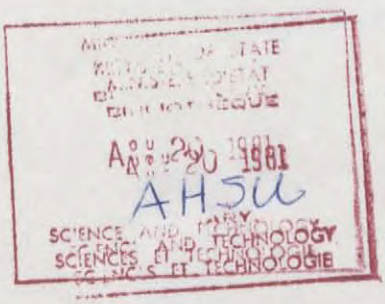
Public Awareness of Science and Technology in Canada

Report to the Minister of State for Science and Technology

PUBLIC AWARENESS OF SCIENCE AND TECHNOLOGY

A REPORT FOR THE MINISTER OF STATE



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FOREWORD

This Report was prepared in response to a request from the Minister of State for Science and Technology, the Honourable John Roberts. The picture that it offers of public awareness in Canada of science and technology is impressionistic, and painted in rather broad strokes. Constraints of time and budget precluded a more detailed survey, although it is to be hoped that a far better picture will emerge if some of the recommendations in this Report are pursued.

Preparation of this Report was undertaken by Council staff, with the assistance of external consultants. Consultation was undertaken within the federal government, with provincial governments, and with the private, voluntary and academic sectors. This consultation, however, was only a preliminary step, and it is hoped that it can be continued and expanded. The help and contributions of ideas from those consulted are gratefully acknowledged. In many cases they went far beyond normal expectations.

The cost of this study was shared with the Ministry of State for Science and Technology, the Natural Sciences and Engineering Research Council, the Medical Research Council, and the Social Sciences and Humanities Research Council, and this financial help from our colleagues is likewise acknowledged. They are not responsible for the content of the Report, however, and do not necessarily concur in its conclusions or recommendations.

Because this Report was undertaken at the request of the Minister, it does not form part of the regular series of Science Council Reports on topics selected by Council itself. Preparation of this Report was the responsibility of the Secretary of Council, Mr. Leslie Millin. He was assisted by Ms. Deborah Frankel-Howard, who was seconded for this study from the Department of Consumer and Corporate Affairs, and the co-operation of that department in making her available is gratefully acknowledged.

As will be obvious from the recommendations, this Report is an early step in a large process involving many actors. It is my personal hope that Council will be able to play a suitable and creative role in furthering that process in coming years.

Claude Fortier,
Chairman, Science Council of Canada.

PREFACE

P R E F A C E

Science and technology pervade contemporary Canadian life. As a way of looking at the world, science has had enormous success as a powerful explanatory system, with its allure of judgements that seem both objective and verifiable, and its perceived capacity to clear away doubts in an increasingly complex and dubious world. Technology is often perceived as the source of prosperity that simultaneously is the source of many ills.

But while we know in a very general way how science and technology are perceived in Canada, and how the public forms its perceptions, we know far less than we should. This country has perhaps a unique involvement in transportation technology, and in common with other industrialized countries depends on science and technology for its prosperity. We rely heavily on transportation technology and the technologies of extracting natural resources, and have come more and more to rely on communications technology both on the job and in our personal lives.

Our lives are being influenced and in some measure changed as science and technology--sometimes dramatically, sometimes imperceptibly--shape and change the way we work, the way we eat and dress, the way we spend our incomes and our leisure, the way we make political choices, the way we care for our health, and the way we die. Science and technology have also altered our expectations and aspirations for better and for worse: widespread belief that, given enough research, science can find a remedy to any problem is coupled with a gloomy belief that pollution, unemployment and the possibility of global disaster, are the direct results of the handiwork of scientists.

Most of the major public issues facing us today have a scientific or technological aspect or component. Employment, energy, industry--all have their social as well as economic considerations, and all have their problems and opportunities that are linked to science and technology. Decision makers are constantly faced with difficult choices affecting the general public, and these choices are the more difficult in that their science and technology components are often not publicly understood.

In the Nineteenth Century, when the great political reform movements were gathering strength, it was understood that a democratic state was impossible without mass education. Unless the population had a reasonable degree of literacy, a democratic state could have form but no substance. Enormous efforts were made to raise the public awareness of the importance of education and literacy if ordinary people were to participate at all in making the choices that affected their lives.

Most industrialized countries have come or are coming to the realization that some appropriate level of public understanding of the importance of science and technology is similarly essential today. This is often based on a pragmatic calculation of what a nation needs if it is to survive in an increasingly complex and sophisticated industrialized world. But there is also recognition that people have to understand their world if they are to operate effectively within it, and that the world is ever more pervaded by science and technology.

This report attempts to examine the situation in Canada. It is no more than a preliminary look at a vast picture. Its preparation has been influenced by the assumption that contemporary citizenship requires that the citizen be sufficiently aware of the importance of science and technology that she or he may have a reasonable opportunity to influence the collective choices that affect all our lives.

In the long run, the educational system is probably the pre-eminent factor, and the Science Council of Canada is already examining this issue in cooperation with the Council of Ministers of Education. But, as the report attempts to describe, there are many other forces at work, more or less susceptible to influence, and therefore presenting opportunities for positive action. Some proposals for action are offered.

The most important contribution the federal government can make is to commit itself publicly to a policy of enhancing the public awareness of science and technology, and then demonstrate its support for that policy by commensurate action. Most other industrialized nations have already done so, in some cases on a very large scale. Canada cannot afford to fail to do likewise. It is more than just a matter of survival in an industrialized world. In an enlightened, contemporary society, it is a prerequisite for full, effective citizenship.

REPORT

1. DEFINITIONS

1.1 A number of words and phrases related to the communication process will be used in this report. Such words may have different meanings for different people. For the sake of clarity and consistency, the following definitions are put forward.

1.2 "Public" is used as a noun (as in "general public") and as an adjective (as in "public awareness"). For the most part, it refers to the groupings of Canadians outside the professional scientific and technological community. Although this study cannot ignore these traditional audiences, the focus is on the far larger non-professional mass: as a unit and as sub-divided.

1.3 "Information" is the content of communication.

1.4 "Communication" refers to the transmission and the exchange of (certain kinds of scientific and technological) information with certain publics.

1.5 "Saliency" and "salient interest" refer to a high-level understanding of science and technology, based on both some level of substantive scientific information and some knowledge of current science and technology-related issues.

1.6 "Latency" and "latent interest" refer to a low-level understanding of science and technology, based on a general acquaintance with certain terms, concepts and issues.

1.7 "Awareness" spans the continuum of public perception of certain kinds of information. It may be said to range from:

a) ignorance, through
b) indifference,
c) unstructured interest,
d) passive knowledge,
e) passive understanding,
f) active understanding,
g) informed interest, to
h) active interest.

1.8 "Public awareness", therefore, may be said to refer to the extent of the consciousness of certain kinds of information by certain publics.

2. AIMS OF THE STUDY

2.1 As refined and developed from the original terms of reference, the aims of the study may be stated:

2.2 To propose a policy for the Government of Canada concerning public awareness of scientific and technological problems and opportunities in Canada;

2.3 To identify the federal objectives such a policy might serve;

2.4 To suggest federal roles, duties, responsibilities and structures appropriate to the implementation of such a policy;

2.5 To describe the public environment with which such a policy would interact;

2.6 To describe the current knowledge of public attitudes towards scientific and technological issues, processes and activities;

2.7 To examine the characteristics of the target audiences or publics to which scientific and technological information could be directed;

2.8 To outline a strategy for increasing public awareness of science and technology, including a general delineation of objectives, audiences and instruments;

2.9 To propose a framework for federal activities (direct, in cooperation with others, in support of others) including suggested roles, mandates and responsibilities for major federal councils, departments and agencies.

3. SUGGESTED FEDERAL OBJECTIVES

3.1 Because of their pervasiveness in the Canadian society, science and technology touch on a great many objectives, both economic and social. These may be conveniently grouped as in the following paragraph.

3.2 Through greater public understanding of science and technology and of the federal role and responsibility, to encourage public and Parliamentary support for federal activities:

a) in support of federal economic objectives involving improvements in:

i domestic research activity and establishments;
ii industrial innovation;
iii human resource development (professional and non-professional);
iv industrial productivity;
v production;
vi employment;
vii wealth creation;
viii national security;
ix economic stability;
x regional development.

b) in support of federal social objectives involving improvements in:

i public health;
ii nutrition;
iii occupational diversity, effectiveness, safety;
iv formal and recreational learning;
v leisure; and
vi effective participation in social choices with science and technology components or implications.

4. CURRENT ACTIVITIES

4.1 In the interim report submitted on 11 September 1980, current public awareness activities were described in section 4. An excerpt from the interim report, attached as Annex B, should be read in conjunction with this report. The balance of this section is a summary of the previous information, together with supplementary information and some comments.

4.2 Considerable activity is taking place, but it is sporadic, piecemeal, uncoordinated and unfocused. Regional variations are considerable. It is not possible to give a documented assessment of the effectiveness of these activities, except to report that virtually all those consulted considered that the current activities are inadequate and incomplete.

