Dr. Petch's Final Report

"SCIENCE COUNCIL"

University of Waterloo

Waterloo, Ontario, Canada
N2L 3G1
Vice President, Academic

May 14, 1973.

Dr. A. Beaulnes,
Ministry of State for Science & Technology,
Room 407,
207 Queen's Street,
Trafalgar Building,
Ottawa, Ontario.
K1A 1A1

Dear Aurèle:

Enclosed is my final report on the Science Council of Canada and some additional source material which should be placed in the proper annexes. This report should replace the draft copy which I sent you on 30 April 1973. The draft should be destroyed if you can collect all copies.

If there is anything else you would like me to do in connection with this study, please let me know.

With best personal regards,

Sincerely yours,

H. E. Petch,
Vice-President, Academic.

HEP/l
encl.

REPORT

on the

SCIENCE COUNCIL OF CANADA

by

DR. HOWARD PETCH
UNIVERSITY OF WATERLOO

SECTION I

LEGAL STATUS

SUMMARY POSITION

The powers of the Science Council of Canada are set out in Section 11 of the Science Council of Canada Act, Chapter S5 RSO-1970. The jurisdiction of the Ministry of State for Science and Technology is found in Order in Council PC 1971-1695. This is further enlarged upon by the decision of the Cabinet Committee on Priorities and Planning dated 1 February 1972 entitled, "Proposed National Objectives for Science and Technology". These documents are attached as Annexes A, B and C.

Tables I and II show, section by section, those portions of the Executive Orders which overlap some or all of the jurisdictional provisions of the Science Council Act. There does not appear to be any power given to the Science Council by this statute which is not duplicated in each of the two Executive Documents relating to MOSST. There are some duties conferred upon MOSST which have no duplication in the Science Council Act but there is no reciprocal situation in which the Science Council has an authority which is not duplicated by MOSST.

Furthermore, Table III, a comparison of the broad program description of each of these bodies given in the 1973-74 Estimates, shows complete overlap between the two programs, although MOSST, in some aspects of its program, has jurisdiction over activities which the Science Council does not. Again, there is no reciprocal situation wherein the Science Council has a program that is not duplicated by MOSST.

SECTION II

OPERATIONS

SUMMARY POSITION

Because MOSST was established recently there has been little opportunity for overlap of work by the two bodies so there appeared to be no reason for studying past operations of the Science Council. Also, because of time limitations, it was decided that it would be impossible to carry out a detailed investigation of the current or planned operations of either organization. This section is based only upon an examination of a number of documents, attached in Annexes A - E, to obtain an overview of their operations.

Table I shows a comparison of ongoing and planned operations in the Science Council and MOSST. In the case of the Science Council, only broad titles of the studies are listed whereas slightly more detailed program titles are given for MOSST. To identify actual duplication would require much finer detail for programs and plans but the purpose here is probably more to point out the possibility of duplication rather than to find hard examples. As might be expected from the overlap of jurisdictional powers outlined in Section I, the operations of the Science Council and MOSST are beginning to indicate the probability of a great deal of overlap in the future if care is not taken. A few examples from Table I are adequate to illustrate this problem:

Science Council Studies	MOSST Programs
ONGOING	
Energy	Assessment of new technologies for energy production and use.
Technology Transfer from Government Laboratories.	Overview of Government Scientific Activities and the Development of Major Science Policies.
PLANNED	
Technology Assessment, perhaps in some biological or biomedical area.	Future impact of Biomedical Technology.
Further investigation of Industrial Technology.	Industrial Environment Factors.
Science in the Universities and the Universities in Science.	Federal Funding of University Research. University Research Contracting.

A certain amount of duplication may be valuable but the amount of possible overlap indicated here suggests an imminent danger of wasteful duplication. There are a variety of approaches to this problem. It will be recommended in Section IV that MOSST deal with the short term and the Science Council with the intermediate and long term so that their work will be complementary. This approach, plus improved communication, is believed to be the most satisfactory answer to the problem.

The operations of the Science Council appear to fall well within its jurisdictional area; the powers of the Science Council in this regard are shown in Table II.

SECTION III

IMPACT

It is very difficult to obtain a valid assessment of the impact of the Science Council for a variety of reasons. Many of the Science Council recommendations are long range in nature so the full impact will not be known for a long time. Also the Science Council has a broad role and speaks to several audiences so its impact on each of these audiences should be measured. This would require objective, time-consuming studies, the results of which should be compared with those obtained from similar studies taken before the Science Council was established. Time did not permit such studies to be undertaken now and in any case an exact knowledge of the state of the scientific community before 1966 is not known. To measure the impact on the Federal Government, one would have to be privy to the thinking of numerous government officials when decisions were taken in areas covered by Science Council recommendations. Again, because of government confidentiality, this is impossible. These factors ruled out the possibility of an objective assessment.

