizations represent the research community in specific disciplines and sectors in Canada and internationally, but there is no single organization that offers a broad Canadian perspective and that can coordinate the multidimensional research interests of the academic, government, and industrial R&D communities.

RECOMMENDATIONS

1. **The Panel recommends** the creation of *The Canadian Academy** as a multidisciplinary and multisectoral body that would operate independently from government. The Academy would be supported by key organizations from the research, academic, business, industrial, labour and professional communities (Appendix D). Such an approach would ensure that The Academy capitalizes on current capabilities and maximizes resources, without duplicating or undermining the work of existing organizations.
2. **The Panel recommends** that The Academy undertake the following three functions which, it concludes, are not being adequately carried out by existing organizations:
 - **identify social, scientific, technological, economic and ethical issues of importance to Canadians, stimulate public debate on such issues, and provide independent advice to Canadians and their governments on public policy, legislation and regulations.** With its broad membership, The Academy would act as a catalyst by identifying important medium- and long-term issues, and bringing the best minds in the country together to help resolve issues critical to Canada's social and economic well-being. It could ensure that the Canadian public is not only aware of priority national issues, but also able to participate in public debate on such issues.
 - **review and make recommendations on broad research directions, capacities in research and the transfer/diffusion of research and discovery among academia, government and industry.** The Academy would examine and advise government on key questions regarding research, such as priorities, capacity, strategic directions, best practices, technology diffusion, international and big science, allocation of funding, and performance relative to other countries.
 - **ensure that the Canadian academic/research community is properly represented at the national and international level.** The Academy would help ensure that the views of the academic, research and industrial R&D communities in all disciplines are represented at the national level. At the international level, it would identify activities in which Canada should be a participant, and coordinate and support Canadian participation on international committees and at international conferences and meetings.

* "The Canadian Academy" is a working title only.

3. **The Panel recommends that** members of *The Canadian Academy* be highly qualified and knowledgeable Canadians nominated by participating organizations drawn from the academic, research, business, professional, government and labour communities in Canada. Such a membership would help ensure that the advice and recommendations of The Academy would be respected and acted upon. The Panel envisions that the members would act as individuals and not as representatives of participating organizations, which in turn, would not be obligated to approve the conclusions of The Academy's work. The number of members would be depend on the number of participating organizations. Terms would be for three years, renewable once and staggered to ensure continuity. The Panel suggests that The Academy have a small staff that would manage research undertaken through contracts with consultants.
4. **The Panel recommends that** the government underwrite the initial development of *The Canadian Academy* for three years at up to \$250,000 annually. In addition, the Minister of Industry should recruit a leading Canadian to spearhead the formation of The Academy and provide financial support during his or her tenure. Such support would provide the momentum for organization building and fund raising.
5. **The Panel recommends that** *The Canadian Academy*, once it is established, be incorporated as a not-for-profit organization with fund raising capacity. To ensure its independence and protect it from being disbanded as a result of changes in government policies and priorities, The Academy should neither be created by legislation nor dependent totally on government funding. Independence of thought and action can only be assured by financial independence and by an independent election process for members. The Panel suggests that at least one-half of the financing of The Academy should come from non-government sources, i.e. the private sector, foundations, universities and individuals. We also suggest that, following the start-up phase, most financing from government be for specific projects, rather than operational funding.
6. **The Panel recommends that** The Royal Society of Canada not act as *The Canadian Academy*. It is the Panel's opinion and the finding of an evaluation of Industry Canada's support to the Royal Society of Canada that the Society does not have the organizational capacity to evolve into the kind of Academy envisioned by the Panel, i.e. an academy that can represent the perspectives of all sectors in the economy, generate funds to ensure its independence from government, and achieve and maintain the public profile required to stimulate and contribute to public debate of complex issues.

The Panel believes that the Society would best serve Canada by focusing on its traditional role of honouring scholarly achievements, a role which it performs well. Because of the stature of its fellows in the academic community, the Society ought to be among those organizations invited to participate in The Academy. (Appendix E: Executive Summary, Evaluation of Industry Canada's Support to the Royal Society of Canada).

CONCLUSION

The Panel concludes that many of the functions of an effective national academy for a 21st-century Canada are now being carried out by a variety of existing organizations. However, we believe there are three crucial functions that need to be addressed by a high-profile multidisciplinary and multisectoral body that is independent from government and able to operate as an open and public forum. Our recommendation to create *The Canadian Academy* is based on a minimalist approach: maximize the impact of scarce resources by bringing together existing organizations to address key issues facing Canadians. We believe that Canadians and their governments will gain significant benefits from this modest idea.

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Industry Canada
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(613) 954-5716

APPENDIX A:

TERMS OF REFERENCE NATIONAL ACADEMY REVIEW PANEL

Phase 1:

The Panel will review prepared documentation on national academies and provide expert opinion on the following questions:

- Does Canada need a national academy and what benefits would such a body bring to Canada?
- If so, what should be the scope?
- If so, would it be appropriate to support such an organization with federal funds?

The Panel will provide preliminary advice to the Minister for Science on whether or not the federal government should encourage the formation of a national academy. If the Panel concludes that the federal government should not encourage the formation of a national academy, it will prepare a report for the Minister for Science at this point. If it concludes that there is such a need, it will proceed to Phase 2 and report to the Minister at the end of that phase.