4.3 On the advice of its Interdepartmental Advisory Committee, the study group sought information on government policies concerning public awareness of science and technology in the United States, France, the United Kingdom, the Federal Republic of Germany and Japan. Each of these countries is very active in this area, through strategies appropriate to each, and at least two - France and the United States - are rapidly expanding their national government activities. National expenditures are typically in the order of millions of Canadian dollars.

4.4 In Canada, federal departments and agencies unanimously support the concept of enhanced public awareness of science and technology. In practice, they focus mostly on their vertical constituencies and/or science peers. There are considerable variations in budgets, aspirations and planning sophistication. But their communications activities reflect their respective perceptions of their individual mandates, and do not seek to communicate about science broadly. The Science Council of Canada has a specific public awareness mandate, but for budgetary and other reasons has not been able to pursue it extensively. There is consensus at the federal level on the need for a federal policy responsibility centre. It does not seem likely, however, that a wide range of federal activities could be coordinated into a tightly orchestrated program. Within a limited range of organizations, however, some fruitful coordination could probably be achieved. The mandates of MOSST, Science Council, SSHRC, MRC, NRC and NSERC are discussed in Annex C.

4.5 Provincial Government public communication activity is typically confined to support for museum programs, ("museums" in this context includes aquaria, botanical gardens, museums of natural and physical sciences, planetaria, science centres and zoos) and some science fair funding. There are few examples of coordinated science policy or a detectable responsibility centre. But the needs for increased industrial development and a growing preoccupation with research and development may force some activity over the medium term. Québec is the notable exception with its science policy White Paper focusing attention on the need for public consensus. Alberta and British Columbia are starting to increase their activities, and the Council of Maritime Premiers will probably also become active as an adjunct to its initiatives in increasing levels of research and development.

4.6 The importance of museums in the current scene cannot be overstressed. They are enormously popular, and usually underfunded. Their programs are largely directed towards school children, although some address a wider public. The Ontario Science Centre is recognized as a world leader, and has been a model for many centres elsewhere. Support for institutions of this kind is an element in the awareness strategies of most industrialized countries.

4.7 The roles of schools and universities are less clear. The Science Council of Canada, in cooperation with the Council of Ministers of Education, is in the very early stages of a major study on science education, and it would be unwise to attempt to pre-judge the findings of that study. But it seems fair to observe that public awareness of the social importance of science, as distinct from the content of scientific disciplines, has not much occupied Canadian educators. Schools have contributed to public awareness largely through extra curricular activities, notably science fairs.

4.8 On an individual basis, with varying degrees of institutional support, attempts are made at the university level to educate students in the social importance of science. But there is consensus that the reward structure of Canadian universities works against such efforts.

4.9 In the educational media, science and technology programming is increasing, especially on radio, but there is wide variation. Manitoba and Saskatchewan schedule a high proportion of science/technology programs in their educational media, but the overall amount of educational programming in these provinces is not very large. In numerical terms, the Ontario Educational Communications Authority produces and broadcasts the greatest amount of science/technology programming. Memorial University of Newfoundland's Educational Television Centre makes available to the community a considerable number of science/technology programs. Most provincial educational media obtain their Canadian programs from three principal sources: OECA, Radio-Québec and Access (Alberta). Most programming is in response to provincial curriculum needs and the situation here can generally be considered satisfactory.

4.10 Outside the educational media, regular Canadian broadcasting is largely devoid of science content, other than as an opportunistic component of magazine-format programs. The Canadian Radio-Television and Telecommunications Commission has informed the study that only one-tenth of one percent of Canadian television programming is formally logged as science. Due to the nature of the CRTC logging system this figure must be subject to judicious interpretation. Nevertheless it is an indication of the very small proportion of science programming on Canadian television. In general, the situation with francophone media is better than that of the anglophone media, but science is typically accorded low priority by all non-educational broadcasters, and is virtually non-existent outside the CBC/ Radio-Canada networks. Public affairs and news programs make use of science stories which often attract considerable public attention, but resources are extremely limited. CBC and Radio-Canada have set up science advisory committees, but their impact to date is difficult to assess. The primary source of English-language science programming for Canadians is the U.S. Public Broadcasting System (PBS) network, brought in by cable systems, which broadcasts programs developed with U.S. federal aid. Both the PBS and OECA edit and use as a basis the BBC series "Horizon"; two examples of this are the U.S. National Geographic series and OECA's Fast Forward programs.

4.11 The situation with newspapers is rather better, particularly in Québec. There, six of the ten dailies have a weekly science page or feature as compared with only one in the rest of Canada. A survey undertaken for this study by the Canadian Daily Newspaper Publishers Association indicates a growing awareness of the importance of this area, particularly amongst newspapers with circulations over 100000. The Canadian Science Writers Association and the Québec Science Writers Association have grown very rapidly in recent years, but publishers indicate some difficulty in finding science writers who are both well qualified in science and skilled as journalists. One conspicuous gap lies with The Canadian Press, the national cooperative wire service which is the principal news service for most newspapers - and virtually the only non-local source for the smaller ones. At the time of writing, CP has no full-time science writer, and has some difficulties finding editors qualified to deal with such science stories as come its way. It is taking steps to deal with these difficulties. Its perception of low demand from its member newspapers may reflect the fact that demand comes mostly from the smaller dailies, since the larger ones can draw on other (often non-Canadian) sources. A few magazines have regular features. Québec has the only viable Canadian science magazine, Québec-Science, and the only Canadian science news service, Hébdo-Science; both are financially supported by the province, with Hébdo-Science also receiving some federal funding.

4.12 The voluntary sector, composed of hundreds of small organizations, is fragmented, unfocused and financially weak, other than l'Association Canadienne-Française pour l'avancement des sciences, which is provincially supported. SCITEC, the national umbrella organization, has had an uneasy first decade but is showing promising signs. The potential of this sector is enormous. The limited success to date reflects a lack of financial support, organizational ability and obvious benefit to the scientists involved.

4.12.1 At present there is no federal policy relating specifically to the funding of voluntary organizations in the science/technology field. Science Council legislation referring to Council's responsibility for increasing public awareness of science and technology provides the only specific legislative basis for such activities, although it may be considered implicit in other mandates. A small amount of

funding--some $200000--is currently provided to voluntary organizations by the granting councils: SSHRC provides funds primarily for activities in support of its own corporate communications objectives; NSERC has no specific policy on funding voluntary organizations, its prime function being the funding of research in natural sciences and engineering, but does give some grants for voluntary activities. MRC co-sponsors projects with such organizations as the National Cancer Institute and the Heart Foundation, groups that perform a public awareness function in their respective fields. MOSST has no funds set aside for the support of the voluntary sector.

4.13 Two opportunities at the federal level require special mention. One involves federal advertising, the other the National Film Board. A mechanism has recently been created that, among other things, permits the coordination of federal advertising for particular purposes. The identification of public awareness as a priority theme of federal advertising would be a major contribution. As to the NFB: the study group was informed of current initiatives to launch a renewed effort in producing films on science. These initiatives will require appropriate funding.

4.14 Another major area for potential development is the private sector. An initial survey of 11 major corporations, and subsequent follow-up discussions, indicate a creditable existing level of activity, particularly in support of science fairs. There is also a considerable interest in expanding activities, particularly in cooperation with voluntary groups and with federal or provincial governments.

4.15 Conspicuous by its absence when the current scene is surveyed however, is an appreciation of the current level of public awareness of science and technology in Canada.

5. STATE OF THE ART: INDICATORS OF PUBLIC AWARENESS

Canada does not have nationally-based data about public attitudes on science and technology, although other countries do. It has, therefore, been necessary to examine data from other sources and to extrapolate conclusions from which we might draw parallels that could apply to Canada. A brief description of relevant findings from these sources follows.

5.1 The European Community study, The European Public's Attitudes to Scientific and Technical Development, comprises a survey of population samples from each of its nine member nations. Respondents were asked for their views on a range of issues relating to scientific and technological development. In general, respondents were favourable towards scientific achievement and were pleased with the material benefits thereof, but they also expressed unease about the consequences of some of these developments, especially in terms of long-term effects on the environment and society. A highly significant finding was the feeling among people in all nine countries that they did not know enough about science and technology and that they needed to know more in order to cope with the world around them.

5.2 Several American sources provide useful indicators of what the Canadian situation might resemble.

5.2.1 The book, Citizenship in an Age of Science: Changing Attitudes Among Young Adults, is the report of a recent survey of high school and college students, testing their knowledge of and attitudes towards various aspects of science and technology. In addition to studying the impact of science and technology on people and their response to related issues, the authors have derived a typology of the "attentive public", i.e., the population with the knowledge and interest to participate in decisions about science and technology that affect them. Various personal and demographic characteristics have been shown to affect the likelihood of an individual's tendency to be a member of this attentive public.