The assessment being presented is a highly subjective one. However, a subjective assessment can be useful. It depends, to a large extent, on the viewpoint, knowledge and judgement of the assessor. The validity of a subjective assessment can be improved by combining the opinions of a number of observers and this has been done here. Press articles originating with Science Council reports or studies have been enumerated. Articles in Science Forum on or relating to the Science Council have been read and previous studies of the Science Council have been examined. In addition, opinions of the impact of the Science Council were requested from members of all sectors of the scientific community. Current and past members of the Science Council were either interviewed or asked to express their opinions by mail. All this material is attached in Table I to III and Annexes A to H so that they may be appraised by another observer.

Short summaries of the responses from various sectors are given below:

VIEWS FROM FEDERAL GOVERNMENT DEPARTMENTS AND AGENCIES:

Most of the writers agree that Science Council recommendations have had little effect on government policies in a direct cause-and-effect relationship. The Science Council recommendations are seen as one input among many and they are often influential in facilitating or accelerating action that is already being considered. The most important role for Science Council is seen to be in promoting the development and change of attitudes among the scientific community, government and the public at large. They seem to consider that this is enough to justify the Council's existence and suggest that this role be expanded to make science and science policy more a part of our national consciousness. No one is wildly enthusiastic about the Council, however, and one gets the impression that if they had to pick up the tab, their opinions as to its value might change.

As far as other uses go, several Departments and Ministries termed the background information "valuable and helpful"; the Defence Research Board found the Council's advocacy of mission-oriented research to its advantage; Indian Affairs and Northern Development has acted on a number of Council recommendations. The general view, though, is that the Science Council's real value is in identifying long-term needs and proposing broad, general policies and, as stated before, doing this in a way that focuses as much public attention as possible on the areas under study.

VIEWS FROM PROVINCIAL ORGANIZATIONS:

The work of the Science Council is not well known in provincial organizations but to the extent it is knowm it is well regarded. A strong feeling was expressed that Reports and Background Studies should be better publicized. Support for the

continuation of the Science Council was expressed and, more than any other group, the need for independence from the Federal Government was stressed.

VIEWS FROM INDUSTRY:

The response from industry varies widely as might be expected. The impact is judged to be less in industry than in other sectors but seems to be increasing. Report #15 (Innovation in a Cold Climate) in particular, is widely acclaimed and is believed to articulate well many of industry's problems.

Its influence on government policy-making is felt to be small but the collective opinion supports maintaining and strengthening the Science Council. Opinion was expressed that it is time for the Council to go much deeper in studying national problems and that it should suggest alternative approaches with the implications of each.

VIEWS FROM THE UNIVERSITIES:

The views of individuals from the universities are extremely diverse, ranging from strong support to a desire to abolish the Science Council. The influence of the Science Council on policy decisions by the Federal Government is perceived to be slight. Also, the impact on the scientific community at large is reported to be small; relatively few practicing scientists or engineers read Science Council Reports even when their own discipline is studied. However, as an individual takes on an administrative position with responsibility for research management, his interest in the Reports increases. Most Departmental Chairmen, Deans, Vice-Presidents and even Presidents appear to read at least some of the Reports with value.

Many of those with administrative responsibilities report that the factual material published in the Reports has been useful to them. They credit the Science Council with having had some effect on changing the attitudes of university

research personnel towards social relevance and applied research. Also the Reports have been used, particularly in newer universities, as an aid in deciding what fields of research to develop. Indeed several report using the material for planning purposes and making curricular adjustments. Mention is made in a few instances where Science Council action has helped certain faculties begin to rationalize their research efforts. The majority support the concept of an independent advisory body on matters of science policy.

SUMMARY POSITION

IMPACT ON PUBLIC OPINION:

The tools to measure the impact on public opinion were not available. However, the number of press stories based on Science Council Reports and Background Studies have increased over the lifetime of the Science Council and indicate some measure of its impact. The large number of citations in Ontario newspapers indicates considerable interest in matters of science policy and suggests that the impact of the Science Council has been greatest here. The fact that Science Council press releases are made in Ottawa probably accounts in some part for the greater use of Science Council material by Ontario newspapers. The impact on public opinion in other provinces would appear to be less.

IMPACT ON FEDERAL GOVERNMENT DEPARTMENTS:

(a) Direct: The direct impact on the Federal Government Departments measured as action taken in direct response to recommendations from the Science Council appears slight.

(b) Indirect: The indirect impact on the Federal Government Departments has been significant. Science Council recommendations have encouraged Departments to take some actions sooner than they might have and have made it easier for them to implement other actions. The influence seems to have been greatest when a senior member from a Government Department was involved in the study.

IMPACT ON SCIENTIFIC COMMUNITY:

(a) Practicing Researchers: The impact on scientists and engineers involved only in technical activities has been slight to significant and, to some extent, appears to vary from discipline to discipline. In the medical science, for example, the impact appears to have been slight to insignificant, whereas it has been much more substantial among the physics community.