Phase 2:

The Panel will be asked to consider the findings of a consultant evaluation of the Royal Society of Canada, and advise the Minister whether the Society is suited to assuming the role of national academy. The consultant evaluation will address the following questions:

- Should the Royal Society of Canada be considered as Canada's national academy?
- To what extent is the Royal Society of Canada achieving its objectives in the areas of corporate development; evaluation of research; advancement of women in scholarship; and public awareness of science?

APPENDIX B:

NATIONAL ACADEMY REVIEW PANEL

Dr. Brian Segal
Publisher
Maclean's Magazine
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Toronto, Ontario M5W 1A7

Dr. Segal's varied background gives him a unique overview of Canada's education system. He has served as President of Ryerson Polytechnical Institute and, from 1988 to 1992, as President of the University of Guelph. He has chaired the Council of Ontario Universities, as well as the task force established by the Association of Universities and Colleges of Canada to review the report of the Commission of Enquiry on Canadian University Education. In 1987, Dr. Segal organized and chaired the first national forum on post-secondary education, which took place in Saskatoon. He has been a senior policy consultant to several provincial and national bodies, including the federal Department of Communications. Publisher of Macleans Magazine, Dr. Segal has a PhD in social welfare policy.

Dr. Mary Clutter
Assistant Director
Biological Sciences
National Science Foundation
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A botanist by training, Dr. Clutter was at Yale University before joining the staff of the U.S. National Science Foundation (NSF) in 1976. She is now Assistant Director, Biological Sciences at the NSF. Dr. Clutter serves on a number of senior national and international policy committees, including the Board of Trustees of the International Human Frontiers Science Program. In addition to her scientific and science policy achievements, she is known for encouraging women's participation in S&T.

Dr. William Cochrane
President
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Dr. Cochrane has an extensive background in academia, government and industry. He has served as Dean of Medicine and President of the University of Calgary, Deputy Minister of Health for the Province of Alberta, and Chairman and CEO of Connaught Laboratories. President of W. A. Cochrane & Associates Inc., a health products consultant investment company, Dr. Cochrane also serves as a business and technical consultant to Vencap Equities Alberta Ltd. He is a member and past chairman of the National Biotechnology Advisory Committee and is a former member of the National Advisory Board on Science and Technology.

Dr. Bartha Maria Knoppers
Associate Professor
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Dr. Knoppers has received postgraduate degrees and diplomas from the Universities of Alberta, McGill, Paris, and Cambridge, and is the author of many books and papers. Dr. Knoppers' interests include children and the law, and genetics, ethics and the law. She is a member of the Management Committee of the Canadian Human Genome Program, and of the International Ethics Committee of HUBO (Human Genome Organization) and of UNESCO.

Dr. Julia Levy
Senior Vice President
Scientific Affairs and
Chief Scientific Officer
Quadra Logic Technologies Inc.
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Vancouver, B.C. V5Z 4H5

Dr. Levy is a microbiologist who has extensive experience in both academia and industry. Senior Vice-President, Discovery, of Quadra Logic Technologies Inc., she is also Industrial Professor of Microbiology at the University of British Columbia. Chairperson of the Premier's Advisory Council on Science and Technology in British Columbia, Dr. Levy is a member of NSERC Council, and a former member of the Medical Research Council and of the National Advisory Board on Science and Technology. Dr. Levy is a Fellow of the Royal Society of Canada, and a former President of the Canadian Federation of Biological Societies and the Canadian Society of Immunology.

Dr. Arthur May
President
Memorial University of Newfoundland
Elizabeth Avenue
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A biologist by training, Dr. May has extensive knowledge of government and of academia. President and Vice-Chancellor of Memorial University of Newfoundland, Dr. May is a former Deputy Minister of Fisheries and Oceans and President of the Natural Sciences and Engineering Research Council. Dr. May has been a Canadian fisheries negotiator, and Canadian representative on various international fisheries organizations. He is currently the Canadian representative to the Science Committee of NATO, and Chairman of the Standing Advisory Committee in University Research of the Association of Universities and Colleges of Canada.

Mr. John Panabaker
Honourary Chairman
Mutual Life of Canada
227 King Street South
Waterloo, Ontario N2J 4C5

A retired insurance executive, Mr. Panabaker is a former Chairman and CEO of Mutual Life of Canada. He has a keen interest in education issues, and is Chancellor of McMaster University and a former Chairman of the Corporate Higher Education Forum. He holds directorships on a number of company boards. Mr. Panabaker has served as a member of the University Research Committee of the Royal Society of Canada, and was a member of the task force established by the Association of Universities and Colleges of Canada to examine the report of the Commission of Enquiry on Canadian University Education.

Dr. Jean-Guy Paquet, O.C.
Président
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Dr. Paquet is an electrical engineer with a background in systems theory and robotics research. Dr. Paquet became Rector of Laval University in 1977, a post he held for ten years. He is President, Laurentian Life Inc. He has served as a member of many national committees and boards of directors, including the National Advisory Board on Science and Technology. Dr. Paquet is a Fellow of the Royal Society of Canada, an honorary member of the Canadian Academy of Engineering, and of the Corporate Higher Education Forum.

APPENDIX C

**National Academy/Royal Society
Review**

***Britain, Germany, Sweden, France
and the United States***

Prepared for:

University Research Policy Directorate
Industry, Science and Technology Canada

Prepared By:

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April 8, 1993

Table of Contents

Executive Summary	i
Summary - Britain	1
Summary - Germany	9
Summary - Sweden	16
Summary - France	23
Summary - United States	31

Appendix A: List of Interviewees

Appendix B: List of Documents Provided by Interviewees

Executive Summary

Introduction

A review of the academy structures in the United States, Britain, Germany, Sweden and France was carried out. The key findings of this review are summarized below. The purpose of the review was to obtain information on the organizational arrangements, the impacts on public policy, the perceived benefits, and the funding arrangements of academies.