5.2.2 Learning Environments for Innovation is a report prepared for the U.S. Office of Productivity, Technology and Innovation. It traces the changing environment for innovation in terms of economic, demographic, educational and

institutional trends, as well as examining the position of the United States internationally. Its finding is that innovation has declined, and the aim of the report is to recommend ways in which public interest in scientific and technological innovation might be stimulated. In delineating the means for achieving this, much emphasis is given to the dominant role of television in providing the individual with information and in shaping his/her attitudes. This medium is seen as being essential in efforts to increase public awareness of the issues. The authors also perceive science museums as an important vehicle, based on the success and public acceptance of existing science museums. The Ontario Science Centre type of museum with its learn-by-doing exhibits, has proven to be an effective means of attracting people to learn about science and to de-mystify some of its aspects.

5.2.3 A recent poll taken by the Louis Harris organization in conjunction with ABC, reveals a decline in public confidence in science's ability to solve problems. These results are based on questions relating to health problems and natural disasters. Respondents were asked if they believed that science would find a way of either predicting or preventing serious damage from such disasters. Compared with responses to the same type of questionnaire in 1976, a significant decrease in confidence was evident. The report points out that these findings are highly significant because "the American lifestyle has been predicated on the assumption that technological know-how will continue to provide people with solutions to complex problems and enhance the quality of life."

5.3. Data from several Canadian sources have provided useful indicators about Canadian public awareness of science and technology.

5.3.1 The Canadian Daily Newspaper Publishers Association asked its members about the number and types of articles newspapers carried relating to science and technology. This provides an indication of what is being made available to the general public. Most of the larger newspapers claim to have a stated policy of promoting public awareness of science and technology, and some of them have reporters who specialize in this area. The most frequently-covered topics include medicine/health, agriculture, energy and nutrition.

5.3.2 In francophone Quebec most of the newspapers have a science component ranging from a column to an entire section. The Hébdo-Science news service provides articles of scientific/technological interest to the weekly newspapers of Quebec, two-thirds of whom subscribe to the service. This indicates a relatively high degree of public exposure to science/technology information.

5.3.3 Audience figures for broadcast programs about science and technology indicate considerable interest in this subject area on the part of the Canadian public, but such programs are few in number and are mostly the product of CBC and Radio-Canada.

5.3.4 The popularity of science museums, such as the National Museum of Science and Technology, the Man and Telecommunications Display Centre in Edmonton and the Ontario Science Centre offers a clear indication of the public's desire to learn more about aspects of science and technology that affect their lives.

5.3.5 In 1973 the Ministry of State for Science and Technology published in 1973 a major study on the representation of science and technology in Canadian mass media, leading to considerable discussion within the media as to the appropriate emphasis to be placed on science.

5.4 All of the above indicators tend to bear out the contention that the level of public awareness of science and technology in Canada is currently rather low, but that there exists the desire and willingness to learn more in order to understand the increasingly complex issues that arise almost daily. Suspicion and fear of science are usually based on lack of knowledge, as are inflated expectations. It is fair to assume that Canada's population is similar to that of other industrialized nations in its need for greater awareness of science and technology. However, the indication in the European Community survey of marked national differences signals the danger of wholesale extrapolation. One must repeat: there are no authoritative data for Canada.

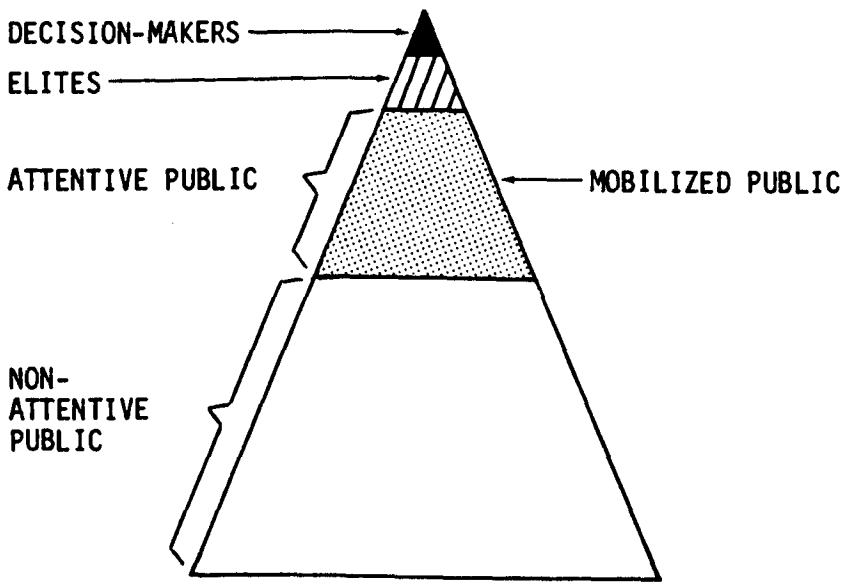
Matters discussed in this section are set out in more detail in Annex D.

6. AUDIENCES

The audience for an attempt at improving public awareness is, obviously, the general public. But it is generally recognized that the public is not a monolithic entity and that different segments of the public may require very different approaches. The public tends to be stratified, vertically and horizontally.

6.1 Horizontal stratification refers to the wide range of interests that might be appealed to by public awareness activities. In the case of science and technology, this might include scientists (both as experts in a field and as members of a general audience), youth, educators, business people, communicators and community activists. The usefulness of identifying these groups lies in their potential as "multipliers", i.e., people who are most likely to reach others with their awareness of science and technology.

6.2 Vertical stratification can be illustrated by the Almond model of public attitudes.



THE ALMOND MODEL OF PUBLIC ATTITUDES

Initial efforts in an awareness program would probably be directed primarily towards the "mobilized public", for this group will tend to influence the "non-attentive public".

6.2.1 Decision makers are those who possess the political and/or economic power to effect initiatives and changes in Canada's science and technology environment.

6.2.2 Elites are composed of the science/technology hierarchy in Canada, those who are directly involved in current policy and developments.

6.2.3 The attentive public can be divided into three groups:

(a) those with an academic or professional interest in science or technology,
(b) those with a strong general interest in science and technology and who desire to learn more; and
(c) activists, who seek to participate in the decisions regarding science and technology that affect their lives.

6.2.4 The non-attentive public can be divided into two groups:

(a) those who are unaware and apathetic with regard to the impact of science and technology on their lives; and
(b) those who have a very basic awareness of science and technology, usually concerning those items that have received wide coverage in the media.

6.3 Selection of those segments of the public that are to be addressed by federal activities in the area of public awareness of science and technology can be done on the basis of these distinctions.

6.4 Further detail on audiences is set out in Annex E.

7 A FEDERAL STRATEGY

7.1 The federal government currently undertakes many activities that enhance public awareness, but not within a systematic approach. Any such approach should have clear objectives and well defined targets.

7.2 Objectives of such a strategy might be:

(a) To increase the level of public knowledge and understanding of and interest in scientific and technological activities, products, processes, achievements and objectives;

(b) To describe the role of the federal government in the Canadian scientific and technological system;

(c) i To foster an understanding and appreciation of the contribution of science and technology in the achievement of certain federal and national economic and social goals;

ii To promote an understanding of the advantages of increased scientific and technological research and development.

7.3 As to targets: the general public can be divided into a number of sub-groups or audiences to whom information may be directed and/or with whom information may be shared. They may be arranged as follows:

(a) People with power to determine, influence or affect public policy:

Cabinet members, federal and provincial;
Other federal and provincial legislators;
Senior public servants, advisors;
Senior business and industrial executives;
- their associations;
Trade union leaders;
Professionals and academics in the hard and soft sciences;
Print and electronic media: publishers, senior network executives, editors, writers, broadcasters.

(b) People with power to affect or influence public opinion:

All of the above;

Experts (with or without political, economic, intellectual or communication power or access) whose views on a specific issue or activity are esteemed.

(c) Attentive publics: those people whose active interest in science and technology is such that they seek to be informed and to participate in the public debate;

(d) Youth: throughout the educational spectrum;

(e) All others.

7.4 The Interim Report to the Minister (11 September 1980) pointed to the following:

(a) The considerable extent of the communication activity taking place in the Canadian environment;

(b) Its fragmentation;

(c) Its lack of focus and leadership;

(d) The low saliency of scientific and technological activities and issues;

(e) A counter-balancing latency of interest;

(f) An apparent and possibly uncritical confidence in the ability of science and technology to solve economic and social problems.

7.5 An examination of the activity of public and private sector communicators of scientific and technological information leads to a number of further observations:

(a) Not surprisingly, individual federal organizational participants communicate mostly out of enlightened self-interest. While they express support in theory for the overall objective of in- creased public awareness, they do not in generalinitiate any communication activity that goes beyond expressions of their own mandates to their own constituents or audiences.

(b) Substantial or meaningful future activities by individual federal organizational participants are unlikely without reassurance that they will not be required to divert resources from their perceived priority programs.

(c) The only way that they may be expected to respond effectively is if outside funding is provided for or towards the purpose.

(d) Any cooperative effort within the federal public sector can succeed only if vigorously and publicly supported at the political level as an expression of public policy. Without obvious political will, bureaucratic cooperation is not likely to occur. If it does appear to take place, it is not likely to be productive. Lack of support for cooperative effort has historically tended to be based upon the primary responsibility of the organization to serve its own constituents or audiences, or lack of adequate funding, or both.