(b) Managers: The impact on those involved in scientific activities who also have a management component in their jobs has been significant. Science Council Reports have been found useful in assessing on-going programs and in planning new ones.

As a final word of caution regarding the validity of the foregoing subjective assessment of the Science Council's impact, two opposing viewpoints of the influence on the Federal Government of the Council's work relating to Canada's space programs will be described. The Executive Director, who describes himself as an enthusiast when it comes to the value of the Science Council, estimates that there has been a "strong negative correlation" between the Science Council's recommendations and the action taken by the Government and believes that Council's "space report" has been its least influential. Annex F shows a point-by-point comparison of Government action and the recommendations in both Special Study #1 (Upper Atmosphere and Space Programs in Canada) and Science Council Report #1 (A Space Program for Canada). This "Case Study" was prepared by a Senior Government Official who was active in the preparation of Special Study #1 and who is in a unique position to observe Government action in this area. He

concludes that "the Science Council has scored very high in its recommendations concerning development of new space programs (over $115 million), but its recommendations on organization were ignored. One could conclude that the Council's views on what should be done carried weight, but that other views prevailed on how it should be done". These contrasting views by two who are well placed to make such judgements, illustrate the difficulties inherent in a subjective assessment of this type.

Every effort has been made to present a balanced opinion of the Science Council's impact, probably with some inclination towards a cautiously conservative rather than an overly enthusiastic evaluation. However, the reader should keep in mind the obvious limitations of the methods used.

SECTION IV

FUTURE OF THE SCIENCE COUNCIL

During the course of this study, personal interviews were held with 28 persons. These interviews were used partly to obtain additional opinions about the impact of the Science Council but mainly to discuss its future. For this reason, the persons interviewed were chosen because of their intimate knowledge of the Science Council and its operations. Most have served or are now serving as members of Science Council, a few spent one or two years on the Science Council staff and others have held positions in the Federal Government where they had close contact with the Science Council over a period of several years. Very brief summary notes of these interviews are included in Annex A as they contain many suggestions from authoritative sources which could be used to strengthen the Science Council and improve its effectiveness. These discussions not only provided useful insights and suggestions for the future of the Science Council but also helped the author sharpen his thinking on many points. Included in Annex B and C are two earlier reports which were useful in considering the future of the Science Council.

The interviews and letters left the author with the strong impression that a consensus exists on a number of major points in relation to the Science Council which are at issue in this study. Before discussing the future of the Council, it will prove helpful to list these points. They are as follows:

> The Science Council has been disappointing in its direct influence on the policies and actions of the Federal Government. However, it has provided a great deal of information which has been useful to science managers in adjusting on-going programs and planning new ones. Also, it has influenced attitudes of the scientific community in a positive way and, indirectly, has influenced actions and policies of the Federal Government.

There is a continuing need for an independent national advisory body on science policy which can criticize government as well as the private sector and make its views public.

The Science Council, as an on-going operation which has established some reputation, should be the independent national advisory body.

The Science Council desperately needs a full-time Chairman.

The Science Council should emphasize its public role and concentrate on influencing the Federal Government indirectly.

The Science Council should pay less attention to short-term matters and concentrate on the medium to long term.

It is emphasized that on none of the above points is there unanimity of opinion but the overwhelming majority of those approached seem to support the positions outlined. Of course, there is also support for many if not all of the smaller points which will be introduced later.

In spite of the apparent agreement that the Science Council should continue, alternatives have been considered in which the Science Council would either disappear in fact or be so altered in form as to constitute effective disappearance. Since these alternatives have been abandoned as plausible answers to the perceived needs, they will not be examined exhaustively here. However, to outline the train of thought, they are listed below:

ALTERNATIVE A - Merge the Science Council Secretariat with MOSST and have the Science Council members cleared for security so that they could be private advisers to MOSST and its Minister.

Undoubtedly MOSST could benefit from the advice and counsel of the Science Council members and efficiencies could be gained in the use of staff. However, the need for a body which is independent of government and able to publicly air the issues is considered great enough to justify rejection of this alternative.

ALTERNATIVE B - Merge the Science Council Secretariat with MOSST but have the Science Council members attached only in a loose way to MOSST, served by a small staff from MOSST, and able to speak publicly about the issues it considers.

Even now the Science Council is seen by some to be too closely identified with the Federal Government. With this alternative, the Science Council would lose all credibility as an independent critic and in this respect, alternative B is little more acceptable than alternative A. Also, serious problems probably would arise because of the conflict between the openness of the Science Council and the confidentiality needed in a Government Department.

ALTERNATIVE C - Abolish the Science Council and distribute its duties to other bodies.