As the scope and funding were limited, the study was based on interviews with key personnel representing the academies in each country, and a limited number of interviewees who were not directly part of the academy system. Documentation provided was also reviewed.

A list of the academies reviewed is attached to this summary.

Organization and Structure

History and Role

Academies generally have a lengthy history and tradition in the countries reviewed. Historically, academies were an important focal point for scholars in the sciences and the humanities, and once were the primary source of independent advice on important national issues. In some of the countries visited, the advisory role for the science academies was reported to have waned somewhat during the post-war period as governments developed internal structures, such as ministries, committees and special councils, to provide advice on issues of national concern. The role of academies, especially in science, has subsequently risen in importance in these countries as the need for independent, credible, and well-reasoned advice on important scientific issues has increased.

All of the countries visited, with the exception of Germany, have a small number of prestigious academies at the national level. Germany has a network of eight state-level (laender) academies connected through a Conference of Academies.

There has been a trend for the science academies to be focused primarily on issues related to basic sciences. To meet the need to address technological and industrial issues, some countries have established academies of engineering or applied sciences. Examples of these are:

- Britain - Royal Society of Engineering
- France - Sub-Committee of the Academy of Science (CADAS)
- Sweden - The Royal Swedish Academy of Engineering Sciences
- United States - National Academy of Engineering

In each of the countries visited there are separate distinct academies (or divisions of academies) devoted to the humanities and/or the arts.

Academies were formed in many countries to foster the development of the arts, humanities, and sciences; to debate important national issues; and to provide independent public advice (solicited or unsolicited) on these issues. The objectives of the Royal Society (UK) provide an example of a typical statement of objectives:

- to encourage scientific research and its applications;
- to recognize excellence in scientific research;
- to promote international scientific relations and facilitate the exchange of scientists;
- to provide independent advice on scientific matters, notably to government;
- to represent and support the scientific community;
- to promote science education as well as science understanding and awareness in the public at large; and,
- to support research into the history of scientific endeavour.

It was found that all of the academies studied have quite similar objectives. An exception might be the National Academies of the United States, including the National Research Council¹ which operates under a role defined by Congress as "to respond to any requests from any department of

¹ The US National Academies of Science, Engineering and Medicine and the National Research Council are referred to as the Academy Complex.

the government for help on any subject of science or art". The mandate of the Academy Complex has been redefined to include:

- initiating studies on topics the officers and governing board consider important, even though no government official requested the study;
- working in a variety of ways to strengthen the nation's scientific and engineering communities;
- collaborating in helping to coordinate international studies and representing the United States internationally;
- striving to improve education in science and mathematics.

All of the countries visited, with the exception of Germany, reported that science academies are now undertaking broad science and public policy studies, rather than just purely technical or scientific studies, in addition to their other traditional activities. This trend appears to be partly a reaction to the demand for these studies, and partly a reaction to a perceived need to demonstrate relevance in an era of limited sources of funding.

Administration

The academies are generally self-governed, usually by a board or council elected by the members. Generally, an administrative staff is responsible for day-to-day operations. A common feature of academies is the existence of an elected or rotated president or permanent secretary, and an executive director who is supported by permanent salaried staff. Members of academies are generally paid only a small honorarium and a compensation for expenses. The honorary position and prestige of the membership in the academy justifies the time (and out-of-pocket expenses) that may have to be paid by the members or their sponsoring organizations.

In all cases, agendas are set by the academies themselves, although most academies are responsive to requests from government authorities. Generally, a council or board is responsible for ratifying agendas that are established by the permanent secretary or president. An important characteristic of the academies is their independence with respect to responding to outside requests to review an issue of national concern. Moreover, academies stress that the process of studying an issue requires careful internal review of both the study terms of reference and the study results.

Membership

Academy membership usually is representative of the eminent scholars in the particular fields of interest to the academies. The French academies limit their membership and new members can only be inducted on the retirement or death of an existing member. Membership limitations are less of a concern for the Royal Society (UK), as the Royal Society has a larger approved membership complement than the French academies. In all cases, membership is by election.

The French academies contain a large proportion of academics, and attempt to attract multidisciplinary memberships. The Royal Society reported mainly academics in its membership. The Swedish academies have a large proportion of non-academic members. Generally, the newer applications-oriented academies tend to have more multidisciplinary memberships as well as more non-academics.

Outsiders have critiqued the academies in some countries on this basis. For example, it is felt that the Royal Society is elitist in character and does not admit enough younger members. There is criticism that a lack of multidisciplinary memberships undermines the credibility in areas that require a multidisciplinary approach. Concern was also expressed that the award of research fellowships favours existing fellows. Similar concerns were expressed in France.

In contrast, the process for electing members is considered by the academies themselves to be a mechanism for ensuring their continued eminent role, credibility and independence.

Young Academics

In most cases, academies perceive one of their roles to be the promotion of excellence in disciplines of interest. In some cases, academies provide post-doctoral fellowships for research grants to young academics. This was the case for the Royal Society and the British Academy as well as for the Swedish academies. In all of the academies prizes are granted for excellence in research. For example, the French academies provide prizes for excellence in research, and the German "laender" academies award medals.