7.6 Two tasks should be initiated immediately:

7.6.1 A budget should be set aside for the Science Council to undertake a national benchmark study on public attitudes. The study which should be updated biennially, would attempt to determine:

(i) public attitude to and knowledge of certain scientific and technological information;
(ii) perceived information needs for certain predetermined key audience groups;
(iii) media habits;
(iv) relationships between knowledge and preferred modes of communication;
(v) the extent to which socio-economic, demographic and psychological factors correlate with the attitudes of individuals.

7.6.2 Council should prepare a major biennial review of developments in Canadian science and technology, with specific reference to problems and opportunities as they relate to social and economic objectives.

Although taking a national overview, the review will comment where appropriate on regional or provincial considerations. This review will be designed for maximum public accessibility. Its primary aim will not be so much to advise government on science policy as to ensure a regular, major contribution to public discussion of science issues.

Because this review will emanate from an arm's-length agency, rather than the federal government itself, it is more likely to be perceived as an objective description and analysis. This review will be additional to existing Council work, which will continue to concentrate on a small selection of major, long-term studies on specific policy issues identified by Council, supplemented by short-term studies as appropriate.

7.7 Concurrently with these tasks, a program development exercise should be jointly undertaken by the Science Council, the Natural Sciences and Engineering Research Council, the National Research Council, the Social Sciences and Humanities Research Council, the Medical Research Council and MCSST. The purpose of this exercise would be to identify an appropriate range of federal activities in support of a federal policy of enhancing public awareness of science and technology, to agree on responsibility for implementing and monitoring these activities and to identify the financial and other resources required. This program development exercise would be coordinated through a Science Communications Advisory Group made up of representatives of these organizations, chaired by the Science Council and provided with staff support from Council.

7.8 On an interim basis, a granting fund of $1 million for the support of voluntary organizations should be established in the 1981-82 fiscal year. This money would provide core funding for organizations in the science/technology field whose programs include enhancement of public awareness as a major activity. In addition, project grants would be made available to organizations for specific, short-term public awareness activities. This fund, over and above the existing granting resources of the various Councils, would for this fiscal year be housed in SSHRC or NSERC, but its disbursement would be on the advice of the Science Communications Advisory Group. The appropriate size and administrative arrangements for this granting fund would be a major element in the program development exercise.

7.9 Program development activities would be required to pay maximum attention to opportunities for cooperative ventures with the private sector and with other levels of government.

7.10 At least for the first year, financial support would be available only to organizations operating nationally, or seeking to serve all Canadians of one or the other two official language groups. Funding in 1981-82 would entail no commitment, express or implied, for financial support in any subsequent fiscal year. The SCAG would include this area in its program development exercise, including long-term funding proposals.

8 CONCLUSIONS

In summary, the study's conclusions are:

8.1 The level of Canadian public awareness of science and technology seems to be low. It is not a salient subject area, although it is becoming more so, and there is probably a good deal of misinformation in the environment. Research is needed to determine the current realities respecting public attitudes so that communication activities can be properly focused.

8.2 There is considerable communication activity by public and private-sector interests and by the print and broadcast media, but it is too often random, sporadic, narrowly-based and unfocused.

8.3 If federal social and economic objectives to be served by increased public awareness of science and technology are to be met, the federal government will need to assume a leadership role.

8.4 The Science Council of Canada's legislation makes it the logical locus for coordination, monitoring and research regarding this responsibility on behalf of the Government of Canada.

8.5 The mandates of the federal scientific councils (NSERC, MRC, NRC, SSHRC and the Science Council) are adequate to support a federal public awareness policy, and need not be amended.

8.6 The councils and MOSST should be asked to cooperate within their own mandates in developing a federal program for increasing public awareness of science and technology.

8.7 Certain immediate steps should be taken, as noted in the in the next section.

9. RECOMMENDATIONS

This report recommends:

9.1 That the federal government publicly commit itself to a policy of enhancing public awareness of science and technology through all its science-linked departments and agencies.

9.2 That the Science Council of Canada be identified as the lead agency to coordinate and monitor this policy.

9.3 That Council be specifically funded:

(a) to undertake a benchmark study into Canadian public attitudes to science and technology;

(b) to prepare a biennial review of Canadian science and technology as described in 7.6.2 above, with particular reference to problems and opportunities as they relate to social and economic objectives;

(c) to lead in the development of special and continuing programming designed to increase public awareness;

(i) of science and technology and
(ii) of the role and responsibility of the federal government in those fields.

9.4 That a special Science Communication Advisory Group comprised of representatives of all federal scientific councils (MRC, NRC, NSERC, Science Council and SSHRC) and MOSST be formed expressly to develop and oversee a program of federal activities in support of this policy, according to 7.7 above.

9.5 That the public awareness of science and technology be identified as a priority theme for federal advertising as provided for in Section 60 of TB Circular 1980-40.

9.6 That federal departments and agencies maintaining laboratories build into their program plans provision for regular open houses each year.

9.7 That favourable consideration be given to any forthcoming request from the National Film Board for funding of a science studio.

9.8 That Ministers draw to the attention of the Canadian Radio-Television and Telecommunications Commission their priority concern with public understanding of science, and the importance of the broadcast media in this regard.

9.9 That a granting fund be established as described in 7.8 above, in support of the voluntary sector.

9.10 That the Science Council should convene a workshop of senior representatives of the publishing industry to review the feasibility of a national English-language science magazine, subject to the Minister's advice on his willingness to entertain proposals. The findings of this workshop, and further research as necessary, should be reviewed by the SCAG as the basis for determining conditions that would have to be met by any request for federal assistance to such a magazine. (See Annex F.)

ANNEXES

ANNEX A

PUBLIC AWARENESS POLICY STUDY:

PARTIAL LIST OF INDIVIDUALS CONSULTED

J. Barnes - Canadian Broadcasting Corporation
B. Bartoche - National Science Foundation (U.S.A.)
J. Baruch - Asst. Secretary, Science & Technology (U.S.A.)
C. Beauregard - Bell Canada
M. Bergeron - SCITEC
L. Bertin - Canadian Association of Science Writers
K. Birchard - Canadian Broadcasting Corporation
E. Blanchard - Nova Scotia Research Foundation
C. Bradley - Policy & Priorities Commitee, P.E.I.
P. Buckley - Canadian Press
T.C. Burnett - Inco
C. Bursill - New Brunswick Research & Productivity Council
D. Campbell - Alcan Aluminum
G. Carman - Agriculture Canada
W.F. Cockburn - Canadian Embassy, Bonn
P. Choquette - National Research Council
P. Costin - Medical Research Council
R.D. Cottier - Northern Telecom
T. Davey - Canadian Association of Science Writers
J. Davidson - Department of Communications
J.M. Dewey - University of Victoria
J.F.C. Dixon - C.I.L.
J. Drewry - Ministry of State for Science and Technology
E. Fanjoy - Council of Maritime Premiers
B. Findlay - Canadian Association of Science Writers
J. Fitzgerald - Intergovernmental Affairs Secretariat, Newfoundland
T. Ford - Department of Fisheries & Oceans
A. Fortier - Social Sciences & Humanities Research Council
C.E. Garrard - Department of External Affairs
K. Glegg - National Research Council
L. Gordon - Environment Canada
M. Granizo - Alcan Aluminum
A. Guy - Deputy Minister of Continuing Education, Saskatchewan
H. Habgood - Research Council of Alberta
D. Hall - Youth Science Foundation
J. Hall - Department of Fisheries & Oceans
R.C. Hamer - Inco
I. Hamilton - Department of Fisheries & Oceans
D. Hanright - Department of Energy, Mines & Resources
A.J. Harkness - Rockwell International
J. Harrison - Canadian Embassy, Washington D.C.
W. Henderson - Agricultural Institute of Canada
M. Hladkowicz - Natural Science & Engineering Research Council
G. Holland - Department of Fisheries & Oceans
S. Hughes - Department of External Affairs
P. Joncas - Ministry of State for Science & Technology
G. Julien - Natural Sciences & Engineering Research Council
G. Kaplan - SCITEC
K. Kincaid - Canadian Press
J. Koop - Canadian High Commission, London
J. Kucharczyk - University of Ottawa
K.J. Laidler - Royal Society of Canada
M. Laing - Canadian Association of Science Writers