The distribution of duties might be done roughly as follows:

Science and Technical Societies - to examine critically scientific and technological activities in Canada, to provide advice and to identify opportunities;

Universities - to conduct research on science policy issues and studies on national problems;

MOSST - to conduct studies and develop recommendations for Federal Government in an open manner.

There are a number of weaknesses to this alternative which make it unattractive:

Had the Royal Society of Canada received good leadership twenty years ago and developed into a vigorous organization or had an Academy of Sciences been formed, one or other might have taken on many of the duties suggested for the science societies and the universities. However, this did not happen and the vitality is found currently in the science and technical societies not in the Royal Society. Because of the proximity to the U.S.A. and its enormous scientific community, the Canadian societies have suffered because of the competition from their far larger and wealthier American counterparts and find themselves in precarious financial positions. It is judged that they are not capable of taking on the duties as outlined at the present time.

Neither would the universities appear to have the competence needed. One or two are contemplating the establishment of units for research on science policy but this does not appear to have happened yet. Also, the universities have experienced great difficulty in assembling multi-disciplinary teams to tackle broad problems on a sustained basis.

MOSST could carry on studies and could try to stimulate public debate on the broad issues. It might even try to let the scientific community at large know what it was working on and try to obtain an input and reaction. In principle, this might be possible but in practice the pressures in the public service are such as to make this seem unlikely.

In spite of an innate dissatisfaction with the status quo in almost any situation, considerations such as outlined have led to a conclusion that the Science Council should be retained in something like its present form for the present. This does not imply any conviction that the present arrangement is best in any absolute sense. It merely seems to meet our needs as we perceive them at the moment.

NATURE OF THE SCIENCE COUNCIL

The overriding reason for the rejection of the alternatives A, B and C and the retention of the Science Council in approximately its present form, is the apparent need for an independent national advisory body which can operate in the public arena. This need was expressed by almost all those with whom the future of the Science Council was discussed. Yet it is interesting to note that the Science Council does not seem to have been set-up expressly for this purpose. Indeed, there is no explicit mention of this role in the report to Mr. L. B. Pearson by Dr. C. J. Mackenzie which led to the establishment of the Science Council. Nor has the Science Council been projected in this direction by its Act which is merely permissive and

says in Section 13 (b), "The Council may cause to be published, such studies and reports prepared for the use of the Council as it sees fit".

The impetus to develop the public role came almost entirely from the Science Council members themselves and it began soon after its establishment. The temptation to be wise advisers whispering into the ears of Cabinet was experienced by the Science Council but a conscious decision was taken to avoid the "grey eminence" role and to adopt the "public advocate" role. This decision was partly based on an intuitive feeling that a body was needed to take on the latter role but there was a pragmatic reason as well. A structural relationship was never developed between the central government and the Science Council which would have made the "grey eminence" role possible.

The independence of the Science Council is also a feature which has evolved. Originally, approximately one-third of the membership was made up of individuals from positions very senior in the Federal Government public service. Even if the intent might have been that the Council should be independent, its membership structure would have prevented it. Gradually the concept of a truly independent Council has emerged, the percentage of members from the Federal Government has declined and now Council seems to be aiming at having all its members from the private sector.

The point that is being made is that the Science Council was not set up explicitly to be an independent advisory body operating in the public domain. Rather, it gradually developed the concept itself and is evolving into such a body on its own initiative. Ifthe Federal Government is truly aware of this development, then Cabinet condones it by mere acceptance. Moreover, there is no public reason to believe that the Federal Government does not endorse this evolution. However, it is not clear that a case has ever been made for an independent, advisory body operating in the public arena followed by an explicit policy decision to create such a body.

The Science Council is supported entirely from public funds and its annual operating budget is a significant amount. If the rationale for continuation of the Science Council is based largely upon a need perceived by the scientific community and others for an independent, public, advisory body, then this need should be examined closely. After all, there are numerous other areas of public policy which are of major national importance yet lack such bodies without apparent problems.

A case that science policy must be treated somewhat differently from other areas of public policy can be made along the following lines:

> Although we live in an age of science and technology, most citizens do not understand either very well. Where the "man-in-the-street" can grasp readily the issues involved in policy relating to education. social welfare, national security, etc. it is a different matter when it comes to heavy water cooled and moderated nuclear reactors versus boiling light water nuclear reactors, the deployment of communications satellites in stationary orbits or the implications of genetic engineering. The issues, implications and alternative policy decisions must be spelled out and publicized to enable citizens to make sensible judgements.
>
> Cabinet members, although well educated and very perceptive, rarely have had technical training or experience. They have as much difficulty with science policy issues as the "man-in-the-street" and need the same kind of help in identifying and understanding the issues.
>
> Because Cabinet members feel that they have less grasp of scientific matters, they may rely more in these areas on the advice of their Deputy Ministers. Whatever the reason, the senior civil servants appear to wield enormous power. This is extremely serious because so few of them have technical backgrounds and they are shielded from much of the political pressures exerted on the politicians. Few have any inkling of how to use science and some appear hostile to science.