Linkages

In almost all of the countries reviewed, the academies are independent of government by statute and by historical precedent. Nonetheless, most of the academies receive some part of their funding from governments. In some cases, the academies are closely tied to government in terms of responding to issues of national concern.

The U.S. academy structure, including the National Academies of Science, Engineering and Medicine and the National Research Council, is organized under a congressional charter granted in 1863 to the National Academy of Sciences. It stipulates that the Academy "shall whenever called upon by any department of government, investigate, examine, experiment and report upon any subject of science or art".

The Royal Society perceives an important role to be advising on issues of national concern. The Royal Society has formal ties to the research councils and to the government. It has only informal ties to industry. As in other countries, industry ties occur mainly through the Royal Academy of Engineering. At the present time, a government review of the research structure in the UK is proposing a re-evaluation of the relationships between the Research Councils, the Royal Society, and the Royal Society of Engineering.

The Royal Swedish Academy of Sciences has formal linkages to government through board memberships and informal linkages to the research councils through joint participation on projects and informal cooperation. It also has a research granting function. Again, ties to industry occur through the Royal Swedish Academy of Engineering.

The French academies are funded by and have formal linkages to government through formal reporting requirements and annual budgetary reviews. They are not formally linked with the research granting process. Linkages with industry occur through a committee of the Academy of Science.

The German State academies are all closely linked to the State Governments and the Federal government, and to each other through the Conference of Academies. They are not involved or linked to the granting councils or to industry.

Funding of Academies

An important principle of academies is their independence from government. With respect to funding, however, most of the academies surveyed receive a part of their funding from government. A notable exception to this is the American Academy of Arts and Sciences in Cambridge, Massachusetts, which is funded from endowments. Other academies reported that in many cases they receive some of their funds from private endowments or legacies.

The British academies are funded primarily from government, with about 25% coming from other income sources. The Royal Society's budget in 1991-92 was £23 million with £18 million from government as a grant-in-aid.

The five German State academies are funded entirely by government on a shared basis between the federal and the provincial governments. The 1992 budget is DM 59.3 Million (around CDN \$50 Million).

In Sweden, the majority of funds available originate with the private sector. Only the Royal Swedish Academy of Sciences receives a considerable amount from the government (13.3 million Swedish Kroner - about \$2 million CDN). The Royal Swedish Academy of Engineering is funded partially from industry contributions of 100,000 Swedish Kroner from each participating company.

The French academies of the Institut de France were reported to be primarily self-funded from legacies and trusts. The Institut de France receives about 10 million French Francs (CDN \$2.5 Million), but has internal resources of 240 million French Francs per year (CDN \$60 Million). The French academies receive direct budgetary support through the Ministry of Education.

The U.S. Academy complex, consisting of the National Academies of Sciences, Engineering, and Medicine and the National Research Council reported that 85% of their funding (\$202 million) was derived from government. Approximately 22% is for administration, 74% is for research and studies, and the remainder is for publication costs.

Impacts on Public and Science Policy Development

The actual reported impacts are based on the opinions of a small number of respondents in each country, as well as on published reports.

Each of the countries reviewed reported a slightly different experience with regard to impacts on public and science policy development. Some indicated that there has been an evolution in the academies' ability to influence science policy development. In both Britain and France, the academies have gone through a cycle during which they had great influence as advisors to governments, but subsequently lost this influence after the Second World War as governments expanded their Ministries concerned with Science and Technology and instituted new scientific advisory councils. The Royal Society and the Institut de France report that in the most recent decades their influence on science policy has increased as governments have sought expert opinion on increasingly complex scientific issues. Some contrary viewpoints agreed that the influence of the academies declined in both countries following the Second World War, but felt that their current influence (although increasing) was still not as great as formerly. The decline in influence is a result of the emergence of other structures such as councils, advisory functions, and ministries that are charged with providing advice.

There was agreement by most of those interviewed that independence and quality of input of the academies permits them to play a very unique and useful role in providing solicited and unsolicited advice on issues of national concern.

The situation in the United States is somewhat different, as the Academies of Science and Engineering and the National Research Council (NRC), have been specifically tasked in their charter to provide advice to government authorities. It appears that the science-advisory function of the American academies has been well institutionalized and is tapped extensively. The review indicated that NRC and Academy reports are considered authoritative and are cited extensively by policy-makers in both the administrative and legislative branches, as well as by outsiders.

The Swedish academies reported that they have a high official status, that their views are well respected, and that they play an important role as advisors on science policy and education.

In Germany, the influence of the five state academies occurs through the co-ordinating Conference of the Academies. The Conference acts to co-ordinate research and set priorities and to represent the academies with the federal government. In Germany, education and research are purposefully decentralized, and it appears that the impacts of the academies are primarily at the state level.

Some examples of impacts follow:

Sweden

- A government bill benefitted from information provided in the Royal Swedish Academy of Science study entitled "Engineers for the 21st Century".
- Criticism by this academy focusing on the education of economists for industry raised a serious debate and contributed to increased support for the education of economists.

France

Studies undertaken by the Institut de France have included:

- Risks of ionizing radiation and norms for protection;
- The greenhouse effect and climactic consequences - a scientific evaluation;
- Experimentation with animals: necessities, constraints and substitute methods;

- Research in genetic engineering: ways of improving its evolution and development;
- Report on biological research. Balanced research among the different sub-disciplines; and,
- Pollution of the subterranean water aquifers in France.

The Institut considers that it frequently provides well-debated independent advice on policy issues, which is taken into account in government decision-making.