R. Lawford - Environment Canada
G. Lawrence - Provincial Education Media Centre, B.C.
R. Lévesque - SCITEC
R.G. Logan - I.B.M. Canada
P. Lucier - Bureau de la science et de la technologie, Québec
D. Low - Ministry of State for Science & Technology
J. MacDowall - Canadian Embassy, Tokyo
P. Maltais - ACFAS; Hébdo-science
R.H. Marchessault - Xerox Research Centre of Canada
C. McAlister - Department of Fisheries & Oceans
J. McNiven - Atlantic Provinces Economic Council
J. Meisel - Canadian Radio-Television & Telecommunications Commission
D. Mess - C.I.L.
J. Mettner - Shell Canada
J. Mills - Xerox Research Centre of Canada
G. Mitchell - Ministry of Universities, Science & Communications, B.C.
A. Morin - Office of Science & Society (U.S.A.)
R.W. Nichols - National Museums Corporation
E.K. O'Brien - Inco
A. Ouimet - Social Sciences & Humanities Research Council
F. Perrier - Canadian Embassy, Brussels
D.-L. Piron - SCITEC
E. Proulx - Shell Canada
L. Racine - National Research Council
C. Rogers - American Association for the Advancement of Science
R. Ronkin - National Science Foundation (U.S.A.)
F. Roots - Environment Canada
R. Seath - Union Carbide
R. Simard - Medical Research Council
F. Simpson - Atlantic Research Laboratories
M. Slivitzky - Bureau de la science et de la technologie, Québec
P. Sormany - Canadian Association of Science Writers
D. Stephens - Ministry of State for Science & Technology
G.E. Stokell - Secretariat for Resources Development, Ontario
J. Trent - Social Sciences Federation of Canada
G. Tressel - Office of Science & Society (U.S.A.)
G.S. Trick - Manitoba Research Council
J. Urban Joseph - Toronto-Dominion Bank
D. Vardy - Clerk of Executive Council, Newfoundland
S. Wagner - Canadian Embassy, Paris
E. Wathen - Social Sciences Federation of Canada
G. Watson - Department of Fisheries & Oceans
A. Young - Rockwell International

ANNEX B

CURRENT PUBLIC AWARENESS ACTIVITIES

EXCERPT FROM INTERIM REPORT

4. Communicators and their activities

4.1 There are a number of participants in the communication process. Each operates independently. This tends to apply not only across categories but within categories. Federal Government agencies operate without pan-sectoral consultation in communication.
Provinces seldom, if ever, talk to each other or to Ottawa, at least until recently. Companies pursue their own pragmatic interests. Media coverage is sporadic, piecemeal and largely opportunistic.

4.2 Without a focus or shape to what is actually considerable activity, the product is random, scattered, unstructured, diluted. This does not mean that individual institutional or programmatic objectives are not being met. It does mean that the sum of the parts has no identity or cohesion.

4.3.1 The Federal Government sub-study examined the communication work of the Medical Research Council, the Natural Sciences and Engineering Research Council, The Social Sciences and Humanities Research Council, The National Research Council, the Departments of Agriculture, Communications, Energy, Mines and Resources, The Environment, and Fisheries and Oceans, and The Ministry of State for Science and Technology.

4.3.2 Federal players unanimously support the notion of public communication of their scientific and technological knowledge and products. In practice, the majority focus on their vertical constituencies and/or scientific peers.

4.3.3 Communication budgets vary from negligible or minimal among the three granting councils to substantial among some of the departments. Communication to the general public is accorded a low priority. The exceptions tend to be among those institutions where the political and/or resourcing leverage of an informed and concerned public has been recognised.

4.3.4 There would seem to be a direct correlation between budget size and (a) communication planning sophistication, (b) variety of target audiences, (c) variety of media utilized, and (d) amount and quality of communication-effectiveness evaluation.

4.3.5 In general, the kinds of scientific/technological communication content vary from pure science (the granting councils) to applied science (the departments). The bulk of the expenditures are vested with the departments and are largely concerned with applications and uses. They tend, therefore, to blur or not draw specific attention to the science that created the application.

4.3.6 An observation: the federal players have said that they wish someone (MOSST, Science Council) would take a run at pan-federal communication coordination. However they would probably resist anything beyond simple consultation or acceptance of support funding without strings.

4.4.1 Provincial Government public communication activity, beyond some random science fair funding, is negligible. There are few examples of coordinated science policy or a detectable responsibility centre. But the needs for increased industrial development and a growing preoccupation with research and development may force some activity over the medium term.

4.4.2 Québec is a notable exception. Its White Paper on science policy focuses attention on the need for public consensus. Alberta wants to attract scientific brainpower; it will find reasons for public communication. Initiatives are also being launched through the Council of Maritime Provinces.

4.5.1 The Museums (aquaria, botanical gardens, museums of natural and physical sciences, planetaria, science centres, zoos) involve themselves in a number of public activities. They are largely directed towards school children, although some programs and all facilities are open to the wider public. Few of these public institutions actively publicize their facilities - a function, it has been assumed, of both fiscal restriction and professional reticence. The Ontario Science Centre is internationally recognized as a world leader, but it should be noted that public outreach activities of the OSC type are seen by many museum authorities as inconsistent with traditional collection-oriented activities.

4.6.1 The voluntary sector clustered around science and technology is composed of hundreds of small, independent, sometimes ad hoc or single-issue organizations. It draws its membership from the public at large and from the universities and other (mostly public sector) institutions. It tends to be middle-class, well-educated and organizationally unsophisticated. It expends a great deal of time and conscientious effort in pursuit of specific, individual goals. Those goals seldom include public communication except where political pressure is a requisite. SCITEC, the national umbrella organization, has had an uneasy first decade but is showing promising signs.

4.6.2 The limited success of these organizations, especially in the area of public communication, probably stems from (a) insufficient funding to support organizational infrastructure and communication initiatives, (b) a lack of appropriate research support, sustained follow-through or organizational mucilage, and (c) an absence of obvious benefit to those scientists who may be involved.

4.6.3 This sector, however, comprises a valuable and committed human resource. Intelligent infusions of funding and management might turn random and often ineffectual activities into consistent media for enhancing public awareness of science and technology.

4.7.1 Eleven major private sector organizations were interviewed: Alcan, Bell, CIL, IBM, Inco, Northern Telecom, Rockwell, Shell, Toronto-Dominion, Union Carbide, and Xerox. Only three claim to have a policy on public communication of science and technology. While overall public affairs/publicity budgets may be quite large (and public affairs/advertising budgets even larger), the evidence suggests that

public communication of science and technology plays a relatively minor role.

4.7.2 Activities are largely directed towards universities: recruitment is the prime motivator. The rest of the programs (films, publications, science fairs) tend to be more responsive than promoted. The public communication activity supports specific corporate goals rather than a larger community responsibility. This does, however, force a concentration on media or projects with high visibility.

4.7.3 Alcan, Bell, IBM, Northern Telecom and Shell have the most comprehensive programs. All companies interviewed have university and speaker programs. Alcan and Bell do some work at the pre-university level. Almost all support the Youth Science Fair program. Some work is undertaken with science teachers. Inco is currently involved in the construction of a science centre for Sudbury.

4.8.1 The English-language mass media, print and electronic, present a mixed and not altogether encouraging picture.

4.8.2 In the newspaper and magazine coverage of science and technology, there are few initiatives taken and only random visible products. Only one daily newspaper, The Globe and Mail, has a regular (weekly) science page. Other newspapers pursue high-visibility issues (organ transplants, acid rain, DNA) as they pass by. However, editors have suggested an increasing readership demand for science stories, and say they are trying to develop more science writers. Magazines as often as not respond to the submissions of their (largely freelance) contributors and the shortage of good science writers restricts the output. The absence (except in francophone Québec) of a science/ technology news service undoubtedly diminishes the opportunities for a wider variety of short-feature material.

4.8.3 On commercial television, science programming (with the exception of CBC's "The Nature of Things" series) is almost non-existent. Many other (news and public affairs) programs do contain extensive and high quality scientific and technological features, but the process is random. In the area of regularly-scheduled popular science, Global's "What will they think of next?" is the sole example. CTV has no consistent science programming, but both CTV and Global do have occasional science-related programs. Mot seem oriented to the medical sciences.

4.8.4 All three networks, even CBC, accord science programming a low position in the pecking order. The reasons seem to be a perceived weakness in audience appeal and the related effect on the advertiser marketplace. The networks, when they do so, compensate by injecting a strong news or entertainment dimension.

4.8.5 Independent programmers, it is felt, would come up with more science programming if seed funding for pilot programs (as exists for theatrical film through the Canadian Film Development Corporation) were more readily available.

4.8.6 The consensus sems to be that nourishment or optimism for the future must come from (a) public and private sector independent program funding, (b) the possibility of a second CBC television network (CBC-2) and (c) pay-TV.

4.9.1 Most educational radio and television programming is in response to provincial curriculum needs. Variations among provincial services are wide. Manitoba and Saskatchewan program most heavily, the Maritimes negligibly. Only two provinces, Ontario and Alberta, operate a year-round service. Scientific and technological programming, however, would appear to be on the increase, especially on radio. There is more science and technology programming (as a percentage of total education programming) on television.

4.10.1 Cable television programming is claimed by the owners to be a direct function of community demand, and communities apparently demand little if any science/technology programming. The exception is in the medical and health-related subject areas. Even here both the programming and the reported cooperation of scientific professionals are limited. It must be noted that real - as contrasted with potential or market area - audience levels are extremely low.

4.11.1 The francophone media in Québec present a somewhat more dynamic and varied picture than is characteristic of the anglophone media across the country.