There are a multitude of critics in the public sector who are quick to point out government excesses, omissions or mistakes in most areas. In science it is different. The vast majority of scientists and applied scientists working at the forefront are employed by the Federal Government or the universities. Those employed by the Federal Government depend upon it for their jobs and those in the universities depend upon it for research funds. Few feel that they can be freely critical in a public way.

Canada's newspapers have only a handful of science writers in total as compared to numerous reporters and analysts in other areas. They and the newspapers alone cannot adequately serve the role of public advocate in matters of science policy at this time.

In some countries, an Academy of Sciences or bodies such as the Royal Society of London have sufficient public prestige that they can act as public advocates. In Canada, we have no Academy of Sciences and the Royal Society and the science and technical societies are too weak and lack the public image to play an effective role in this capacity.

Some side effects of modern technology are causing great problems and must be more closely guarded against in the future. This requires detailed assessments of future developments and the description of alternatives with their implications. The results must be made public so that society can choose the broad direction of development which seems optimum.

To the author and probably to the vast majority of the scientific community, the case appears conclusive. However, we are all looking at the problem from a highly personal, relatively common and probably biased point of view. Although the remainder of this report will be written on the assumption that the case is made, a very careful assessment of the need for an independent, public, advisory body on science policy should be made by persons from a broader spectrum of the public sector.

Because the Council was established by an Act of the Federal Government, members are appointed by Order in Council, and its annual budget is provided by the Federal Government, it is natural to think that it is advisory to the Federal Government. Indeed, the vast majority of Council's recommendations have been directed to the Federal Government in the past. However, the Federal Government now has a new advisory body, the Ministry of State for Science and Technology, which is a part of government. Relative to MOSST, the Science Council has disadvantages if its role is to be adviser to the Federal Government. For example, the Science Council:

> Does not have a mechanism to inject its recommendations into the policy-making machinery of Government in a form ready for Cabinet Committee consideration.
>
> Does not have an adequate knowledge of current Government priorities.
>
> Does not have an adequate knowledge of imminent Government action which relates to recommendations it might be formulating.
>
> Does not have general access to Government information which is currently confidential.
>
> Is not able, on a routine basis, to consult with and obtain input from Government Departments in preparation of recommendations.
>
> Does not interact, on a regular and routine basis, with its reporting Minister and is unable to take into account political (and should not if it is an independent body) and budgetary considerations.
>
> Does not have as easy access, even to non-confidential but current information, from Government Departments.
>
> Is not able to draw on resources of Government Departments as easily.

On the other hand, the Science Council does have certain advantages relative to MOSST; it:

Is made up of a broadly-based group of people with demonstrated ability, experience and judgement in addition to its Secretariat staff.

Has easier access to some kinds of information from the private sector.

Is removed from day-to-day pressures of Government,

Is free from erratic shifts in priorities.

Can obtain experts more easily from the private sector for assignments of perhaps a year in length.

Study of the Science Council's disadvantages relative to MOSST immediately reveals that its weaknesses are in the short term and that most of these considerations are not applicable in the intermediate to long term. Furthermore, its strengths over MOSST are such as to give it an advantage on longer-term issues. One concludes from the comparison, that the Science Council is likely to be ineffective as an adviser to the Federal Government on short-term issues but that it has important advantages in considerations of intermediate to long-term issues. Here, the lower time limit of issues considered to be intermediate is five years into the future.

If one accepts that Science Council advice should be directed mainly at the solution of issues at least five years into the future, then it is clear that it is not an adviser to the current Federal Government. The party in power in five or more years may be different but, even if not, there are likely to have been numerous changes in Cabinet. The only effective way to provide help to this unknown government of the future, is to identify the issues of the day, to suggest ways of tackling them, to try to stimulate public debate on the issues and suggested solutions and to try to create an attitude conducive to rational handling of these issues. It is interesting to note that we have arrived again at a public role for the Science Council by a totally different series of arguments. Also, it must be pointed out that the conclusion is not forced in this

direction because of the Science Council's own decision to become a public-oriented body. The structural relationship to the Federal Government which led us to this conclusion has existed in much the same form since the establishment of the Council and it was this structural relationship which caused the Science Council to move in the direction it did.

In the foregoing paragraph, it was reasoned that the Science Council cannot be primarily an adviser to the current Federal Government but should project its advice to some future Federal Government. But is this the only level of government or body to which it should direct its advice? The answer has to be no. Science and technology are becoming all-pervasive in modern life. Issues of the future,such as energy, cross the boundaries of Federal-Provincial jurisdictions. Some of the major performers of research, such as universities and industry, are outside the direct control of any level of government in important ways. The effectiveness of some programs are even dependent on the individual attitudes of scientists and applied scientists. It seems obvious that there is no single audience for the Science Council's advice. It should deal with national issues and be considered a national advisory body.