United States

Academy/Research Council reports are often viewed as the authoritative reference on a topic - a reflection of the thoughtful examination by committees of Research Council experts. As a result, the reports are routinely cited by members of Congress, executive branch officials, industry groups, nonprofit associations, and others. The reports are catalysts for new legislation, government policies, and private sector initiatives.

- A review of US export controls on high-technology products found that the regulations cost the nation's businesses about \$9 billion annually and yet often were ineffective in protecting national security. The study concluded that the regulations in some cases penalize US exporters while still permitting access by the Warsaw Pact countries to many advanced technologies. Within a few weeks of the report's release, the Commerce Department issued new rules easing export controls on some products that already were widely available from US allies, and streamlining trade rules for other products.
- A committee that studied air quality aboard commercial airliners concluded that modern aircraft ventilation systems cannot effectively remove cigarette smoke despite designated smoking and nonsmoking seating areas. Citing possible adverse effects on the health of flight attendants and nonsmoking passengers, the expert panel recommended banning smoking on all domestic commercial flights. Congress subsequently passed legislation that prohibits smoking on domestic flights of less than two hours' duration.
- Following completion of a Research Council study which found that technologies for maintaining highways cannot adequately protect the nation's trillion-dollar system of roads, Congress implemented a five-year, \$150 million program to accelerate research on important maintenance problems. In addition, the law-makers charged the Research Council with managing the unique federal-state cooperative transportation program.

- The report, *Diet, Nutrition, and Cancer*, was the most comprehensive summary of current understanding of this complex and often confusing subject. Its recommendations inspired the federal government's National Cancer Institute and the non-profit American Cancer Society to issue similar dietary guidelines. The recommendations also helped motivate the meat industry and supermarkets to offer leaner products to consumers.
- An Institute of Medicine report urged major changes in the regulation of nursing homes. The report prompted congressional hearings on the subject and resulted in two bills that incorporated the committee's recommendations almost in their entirety. Subsequently, the Department of Health and Human Services proposed a major overhaul of its nursing home regulations, basing its reforms on the Institute's report.
- While major suppliers of childhood vaccines were discontinuing or threatening to cease production in response to injury-liability suits, an Institute committee issued a report detailing several options for resolving the public health crisis. The report's recommendations were later embodied in federal legislation.
- Congress established the National Commission for the Prevention of Infant Mortality partly in response to an Institute report documenting that prenatal care helps prevent premature birth and low birthweight. In addition, the report helped spur more than half the states to introduce legislation that would make prenatal care available under Medicaid.

Criteria for Success

There are certain conditions which appear to foster greater impacts on public policy.

- In cases where there is an academy of engineering or sub-committees of the science academy which are concerned with science applications, there appears to be a greater influence on science and public policy;
- The prestige and independence of the academies is an important factor in the influence the academy can exert in all of the countries reviewed. In the United States, the linkage to science policy formation appears to be well recognized and well-defined. In Britain, France, and Sweden, advice is frequently solicited but also may be unsolicited. However, the science policy linkages are apparently not as formalized or as well recognized.

It appears that to some extent, the academies have to "compete" for an influential role in public and science policy. From this perspective, the comparative advantage of the academies is their intellectual prestige and credibility. Therefore, although there may be

other entities whose role is more directly concerned with public policy formation, the prestige and importance of the academies positions them favourably as an external advisor to policy-makers.

- The process of defining the content of studies and of reviewing their quality increases the prestige and perception of value of the science policy advice.
- The academies' history of being self-contained in selecting their work programs and of self-critiquing their own work through internal peer reviews, as well as their partial financial independence, contributes to a perceived impartiality and independence from official government policy.
- Member induction processes which result in very high quality standards for membership, and options to use outside resources such as associates and correspondents, contribute to the prestige of the academies.

There are a number of benefits that flow from the existence of the academies. The benefits are quite common among academies, although the perceived importance of the benefits varies from country to country.

Benefits can be classed into the following general categories:

Promotion of Scholarly Work and its Discussion and Dissemination

Academies (in the Arts, Sciences, Humanities and Social Sciences) perceive one of their primary roles to be the promotion of knowledge and excellence in the disciplines included in the academy. In most cases an important set of activities involves:

- Holding members meetings at which new research or discoveries in the academies' disciplines can be presented, debated, and critiqued. This debate often leads to a critical assessment of the validity and value of the research and its implications;
- Publishing proceedings of meetings and periodic journals reporting on the meetings and debates of the academy;
- Promoting excellence in research and scholarly work through the provision of rewards for excellence; and,

- Supporting promising young researchers through special awards or through scholarships and post-doctoral fellowships.

Representation of the Research Community

Academies also act as representatives of the research community in the sciences, arts, and humanities. For example, in France, it is believed that papers issued from the Academy of Science of the Institut de France are a statement on behalf of the French scientific community.

Academies are trying to form linkages to the community at large and to publicize current issues and trends in their disciplines.

Academies often act to strengthen international ties and to represent the research communities in their disciplines internationally.

Advice on Matters of National Concern

Another function of the various academies has been to study and issue reports on issues of national concern. This has become an increasingly important phenomena with respect to science academies, particularly those outside of the United States.

The increasing complexity and sensitivity of issues in the physical, biological and social sciences has created a demand for independent advice that is considered to be of the highest quality. The French and British academies are augmenting their provision of this type of advice on both an unsolicited and solicited basis. There is a desire of academies in these two countries to insert themselves in debates on issues of national concern, not as lobby groups, but rather as independent sources of research and advice.