4.11.2 In print, the news service (Hébdo-Science) contributes to more regular coverage of scientific and technological topics, especially in the weeklies, than exists in the English-language media. Six of the ten dailies have a weekly science page or feature. A French-language science magazine, Quebec-Science. is published monthly by les Presse de l'Université du Québec. Although largely read by school-agers and teachers, it is directed to an adult population.

4.11.3 On radio, Radio-Canada presents two somewhat intellectual programs, "Antenne 5" and "Connaissance d'aujourd'hui". As well, Hébdo-Science now offers a radio news service.

4.12.1 The governments of four industrialized countries were polled by External Affairs to determine their scientific and technological communication policies and programs. The study team dealt directly with a fifth, the United States. The evidence suggests that these governments tend to have a more organized and focused approach than does Canada.

4.12.2 France's Mission interministerielle de l'information scientifique et technique (MIDIST) is a central agency for all scientific information and documentation. Its initiatives are directed toward the media, the musuems, young people and (as potential future agents for public communication) the scientific community.

4.12.3 The United Kingdom expresses its apparently well-defined public communication policies somewhat narrowly - through advisory committees, documentation, and the work of a number of policy-oriented councils and voluntary organizations.

4.12.4 Japan has a well-developed public communication program and a reportedly high level of public awareness and acceptance of the importance of science and scientists. It has an annual Science Week. At Tsukuba, near Tokyo, it has created a "Science City" housing over forty research institutes. The Japanese Government has an extensive popular publishing program on scientific and technological subjects.

4.12.5 The Federal Republic of Germany has established twelve federally-funded "Big Science Centres", which are open to the public. It also supports an elaborate issue-oriented publications program.

4.12.6 Through the National Science Foundation, the United States government has been active in this area for nearly 20 years. It is also currently reviewing plans for a major program expansion through coordinating the activities of several departments and agencies.

ANNEX C

MANDATES OF THE FEDERAL SCIENTIFIC COUNCILS AND MOSST

1. The mandates of the various scientific councils are set out in the legislation creating them together with any amendments. MOSST was created by Order-in-Council and for this discussion its mandate is as set out in its most recent Annuel Report. SSHRC and NSERC had their functions set out in the Government Organization (Scientific Activities) Act. 1976, which also contains the relevant amendment to the Science Council's mandate.

2. SSHRC, NSERC and MRC are mandated to promote and assist research: MRC is further mandated to undertake it. The areas of research are defined as indicated in the title of each organization. NRC's mandate, as expressed in its ACT, is also to promote, undertake and assist scientific and industrial research. As expressed in its Annual Report, MOSST's mandate is concerned mainly with policy development, but includes a responsibility "for ensuring the introduction of scientific knowledge, reasoning and methodology into development of public policy at the strategic level." None of these mandates makes any reference specifically to public awareness, although it may be considered as implicit in them all.

3. The Science Council's mandate was amended to give it a specific responsibility in this area:

"It shall be the function of Council...

(b) to increase public awareness of

(i) scientific and technological problems and opportunities, and

(ii) the interdependence of the public, governments, industries and universities in the development and use of science and technology."

4. Since this amendment was made in the same legislation that created SSHRC and NSERC, and reviewed MRC and NRC, it seems reasonable to conclude that the Government intended Council to assume primary responsibility in this area. Further, Council's general powers were left very broad, so that it has a considerable choice of ways to implement this mandate. Taken in aggregate, the mandates of the federal scientific Councils and MOSST seem quite wide enough to cover any federal public awareness policy.

ANNEX D

STATE OF THE ART: INDICATORS OF PUBLIC AWARENESS OF SCIENCE AND TECHNOLOGY

In the absence of nationally-based Canadian data regarding public awareness and attitudes concerning science and technology, it has been necessary to refer to sources from other industrialized countries and extrapolate from them. It is thus possible to arrive at certain parallels and tentative conclusions that could apply to the Canadian context. A brief description of some of the sources used and their findings is given in this annex.

1. The European Public's Attitudes to Scientific and Technical Development

This study was carried out on behalf of the European Community and comprises an opinion survey of samples drawn from each of the nine member nations. Respondents were asked their views on a range of issues related to scientific and technological development including the possible risks associated with such development, the effects of development on society and their knowledge of, and confidence in, science and technology. Specific areas such as telecommunications, organ transplants and nuclear energy were also discussed. Respondents were asked to rate the importance of various statements and were asked whether they agreed or disagreed with others.

One of the most significant findings, which occured in all nine countries, was that people saw themselves as being insufficiently informed about science/technology matters and would have liked to know more so that they could be more involved in policy decisions.

Public confidence in science/technology as a problem solver and a force capable of self-correction was fairly limited. Respondents tended to believe that science was generally used to improve the quality of life, but that there were considerable risks associated with many innovations and developments. Despite their reservations about such risks, however, very few respondents were strongly in favour of "going back to nature"; some expressed a nostalgic view that it would be nice if there were fewer machines, usually in reaction to fears about unemployment and pollution.

When asked about specific subject areas, respondents' opinions varied from country to country, reflecting national differences in economy, culture, etc. Individual responses to questions of this nature showed more fears expressed about areas that might threaten the individual, such as nuclear power or genetic engineering; in contrast, areas perceived as carrying few risks for the individual, such as organ transplants or exploration of new sources of energy, were rarely objected to by respondents. Thus, issues that appear to be more remote from the individual are less likely to cause concern than those issues that appear more immediate, and can be shown to have the potential for dramatic change in the life of the individual.

2. Citizenship in an Age of Science: Changing Attitudes among Young Adults

This study, carried out in the United States comprises the report of a survey of high school and college students, testing their knowledge of and attitudes towards various aspects of science and technology. Among the responses that were measured are the students' knowledge of certain scientific concepts, readership of newspapers, news magazines and science magazines, and the amount of television watched. The authors are thus able to determine a degree of scientific knowledge and determine the main sources of information. Not surprisingly, the largest number of students cited television as their most important source of information. When asked to express their degree of confidence in various sources, respondents ranked television news well behind such sources as government agencies and university professors.

Respondents were given a series of statements relating to the effects of science and technology and asked to indicate the extent to which they agreed or disagreed. From the results of these questions an interesting parallel with the European Community survey (see above) emerges. It was agreed that science and technology had a beneficial impact on the standard of living but there was concern about the risks associated with scientific development and of possible negative societal impacts.

For purposes of this policy study, Citizenship in an Age of Science develops a very useful typology of the "attentive public" i.e., the population with the knowledge and interest to participate in decisions about science and technology that affect their lives. Various personal and demographic characteristics are shown to affect the likelihood that an individual would belong to this attentive public.

3. Learning Environments for Innovation

This report was prepared for the United States Office of Productivity, Technology and Innovation in response to concern that there has been a decine in innovation in that country. In examining economic, demographic, educational and institutional trends as well as the position of the United States vis-à-vis other industrialized nations, the report traces this decline, citing as factors: (a) the shifting and aging composition of the population, (b) the divergence of intellectual and manual skills in the classroom, (c) the increasing size and bureaucratic structure of institutions, and (d) the increasing complexity, diversity and competitiveness of the international marketplace.

The aim of the report is to recommend ways in which public interest in scientific and technological innovation might be stimulated. In delineating the means for achieving this, much emphasis is given to the dominant role of television in providing information and shaping attitudes. This reflects the findings of Citizenship in an Age of Science, cited above, as well as other studies that show the predominance of television. Also corroborated is the finding that the level of confidence in information acquired from television is relatively low.

Science museums are perceived as another important vehicle for increasing public awarness of science and technology. This view is based on the success of existing science museums in gaining public acceptance. The "new" type of museum, which uses a learn-by-doing approach and often is involved in outreach activities within the community, is an effective means of attracting people to learn about science and technology and de-mystifying many aspects.

Other vehicles for increasing public awareness are discussed in the report. They include early childhood contact with interested adults and educational toys, the role of film and drama entertainment and popularly-oriented science publications such as Omni, Scientific American and Science 81.

Recommendations of the report include enhancing the use of television as a communicator of science in terms of program content and broadcast policy for general audience as well as educational programing. Other recommendations pertain to increasing the number of science museums, continuing education for adults, greater emphasis on the sciences in schools and support for innovation by the government and private sector.

4. ABC News - Harris Survey

A report on a recent poll headed Americans' Faith in Science Decreasing serves to confirm some of the tendencies noted in both the European Community report, The European Public's Attitudes to Scientific and Technical Development and the American report, Citizenship in an Age of Science.

Respondents were asked a series of questions relating to health problems and natural disasters and whether or not they believed that science would find a way of either predicting or preventing serious harm from these. The subjects covered included cancer, stroke, heart attack, floods, earthquakes, hurricanes and cyclones. In comparison with responses to the same series of questions asked three years earlier, a signficant decrease of confidence in science as a problem solver emerged. The report notes the importance of this finding in light of the fact that "the American lifestyle has been predicated on the assumption that technological know-how will continue to provide people with solutions to complex problems and enhance the quality of life."