MEMBERSHIP

The thesis has been developed that the Science Council should be an independent, public,national advisory body considering major issues of the future. The appropriate question at this time is the make-up of the Council to perform the functions expected ot it. Of course, the Science Council cannot be expected to examine every issue from every point of view. Its perspective should be concentrated on how science and technology can be developed and utilized for the optimum benefit of all Canadians. In other words, it should be concerned with that area of public policy which has come to be identified with the term, "science policy". Note that science policy includes, but is very much more than, a policy for science.

As it will have to carry out very detailed, complex studies, it is essential that the Council have available a highly competent staff. But it is not enough to perform a lot of academic exercises and publish a series of scholarly papers or books. The object of the Science Council is to bridge the gap between the science policy researcher and the policy and decision makers of the future. They must add to the staff studies not only a critical examination from a base of professional competence in some field, but also the type of judgement that can only be gained through experience in policy and decision-making. We thus need a staff of specialists and a group made up of individuals who might have been specialists at one time but have had much braoder experience. The staff must be full-time but the group who will interpret and inject an understanding of management into the results of the staff studies, can be part-time i.e. the present Science Council members.

Since the Council will be dealing with science policy, the economic and social implications are just as important as the technical considerations. Thus, the Council must draw its staff and Council members from areas broader than science and technology alone. The economist, social scientist and humanist have every bit as important a role of play on the Science Council as the scientist and the engineer. Because of some past misunderstandings, it may be necessary to emphasize that their role is to provide an essential input into science policy considerations not to enable the Science Council to speak for the arts or on social problems in general.

The members of Council should come entirely from the private sector. Perhaps one-third might come from the universities, one-third from industry and the remaining third from the private sector at large. Geographical and language considerations are important as the Council must be broadly based. However, personal qualifications in terms of educational background, vision, experience and judgement, are of paramount importance. The appropriate number of members would appear to be in the range of 24 to 32.

A more open procedure for nominating members would give the Council more credibility. The current procedure has produced good members but it is a mystery even to the members of Science Council. It is suggested that such bodies as the science and technical societies, the Social Sciences Research Council and the Canadian Manufacturers Associations be invited to submit names which could be considered with those submitted from government sources. This would help the private sector identify with the Science Council and emphasize its independent and public nature.

RELATIONSHIP BETWEEN THE SCIENCE COUNCIL AND MOSST

As pointed out in Section I (Legal Status), there is a complete and total overlap of the jurisdictional provisions of the Science Council Act by the powers bestowed later upon the Ministry of State for Science and Technology by Order in Council. At first sight, this would appear to be a very bad thing leading to wasteful duplication and jurisdictional squables. In fact, this has not happened yet but the study on the operations of the two bodies, Section II, reveals that it could happen shortly if steps are not taken to forestall it.

The fact that the jurisdictional powers of the two bodies overlap is not, in itself, necessarily a bad thing. Wasteful duplication will only come about if Science Council and MOSST are working in the same time-scale. As has already been argued, the very structure of the Science Council mitigates strongly against it being an effective adviser to the Federal Government on short-term issues. MOSST, on the other hand, is subjected to all the day-to-day pressures of a Government Department. The demands on it are extremely insistent and are almost entirely short range. With this atmosphere, it is difficult to see how MOSST could ever devote much of its resources to peering into the long-range future. MOSST and the Science Council should be compatible with their currently overlapping jurisdictional powers providing each does what it can do best in the adviser role; MOSST dealing with

short term and Science Council with intermediate to long-term issues.

In the past, the Science Council Reports have tended to mix recommendations for policy in the relatively short term with those aimed at the longer range potential role of science and technology. This was understandable because the Science Council had to evaluate current material to get a sense of what was occurring and the Federal Government had not designated any other group to deal with immediate science policy issues. Now, however, the Federal Government has established MOSST which is rapidly developing the capacity to deal with the latter. The effects of policy decisions based on the work of MOSST will be long range but it is expected that the analyses carried out by MOSST will be on current problems and opportunities which will lead to policy implementation within the next five years. In this context, the Science Council should increasingly restrict its activity to long-range policy analyses on problems and opportunities that are likely to emerge beyond the next five years.

Little danger of MOSST stepping out of its proper time-scale is foreseen because the pressures of government will restrain it even if it had ambitions to move into the longer range. No such pressures exist in the case of the Science Council. As an independent body it is relatively free to choose to do what it likes and it has been isolated purposely from the pressures of government. It is inevitable that there will be a tendency for the Science Council to move into the short-range area because dealing with the present is much more exciting and easier as the issues are already defined. This tendency must be thwarted because unnecessary duplication would be wasteful and because the Science Council is almost completely ineffectual in the short term.