Some General Observations

1. In the countries visited, Academies have generally been established for very long periods of time. It is apparent that the success of the academies has been a result of institution building over a long time period.
2. In most of the countries visited, academies were established to fulfill an organizational void, to create an entity to foster learning and research, and to provide advice to governments. The membership of academies appears to have been drawn from the most eminent researchers and individuals in specific disciplines. In latter years, some of the rationale for

academies has diminished as other institutions have been created to fulfill a similar function (national councils, government ministries, independent think tanks, etc.).

3. Despite this, academies continue to be important in the five countries visited. It was difficult to discern how effective they are in the formulation of public policy. However, the evidence presented indicated that they: provide credible, independent advice on policy matters to governments; act to represent the humanities and social sciences as well the physical and biological sciences in national debates; and, act to encourage excellence in research and the continued development of researchers.
4. In the countries visited, with the exception of the United States, the academies represent only a small part of the investment in research in the sciences and humanities and social sciences, and are only a small part of the network of institutions providing policy advice in the country.
5. The national academy structure in the United States appears to have generated the most evident impacts on public/science policy. This is probably due to the very clear mandate of the Congress, which specifies the role of the Academy Complex as one of responding to government-raised issues.

List of Academies/Institutes Reviewed

Britain

1. Royal Society
2. British Academy
3. Royal Academy of Engineering
4. Conference of Medical Royal Colleges

Germany

5. German Research Society
6. Max Planck Society for the Promotion of the Sciences
7. National Research Centres
8. German Conference of Education and Science
9. Federal-Provincial Commission for Education and Research
10. Fraunhofer Society

Sweden

11. The Royal Swedish Academy of Engineering Sciences
12. The Royal Swedish Academy of Sciences
13. The Royal Swedish Academy of Letters
14. The Royal Swedish Academy of Fine Arts

France

15. Académie Nationale de Médecine
16. Académie Française
17. Académie des Sciences
18. Académie des Sciences morales et politiques
19. Académie des Beaux-Arts
20. Académie des Inscriptions et Belles-Lettres

United States

21. National Academy of Sciences
22. National Academy of Engineering
23. Institute of Medicine
24. National Research Council
25. American Academy of Arts and Sciences

APPENDIX D

The Panel suggests the following organizations could be invited to participate in The Canadian Academy. This list is by no means exhaustive.

Royal Society of Canada
Canadian Academy of Engineering
Natural Sciences and Engineering Research Council
Social Sciences and Humanities Research Council
Medical Research Council
Association of Universities and Colleges of Canada
Business Council on National Issues
Royal College of Physicians and Surgeons
Canadian Society for Clinical Investigation
National Research Council and other federal laboratories
Canadian Bar Association
Corporate Higher Education Forum
Social Sciences Federation
Canadian Federation of Biological Societies
Canadian Federation of the Humanities
Association canadienne française pour l'avancement des sciences
(ACFAS)
Institute for Research on Public Policy
Public Policy Forum
Canadian Manufacturers' Association
Canadian Chamber of Commerce
Canadian Institute for Advanced Research

APPENDIX E

FINAL REPORT
EVALUATION OF INDUSTRY CANADA'S
SUPPORT TO THE
ROYAL SOCIETY OF CANADA

Prepared for:

**Federal-Provincial Relations,
Planning and Evaluation Directorate
Industry Canada**

Prepared by:

The ARA Consulting Group, Inc.

December, 1993

Table of Contents

	Page
Summary	i
1.0 Introduction	1-1
2.0 Organization and Operation of the Royal Society	2-1
2.1 Society Structure and Operation	2-1
2.2 Organization and Operation of the Secretariat	2-2
3.0 Study Design	3-1
3.1 Documentation of Activities and Outputs	3-1
3.2 Client Interviews	3-1
3.3 Expert Interviews	3-2
3.4 Management Review	3-3
3.5 Interviews of Other Organizations	3-4
3.6 Survey of RSC Fellows	3-4
3.7 Analysis and Preliminary Report	3-5
3.8 Additional Interviews	3-5
3.9 Concluding Activities	3-5
4.0 Use of the Industry Canada Grant by the Royal Society	4-1
4.1 Financial Overview	4-1
4.2 Activities in the Three Specified Areas	4-3
4.3 Other activities Supported by the Grant	4-5
5.0 Findings and Conclusions	5-1
5.1 Appropriateness of Federal Government and Departmental Support	5-1
5.1.1 Appropriateness of Federal Government Support	5-1
5.1.2 Consistency of RSC Support With the Mandate of ISC	5-2
5.1.3 Relevance of the Grant Objectives to the Mandate of ISC	5-4
5.1.4 Appropriate Government Departments/Agencies for Supporting the RSC	5-5
5.2 Need for Industry Canada to Continue Support to the Society	5-5
5.2.1 Need for the Support for the Society's Survival and Further Development	5-6
5.2.2 Need for Continued Support in Order for the Society to Continue to Undertake Work in the Three Specified Areas	5-8

5.3	Objectives Achievement in the Three Specified Areas	5-17
	5.3.1 Quality of the Action Plans	5-18
	5.3.2 Contribution of Activities Carried Out to Objectives Achievement	5-21
	5.3.3 Other Activities that Might have Contributed More to Objectives Achievement	5-26
5.4	Alternative Approaches for the Three Specified Areas	5-28
	5.4.1 More Effective Alternative Organizations	5-30
	5.4.2 Other Activities that Might be More Effective	5-32
5.5	Success in the Area of Corporate Development	5-36
5.6	Additional Activities Undertaken	5-47
5.7	National Academy Issues	5-49