Another Harris poll asks respondents for their views on the effects of scientific research and technology. Respondents were given a series of statements with which they were to agree or disagree. In this instance, a majority of respondents saw science as the only means of solving the problems of air and water pollution. There was agreement that scientific research and technological development contributed to a strong economy and might lead to increased leisure time. On the other hand, there was considerable agreement with negative statements pertaining to loss of employment, increased pollution, overproduction leading to waste and too much materialism. The report notes that there appears to be a continuing trend towards a post-industrial era in which "nonmaterial experiences are valued far more than the acquisition of products." This uneasiness on the part of

the public towards science and technology has appeared in several other sources used in this policy study, and indicates the need for the public to be better informed and provided with better means of participating in decisions that affect them.

5. Canadian Sources

Data from several Canadian sources provide useful indicators of Canadian public awareness of science and technology.

(a) The Canadian Daily Newspaper Publishers Association carried out a survey of its members in which questionnaires were sent to the managing editors of newspapers, asking about the number and types of articles they printed relating to science and technology. Most of the larger-circulation papers claim to have a stated policy of promoting public awareness of science and technology and a number of these have on staff reporters who specialize in this area. The most frequently covered topics in the science/technology category include medicine and health, agriculture, energy and nutrition. When asked for suggestions as to how science/technology reporting might be improved, some respondents mentioned gearing the story to the reader, relating the subject matter to his/her experience and setting up a top-flight science reporting capacity within Canadian Press. Also suggested were bridging activities between the science community and the press, use of existing scientific articles rewritten for a general audience and an inventory of current scientific activities in Canada.

The responses to this survey are valuable in that they provide an indication of what is currently being made available to the general public in Canada.

(b) A report on public awareness activities in francophone Quebéc notes that most daily newspapers carry scientific articles and usually have a weekly science feature ranging from a column to an entire section. Weekly community newspapers are supplied with articles pertaining to science and technology by the Hébdo-science news service. This service was initially provided free of charge; once a fee was introduced some papers dropped out, but two-thirds of Québec weeklies still subscribe to Hébdo-science.

(c) Audience figures for broadcast programs about science and technology indicate considerable interest in this subject area on the part of the Canadian public. Such programs are, however, few in number and almost entirely produced by CBC and Radio-Canada. The private networks have, with a few exceptions, refrained from producing science/technology programming.

(d) The popularity of science museums such as the National Museum of Science and Technology, the Man and Telecommunications Display Centre in Edmonton and the Ontario Science Centre offers a clear indication of the Canadian public's desire to learn more about science and technology and its effects on their lives. Corresponding data from the United States confirm this.

Conclusions

There are certain commonalities among the indicators described in this Annex. They can be grouped and summarized as follows:

(a) People are aware of their lack of knowledge regarding science and technology;

(b) People are concerned and fearful about aspects of science and technology that might affect their lives adversely;

(c) People would like to learn more about science and technology and the ways in which it affects their lives.

ANNEX E

AUDIENCES

The audience for an attempt at improving public awareness of science and technology is, obviously, the general public. But it is generally recognized that the public is not a monolithic entity and that different segments of the public may require very different approaches if they are to be reached. The public tends to be stratified both horizontally and vertically.

1. Horizontal Stratification

This refers to the wide range of interests that might be appealed to by public awareness activities. In the case of science and technology we might identify the following:

(a) Scientists both as experts in a field and as members of a more general audience are a useful target in that they are familiar with scientific thought processes and might serve as a "bridge" in communicating these to others.

(b) Youth through the educational system and through participation in such events as science fairs, are already an important target audience because of their influence on their peers and their families as well as their future role as citizens.

(c) Educators of both youth and adults are important purveyors of scientific information to the public and are therefore an important target audience for promoting public awareness of science and technology.

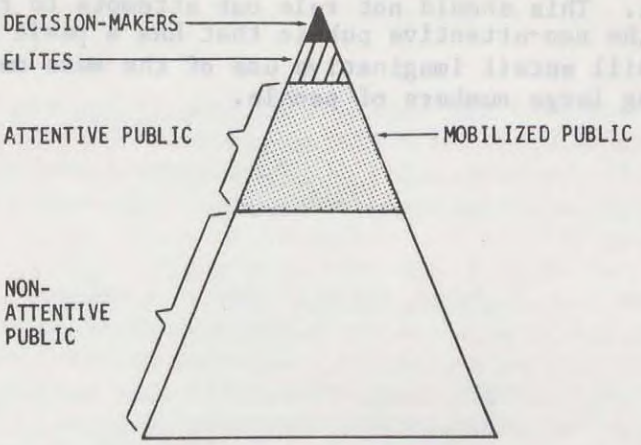
(d) Communicators are the primary means by which the public receives its information. Sensitization and education of communicators to the importance of public awareness of science and technology is a vital aspect of any program.

(e) Business people have an important role in the community and its economic life. As such, they can be valuable multipliers for science/technology information.

(f) Community leaders and community activists are important in forming community attitudes. It is necessary to reach these individuals with information relevant to the sphere in which they operate so that they in turn may provide their constituencies with a better basis for participation in decision making.

2. Vertical Stratification

The Almond model of public attitudes provides a useful illustration of vertical stratification.



THE ALMOND MODEL OF PUBLIC ATTITUDES

(a) Decision makers are those who possess the political and/or economic power to effect initiatives and changes in Canada's science/technology domain.

(b) Elites are composed of the science/technology hierarchy in Canada, those who are directly involved in current policies and developments.

(c) The attentive public can be divided into three groups:

(i) those with an academic or professional interest in science/technology;

(ii) those with a strong general interest in science/technology and a desire to learn more; and

(iii) activists who seek to participate in the decisions regarding science and technology that affect their lives.

(d) The non-attentive public can be divided into two broad groupings:

(i) those who have a very basic awareness of science and technology, usually concerning those items that receive wide coverage in the media; and

(ii) those who are unaware and apathetic with regard to the impact of science and technology on their lives.

Decision makers and elites are usually reached by fairly direct and intense approaches. The attentive public comprises the motivated or "mobilized" segments of the general population, many of whom are probably being reached through existing activities and materials.

The non-attentive public poses the greatest challenge and is probably the most difficult and costly to reach. For this reason, initial public awareness efforts are likely to be directed at the attentive public. This should not rule out attempts to reach at least the section of the non-attentive public that has a basic awareness of issues, but it will entail imaginative use of the mass media and other means of reaching large numbers of people.

ANNEX F

A NATIONAL ENGLISH-LANGUAGE SCIENCE MAGAZINE:

SOME CONSIDERATIONS

1. Although not specifically set out in the terms of reference for this study, the question of a national English-language science magazine was agreed by the study team as requiring consideration.

2. Background

2.1 The demise in 1979 of the magazine Science Forum was documented in the case studies and commentary prepared for this study by Messrs. Joncas and Chetcuti of the Ministry of State for Science and Technology. This material is available from the Science Council of Canada upon request.

2.2 Briefly summarized, Science Forum - the only national English-language science magazine in Canada addressed to the general public and available on news stands - suspended publication for financial reasons in mid-1979, some 18 months after starting its program of expansion based on federal financial support. Its proprietors sought further financial support from the federal government and suspended publication when none was forthcoming. Two applications were made, the second was made after the first was considered by an interdepartmental group to be inadequately documented. In the second, the sums sought from the federal government were substantial.

2.3 The proposals to re-float Science Forum were based on its being taken over by a successful magazine publishing company based in Toronto. The author of this report has investigated this proposal, and is content that the company involved is not deeply enthusiastic about pursuing the venture.

3. Consultations

3.1 In the course of preparing this report, the study group discussed with a considerable number of interested parties the question of a national English-language science magazine. Respondents tended to fall into two major groups.

3.2 Those professionally interested in magazine publishing unanimously advised that such a magazine could not survive without substantial subsidy. (It should be noted, however, that this survey was not exhaustive. There may well be differing opinions in the magazine industry that were not canvassed.) Although the success of Québec Science was acknowledged, professional advice was that an English-language equivalent was not commercially viable.

3.3 Among those with an interest in science and science policy, there was nearly complete unanimity that such a magazine was desirable. Various subsidy schemes were suggested.

3.4 A major factor in the analysis by magazine professionals was the advent within recent months of a number of new international English-language science magazines, stacked onto the existing market penetration of several well-established publications such as the Scientific American and the New Scientist. It was noted that at least one of the newcomers has already been forced out of the market.

3.5 All of the newcomers entered the market backed by very substantial financial resources, and after extensive international market research. No such market research has been done in Canada. It is the opinion of the writer that the demise of Science Forum was probably due in part to the absence of such research.

3.6 The federal government has ample precedent for supporting publications it considers worthwhile. This has been done by way of direct subsidy or by way of advertising, sometimes at artificially high rates. Lesser methods have included the provision of prepared editorial material. At times those methods of subsidy have reached very substantial levels. There does not appear to be any clearly articulated federal policy on this subject, however - rather, a series of uncoordinated departmental initiatives.