The foregoing paragraphs are not meant to eliminate the Science Council from any consideration of current events but simply to indicate that its proper time period for advising on science policy is in the medium to long term. There are at least two roles in which it can make an important contribution on the short term. The first has already been discussed. This is the role of critic in which it should bring to public attention any shortcomings in government handling of science policy issues and weaknesses in the private sector. The danger here is that in studying the current situation for its strengths and weaknesses and in obtaining the background material needed to substantiate criticisms, the Science Council will be drawn into short-term issues in spite of all good intentions to the contrary and neglect its more important role. There does not appear to be a guaranteed way of preventing this from happening and one can only caution the Science Council to be on its guard.

The second role in which the Science Council could be useful in the short term is as a "sounding board and objective critic" for MOSST. An important strength that the Science Council has over MOSST is the ready availability of a broadly-based group of people with proven competence, experience and judgement. It would be very useful to MOSST if it could have access to this wisdom on occasion. Of course, this would have to be done early before the matter reaches the confidential stage. MOSST is building up a competent staff but after working very hard over a period of several weeks on a particular problem, it is very common for any group to develop a sort of "tunnel vision" about the problem; the perspective becomes so narrow that a rather obvious but slightly different approach is missed. This is why it is often so helpful to have a fresh person or group review one's work. Also, MOSST often needs the reaction to a proposal from persons outside the Ottawa milieu. Fringe involvement of the Science Council in the work of MOSST would not only be helpful to MOSST but would be stimulating to Science Council members and help to retain their interest. Nor need it weaken the independence of

the Science Council. Requests for assistance should be done in a formal way, proceeding from the Secretary of MOSST to the Chairman of the Science Council via the Minister.

There is a reciprocal role that MOSST could play in improving the effectiveness of the Science Council, at least in the Federal Government sector. Each Science Council Report should be analyzed and relevant material brought to the attention of the appropriate Government Department. Later, Departments might be asked whether the information has been useful and whether they have initiated any action as a result. This would appear a useful function for MOSST to perform and it might also provide feedback from the Government Departments to the Science Council.

The Science Council also could be helpful to the Minister by advising, from time to time, on specific matters. For example, Volume III of the Lamontagne Report will be released soon and it is expected to contain many recommendations regarding the organization of government science. The Minister might find it helpful to request from the Science Council, an appraisal and comment on the suggestions of the Senate Committee. We should also look to the future. A likely possibility is that some operating agencies such as university research granting agencies might report to the Minister. The Science Council could provide useful advice regarding the priority of development and funding in different areas. Occasionally, the Science Council may initiate short-term advice but normally this should be done only upon the request of the Minister.

Those activities which have become known as technological forecasting and assessment perhaps require some special mention. In its role as policy formulator and coordinator, it is essential that MOSST have some competence in these areas. It would be expected

to make use of available material but cases undoubtedly will arise where additional projections or assessment of immediate alternatives are needed. This might be thought of as the operational side of technological forecasting and assessment where they are used in the current formulation of public policy.

There is, however, a longer term aspect of technological forecasting and assessment which is becoming of increasing importance and it is in this aspect that the Science Council could play a major role. Society is becoming increasingly concerned about the development of certain technologies and their side effects. It appears likely that the public will demand a greater say in what new technologies are developed and in how fast they are implemented. To play a meaningful part, the public will need to be informed of possible technological development, of how it can be controlled by policy decisions, and of possible side-effects. Studies to provide this sort of information and the exploration of alternatives will have to be made long in advance of the actual developments if intelligent choices are to be made. Otherwise, a particular development by its own momentum will pre-empt a rational choice between alternatives. The Science Council would appear to be the logical body to carry on much of Canada's research in technological forecasting and assessment.

The Science Council and MOSST have similar interests and functions but they are distinctly different bodies operating in different arenas on different time-scales. Although they report to the same Minister and it is recommended that they continue to do so, they should be kept as distinctly separate entities. There should be good communication between them but it should be on a formal basis. The nature of the two organizations is such as to encourage them to be complementary rather than competitive. If it is made clear to the Science Council that it is to work on longer-term problems and the Minister encourages joint discussions about programs between the Chairman of the Science Council and the Secretary of MOSST, little difficulty should be experienced with wasteful duplication. Each will be strengthened by the existence of the other.

SUMMARY POSITION

An independent advisory body for science policy appears to be needed because of some features unique to this area of public policy. The Science Council could fill this need but in doing so, should increase its orientation to the public sector, direct its studies to the longer range and become national in scope. Its primary objectives should be along the lines outlined below:

> To identify possible future science policy issues, to analyze them for alternative approaches and implications and to inform the public.
>
> To study science and technology with a view to identifying future opportunities, recommending priorities and outlining possible development plans.
>
> To establish a competence in technological forecasting and assessment.
>
> To act as an assessor and public critic of the nation's scientific and technological activities.
>
> To attempt, through its studies, to influence the scientific community, government, the private sector and the public at large, to utilize science and technology to obtain the optimum benefits for Canadian society.