Appendix A Royal Society Staff Responsibilities

Appendix B Summary of the Royal Society's Plans and Activities in the Three Specified Areas

Appendix C Questionnaires and Interview Guides

Appendix D Management Review Questions

Appendix E Survey Responses of RSC Fellows

Appendix F Discussion Guides for Interviews re. Alternatives

Appendix G Description of the UBC Research Evaluation Unit

APPENDIX E

Summary

Evaluation of Industry Canada's Support to the Royal Society of Canada

Introduction

This summary presents the conclusions of the evaluation of the grant (\$5 million over the period 1989/90 to 1993/94) provided to the Royal Society of Canada (RSC) from the Department of Regional Industrial Expansion, later called Industry, Science and Technology Canada, now Industry Canada. This study was undertaken for the Federal-Provincial Relations, Planning and Evaluation Directorate of Industry Canada over the period of June to November 1993.

Background

The Royal Society of Canada is a non-profit organization whose approximately 1,300 members are people who have had outstanding research careers in the arts and sciences. The primary objective of the Society is to "promote learning and research in the arts, humanities, and sciences".

In 1987-88 the expenditures of the Royal Society were approximately \$700,000, of which \$100,000 was supplied by the federal government. In 1988-89 the Society received an additional \$500,000 from several federal departments, which was administered by the Ministry of State for Science and Technology. This was partly intended to provide additional financial support to the Society, which at that time was having to use its reserve fund for day-to-day operations. It was also intended to assist the Society in planning a submission to the government which would consist of a plan for a major expansion of its activities, accompanied by a request for increased government support. The Department of Regional Industrial Expansion (now Industry Canada) accepted this plan, the 1989 Corporate Plan, and agreed to provide a grant of \$1 million per year over the period 1989-90 to 1993-94.

As a condition of the grant, the Society was to invest in corporate development, including its management and fundraising capacity, and also undertake the following activities:

- evaluation of research (EOR);
- advancement of women in scholarship (WIS); and
- public awareness of science (PAS).

These are referred to as the *three specified areas of activity* in this report.

The conditions authorizing the grant called for a review of the use and impacts of the grant to be undertaken in fiscal year 1993-94. This report presents the results of the review.

Study Design

The main data collection activities were as follows:

- Client interviews—"clients" were defined to be those people who are the primary intended beneficiaries of the Royal Society's activities. The sample of client representatives was drawn from the following groups: senior research policy analysts and advisors, senior university representatives (including university presidents), senior government representatives who are concerned with research policy, and senior industry representatives. A total of 15 clients were interviewed.
- Expert interviews—Three sets of experts were interviewed, one for each of the specified areas of activity. Prior to the interview each expert was mailed a copy of a summary of the Society's plans and activities in their particular area, together with certain additional materials produced by the Society in the area. A total of 23 experts were interviewed—seven in WIS, ten in EOR, and six in PAS.
- Management review—The purpose of the management review was to examine what the Society has accomplished in the area of corporate development (e.g., financial control, planning, marketing, fundraising, staffing). The management review was carried out through the review of documentation and interviews of Royal Society staff and officers.
- Interviews of other organizations—This sample involved representatives of organizations which have a mandate that at least partially overlaps the mandate of the Royal Society—i.e., other organizations which are also involved to some extent in the promotion of learning and research. A total of 17 organizations were interviewed—ten scholarly associations, federations, or academies and seven government departments or agencies.
- Survey of Royal Society Fellows—This activity involved a mail survey of a randomly selected group of 60 Royal Society members. Unfortunately, due to a surprisingly low response rate, the results of this survey are not statistically meaningful, and were therefore not used to any great extent in addressing the study issues.
- Additional interviews—The main set of additional interviews dealt with the "alternatives issue": Are there better alternative approaches to achieving the objectives in the three specified areas of activity (i.e., either other organizations that might be more effective than the Royal Society and/or other activities which might be more effective than the kinds of activities the Royal Society has been carrying out)?

Use of the Grant by the Royal Society

During the period of the \$1 million annual grant the Society proposed to use about 42% of the grant to support the three specified areas of activity. As things transpired, the Society only devoted one-third of the grant during the first four years to the three areas. The main reason for this was that the revenues from other sources projected by the Society over this period did not materialize—neither the expected revenues for the three specified areas of activity nor the expected revenues for the Society's other activities.

Other than expenditures in these three areas, the major expenditure items from the grant funds have been meetings, publications and communications, administration, and day-to-day operating expenses. The grant has provided 68% of the total operating budget of the Society (excluding expenditures for the separately-funded Canadian Global Change Program) over the first four years of the grant.

The main activities carried out in the three specified areas over the four year period (1989-90 through 1992-93) have been as follows:

- Evaluation of Research (total expenditures \$1,231K, grant expenditures \$871K)—the main study carried out by the Society in the area of EOR was a study of university research. This study was intended to address the question: how effective are university research funding mechanisms. The resulting report, *Realizing the Potential: A Strategy for University Research in Canada*, presents the conclusions and recommendations of the Society's University Research Committee, based on their consideration of written briefs and comments made in hearings and meetings they conducted. Other activities carried out during this period included considerable work on two discipline studies—one on molecular biology and one on advanced materials. These two study reports are expected to be produced sometime later in 1993.
- Public Awareness of Science (total expenditures \$364K, grant expenditures \$300K)—the main activities carried out in this area included:
 - the sponsorship of several conferences and symposia;
 - the initiation of a newsletter devoted to information exchange on public awareness of science issues;
 - the establishment of an award to recognize achievement in public awareness of science; and
 - the establishment of a program of small grants to support public awareness of science activities.
- Advancement of Women in Scholarship (total expenditures \$148K, grant expenditures \$144K)—one of the Society's objectives in this area was to increase its number of

women members, and it met the targets it set for new women members. Its second objective was to improve the opportunities for women in Canada in scholarship and research. The main activities carried out in this area included:

- the preparation of a booklet of biographies of prominent Canadian women scholars designed for high school students;
- the implementation of a program of lectures presented by prominent women scholars;
- the implementation of a series of annual symposia; and
- the establishment of an award for a Canadian woman Ph.D. graduate.