3.7 In this regard, it should be noted that federal subsidies have gone to a number of publications that are intended to be profit-making.

3.8 External consultations seem to indicate that those interested would not object to federal subsidies on ethical grounds. Those who favour the existence of such a publication consider that federal subsidy, if necessary, would be in the national interest. Those in the magazine industry, generally speaking, consider that such a publication would not seriously threaten their interests, and could not survive without subsidy.

3.9 It was drawn to the attention of the study group that Québec Science, cited as a successful popular science publication, is in fact subsidized by the provincial government.

4. Options

4.1 Assuming that the existence of such a magazine is considered desirable, federal options are the following:

(a) To leave the matter to market forces, with perhaps some minimal intervention by way of public encouragement for some entrepreneur to enter the field;

(b) To provide some degree of subsidy for an entrepreneur, by way of grant, guaranteed advertising, guaranteed subscription, prepared editorial material, or some combination of these; or

(c) To (simply) create such a magazine by contracting for the total net costs of its production and distribution.

4.2 On the basis of consultations to date, Option (a) is unlikely to bear fruit for the time being.

4.3 Option (c) would be expensive. Without far more research than has been possible within the limitations of this study, it is not possible to be authoritative. However, something on the order of a minimum of $400000 appears to represent industry consensus.

4.4 Option (b) is difficult to gauge without further research, because it supposes a publication that must to some extent find its own way in the market. The question here is (i) to determine the level of support needed, and over what time period, assuming that the publication would be expected ultimately to survive without major subsidy; and (ii) to determine the optimum instrument, or combination of instruments, for such support. The "entrepreneur" need not be a private company; it might be a voluntary organization.

5. Factors

5.1 Discussions with print-media editors and publishers indicate that, while the number of qualified science writers has greatly increased in recent years, there is concern that these writers are often deficient in the general skills of journalism. This may reflect the fact that, as a journalism specialty, there has not been time to develop the relationship of trust with scientists in the way that medical or economics journalists have done with their professional sources.

5.2 In consequence, it has been suggested repeatedly to the study group that at least for the time it would be preferable to leave English-language science journalism to the general newspaper and magazine market, until its skills and self-confidence develop.

5.3 Baldly stated, the suggestion is that a magazine written and edited by the existing stock of writers would fail because it would be uninterestingly written and poorly edited. The last few issues of Science Forum have been cited to support this position.

5.4 The demand-pull side of the argument suggests that the existence of such a publication would create a nurturing environment in which existing skills could be upgraded, and in which recognized general journalists of unarguable skill could address science subjects.

5.5 Traditionally, there has been concern that a publication fully subsidized by government would be publicly suspect as no more than a government spokesman. The success of IRPP's magazine Options suggests that this need not be the case. With this publication, public acceptance seems to stem from personally signed articles by eminently qualified individuals in a magazine of high editorial and production quality.

5.6 News stand circulation has been seen as a sine qua non of an independent, commercially successful publication. This consideration was almost certainly a factor in the demise of Science Forum. Recent successes in the magazine field in Canada, however, suggest otherwise: the most commercially successful newcomers have been in the controlled circulation field, where all profit derives from advertisers willing to pay premium rates for access to a carefully selected market.

6. Conclusions

6.1 Choosing between Option (a) and the other two options requires a policy decision beyond the scope of this report: is the federal government, as a matter of principle, willing to invest in an English-language national science magazine?

6.2 In the event that Options (b) or (c) are adopted, a proper market survey must be completed and thoroughly analyzed before any further commitment is made. This will entail a minimum expenditure of some $200000. It cannot be stressed too highly that such a publication will be in competition with magazines that have already spent far more on market research.

6.3 As a preliminary step, to assist in selecting among the options listed above, it might be useful to convene a workshop of senior representatives of the magazine industry to explore thoroughly their perceptions of problems and opportunities. The Science Council of Canada is willing to convene such a workshop upon request.

ANNEX G

Letter of Mandate, and Terms of Reference

Minister of State
Science and Technology

Ministre d'État
Sciences et Technologie

May 30, 1980

Monsieur Claude Fortier
Président
Conseil des sciences du Canada
100, rue Metcalfe
Ottawa (Ontario)
K1P 5M1

Monsieur,

Lors de notre rencontre du 26 mars, nous avons discuté brièvement le mandat du Conseil des sciences pour la sensibilisation du public à la science et à la technologie. Comme vous le savez, cette question intéresse le Conseil des ministres depuis quelques années. Bien que le Conseil des sciences ait des responsabilités explicites dans ce secteur, d'autres ministères et organismes fédéraux ont aussi un rôle à jouer, et je crois le temps venu d'élaborer une politique cohérente et globale dans ce domaine.

Je sais que des employés du MEST ont rencontré leurs homologues du Conseil pour discuter le mandat et les objectifs éventuels d'une étude pouvant servir à l'élaboration d'une telle politique. Après les avoir examinés, je crois qu'ils constituent une base pour cette étude et j'aimerais voir le Conseil la mener en mon nom.

L'échéancier est très important. On m'a dit que le Conseil pourrait terminer l'étude en six mois. Puisqu'il sera important, d'ici la fin de l'été, de connaître au moins l'orientation probable des conclusions de l'étude, je souhaite recevoir un rapport provisoire d'ici le début de septembre. Ce rapport provisoire n'a pas besoin d'être long, mais il devrait indiquer la portée des travaux entrepris jusque là et le sens probable des conclusions.

Les représentants du Conseil ont fait part au personnel du MEST de leur souci que le rapport final de l'étude soit publié en temps utile. Je suis d'accord en principe, mais

la date de publication du rapport devra être approuvée par mon cabinet. Toutefois, il se peut très bien que cette étude donne lieu à des recommandations de programme précises qui pourraient faire l'objet d'une annexe au rapport principal de l'étude et dont la publication serait laissée à ma discrétion. On m'informe que le Conseil est d'accord avec cette façon de procéder.

Je sais que le MEST et le Conseil des sciences appuieront cette étude par des contributions financières et en y apportant des ressources en personnel. Comme une politique fédérale de la sensibilisation du public affectera tout probablement les activités des conseils de subvention, ceux-ci ont consenti de contribuer $15,000 chacun à l'étude.

En conséquence, je vous demande d'entreprendre l'étude selon le mandat ci-joint. Je vous serais reconnaissant de me faire connaître votre réponse le plus tôt possible.

Veuillez agréer, Monsieur, l'expression de mes sentiments les meilleurs.

John Roberts

Public Awareness of Science and Technology

Terms of Reference for A Study

The objectives of this study are:

(a) To derive a policy on federal role, duties and responsibilities concerning public awareness of scientific and technological problems and opportunities in Canada; and

(b) To recommend appropriate administrative and other arrangements for the implementation of such a policy.

More specifically, the study will seek:

1. To provide a working definition of public awareness within this context, including those publics or target groups such a policy would primarily address;

2. To identify the federal objectives such a policy would serve;

3. To describe briefly but comprehensively the environmental factors pertaining to the implementation of such a policy;

4. To analyze relevant characteristics of the intended target groups;

5. To review the appropriate instrumentalities for implementing such a policy;

6. To identify needs and opportunities which federal programs could address;

7. To advise on mandates and division of responsibilities among federal departments and agencies;

8. To identify measures reflecting federal policy on the linguistic and regional interests of Canada; and

9. To propose a framework for federal activities--direct, in cooperation with others, or in support of others--to enhance public awareness of science and technology.

Sensibilisation du public à la science et à la technologie

Mandat d'une étude

Les objectifs de cette étude sont les suivants:

a) Etablir une politique relative au rôle, aux fonctions et aux responsabilités du gouvernement fédéral en matière de sensibilisation du public aux difficultés et aux possibilités scientifiques et technologiques au Canada; et

b) Recommander des mesures administratives et autres appropriées à la mise en application d'une telle politique:

De façon plus précise, l'étude tentera:

1. De définir de façon pratique ce qu'est la sensibilisation du public dans ce contexte, de même que les publics ou les groupes principalement visés par une telle politique;

2. D'identifier les objectifs d'une telle politique fédérale;

3. De décrire brièvement, mais aussi de façon complète, les facteurs externes affectant la mise en application d'une telle politique;

4. D'analyser les caractéristiques pertinentes des groupes visés;

5. D'étudier les moyens appropriés pour la mise en oeuvre d'une telle politique;

6. D'identifier les besoins et les possibilités auxquels les programmes fédéraux pourraient répondre;

7. De formuler des conseils quant aux mandats et à la division des responsabilités des ministères et des organismes fédéraux;

8. D'identifier les mesures conformes à la politique du gouvernement fédéral sur les intérêts linguistiques et régionaux du Canada; et

9. De proposer une structure pour les activités fédérales entreprises de façon autonome ou en collaboration avec d'autres secteurs, ou pour aider d'autres secteurs, dans le but d'accroître la sensibilisation du public à la science et à la technologie.

Sensibilisation du public à la science et à la technologie

Mandat d'une étude

Les objectifs de cette étude sont les suivants:

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