Conclusions

Issue 1: Appropriateness of Federal Government and Departmental Support

The reorganization of Industry Canada occurred toward the end of this study. The conclusions for this issue which follow are based on the mandate of Industry, Science and Technology Canada (ISTC), which we understand has not changed significantly as it relates to the Royal Society. There is, as yet, no approved mandate statement for Industry Canada.

- Federal government support for the Royal Society is appropriate. This activity is not within the purview of the provinces, and the federal government has frequently stated its support for learning and research.
- This support is consistent with ISTC's Science Coordination and Leadership mandate, which is now the Industry and Science policy program activity in Industry Canada.
- Support for the three specified areas of activity and corporate development is consistent with the mandate of ISTC.
- Industry Canada is a logical federal department to support the Royal Society and/or to coordinate support from other discipline-based departments and agencies, including the granting councils.

Issue 2: Need for Industry Canada to Continue to Support the Society

- In the absence of any support from the federal government, the Society could probably survive, but unless it dipped into its reserves, it would have to revert to its mode of operation prior to the grant period. This primarily involved the election of members, the administration of awards and fellowships, and the organization of meetings and symposia.

- There is little need for continued financial support in order for the Society to continue to undertake work in the three specified areas. Other organizations are better suited to play leading roles in each of these areas. The appropriate role of the Society in PAS and possibly EOR is one of support. For example:
 - in EOR, possibly helping to organize experts for peer review type exercises;
 - in PAS, encouraging and assisting its members to identify and communicate important scientific issues to the public.
- In WIS the appropriate role of the Society is to continue to promote the equality of women in the Society and in scholarship and research generally. This does not require significant funds.

Issue 3: Objectives Achievement in the Three Specified Areas

- Evaluation of Research:
 - The plan for EOR was unrealistic and too broad in scope. On the other hand, the EOR plan did not include a specific strategy for carrying out a comprehensive assessment of Canadian research output, which was one of the objectives of the EOR activity.
 - The Society's work in EOR has been poor. First of all, there has been little output, given the amount of time that has passed and the amount of resources that have been devoted to this area. Secondly, the only real output to date (other than working papers), the university research report, is unlikely to be very useful or have much of an impact.
- Advancement of Women in Scholarship and Public Awareness of Science:
 - The activities specified in the Society's plans for these two areas were more closely aligned with its objectives in these areas.
 - The quality and usefulness of the work in these areas has been medium. These were smaller scale activities than EOR, but it is clear that at least some of the activities carried out by the Society have led to useful outputs that will make a positive contribution to the achievement of the Society's objectives in these areas.

Issue 4: Alternative Approaches for the Three Specified Areas

- The following organizations would be better suited for carrying out work in each of the three areas:

EOR - One or more independent centres of expertise in EOR

PAS - Professionals involved in PAS
WIS - Professional associations.

However as noted under Issue 2, in PAS and WIS (and possibly EOR) the RSC can play a useful role.

Issue 5: Success in the Area of Corporate Development

The term "corporate development" is not defined in the grant agreement, nor is it defined in the 1989 Corporate Plan of the Royal Society. The conclusions below are based on the interpretation of corporate development as meaning primarily development of management and fundraising capacity.

- The Society has made advances in the following areas:
 - **financial and cash flow management** - Budgeting, control procedures, and accounting procedures have been improved.
 - **project accounting** - There are more efficient procedures for the financial monitoring of projects (i.e., monitoring of funds expended versus budget).
 - **organizational structure** - The major elements (e.g., organization chart, job descriptions) are now in place.
 - **staff capabilities** - The administrative capabilities of staff have been increased.
 - **level of marketing activity** - The Society has increased the amount of activity in this area over the period of the grant.
- The following areas need strengthening:
 - **project management** - The systems for monitoring the progress of projects need to be improved. One way to do this would be to hire senior staff with project management experience and delegate the responsibility for the management of major projects to these people.
 - **business planning** - The 1993 Development Plan should be accompanied by a carefully thought-out business plan, which would set goals, describe specific strategies, and identify sources of funding.
 - **marketing** - It would be useful to have a formal marketing plan and process, including appropriate public relations activities and well thought-out distribution and follow-up activities for major project reports. This would increase the Society's visibility and effectiveness in fundraising.

- The Society has had limited success in fundraising. It could have taken a more aggressive approach in this area (e.g., launched a more expensive campaign or hired an in-house fundraising expert); but given the economic climate of the past four years, we are not in a position to say whether, if it had done this, the net funds obtained (after expenses) would have been greater.

Issue 6: Additional Activities Undertaken

- The grant has enabled the Society to expand its activities in a number of areas, as was foreseen in the 1989 Corporate Plan. These include:
 - membership and awards
 - meetings
 - symposia
 - publications and communications
 - international relations
 - administration.