To achieve these objectives, the Science Council should have a highly trained staff with competence in many disciplines in addition to members of demonstrated achievement, judgement and experience. The members should be broadly representative of the geographical and language features of Canada, chosen entirely from the public sector and with backgrounds not only in science and technology but also economics, social science, humanities, the professions, etc.

The development of the Science Council along the lines described, should be paralleled with a strengthening of MOSST on one side and the science and technical societies on the other. Each has a related but different job to do and together form important elements in Canada's science policy advisory system.

SPECIFIC RECOMMENDATIONS

These recommendations are put forward in support of a particular model for a science policy advisory body which is designed conceptually to fill a need perceived not only by the author but by an overwhelming majority of those with whom he communicated on this subject. However, the reader should be cautioned that this perception of need has been expressed only by a small segment of Canadian society having a rather unique point of view, a special interest and a rather uniform set of values. Before accepting the model proposed here, or any other, a broadly-based decision-making body such as a Cabinet Committee of the Federal Government should decide the basic question of whether the value of an independent science policy body is worth the cost in public funds. If the answer is in the affirmative, it is believed that the following recommendations would help produce an effective body.

1. THAT THE SCIENCE COUNCIL BE RETAINED.

A need for an independent advisory body for science policy has been expressed. It requires funding by the Federal Government but should ~~be relatively~~ independent of government, public in orientation and national in scope. The Science Council has been evolving in this direction and already has a modestly successful operation with a growing reputation. It should be retained and encouraged to develop fully the roles described.

2. THAT ITS NAME BE CHANGED.

Many scientists and applied scientists still misunderstand the role of the Science Council thinking that it is a Council for Science and that it should be a spokesman or lobby for science. This raises unrealistic expectations which, when not realized, cause disillusionment. Others appear to resent the Science Council because the name suggests it is superior to other bodies even though they may be heavily science oriented and have very large operational

responsibilties. Science Policy Advisory Council is suggested as an example of an appropriate name which would give a truer indication of its purpose.

3. THAT IT CONTINUE TO REPORT TO THE MINISTER OF STATE FOR SCIENCE AND TECHNOLOGY.

The Science Council's interests should encompass, to some extent, those of all Departments which have large operational responsibilities for science and technology. However, its interests are much broader than those of any one line Department. Because the Ministry of State for Science and Technology has equally broad interests and responsibilities for science and technology, it appears logical that the Science Council should report to its Minister.

4. THAT A FULL-TIME CHAIRMAN BE APPOINTED.

Yes Full time chairman

No one on a part-time basis can provide the leadership or the interface with government (at all levels) and the public sector that the Science Council requires. The Executive Director does his best to make up for the lack but it is impossible for one person to do two rather different jobs. Probably, no other single action could improve the effectiveness of the Science Council as much as appointing a full-time Chairman.

5. THAT MEMBERS BE DRAWN FROM A WIDE SPECTRUM OF THE PUBLIC SECTOR.

It is assumed that the Science Council will deal with science policy which is interpreted here as that area of public policy which deals mainly with science and technology and their implications. If the Science Council is dealing with public policy it stands to reason that the Council must not only have members who have strong backgrounds in science and technology but members who are qualified in numerous other areas as well, for the implications important to the public are primarily economic and social. It is suggested that the required change can be made by addding a few words to the present description in the Science Council

Act i.e. "25 members chosen from among persons having a specialized interest in Science and Technology", or their social and economic implications.

6. THAT MEMBERS BE NOMINATED BY A MORE OPEN PROCEDURE.

The credibility of the Science Council as an independent body and the identification of the public sector with it, would be enhanced if the public sector played a part in selecting the members. It is suggested that nominations be invited when new members are required and that these nominations be considered on an equal basis with suggestions that arise from government sources. Appointments would still be made by Order in Council.

7. THAT THE SECRETARY OF THE MINISTRY OF STATE FOR SCIENCE AND TECHNOLOGY BE AN EX-OFFICIO NON-VOTING MEMBER.

As a general principle, senior officials of Federal Government Departments should not be members of the Science Council because of its independent, public stance. However, it is essential that there be good communication between the Council and MOSST. For this reason, the secretary of MOSST should be an ex-officio, non-voting member.

8. THAT UP TO FOUR OBSERVERS BE APPOINTED FROM SIMILAR ADVISORY COUNCILS.

Improved communication between the various advisory councils should result in better integration of advice, greater cooperation and less chance of unnecessary duplication. Appointment of four observers from similar advisory councils would serve these purposes. Normally, the Chairman would be appointed, e.g. Chairman of the Economic Council. Observers should be able to participate freely in meetings of the Science Council.

9. THAT THE PHYSICAL LOCATION OF THE SECRETARIAT BE MOVED TO MONTREAL.

It is recommended that the Science Council relate more to the public sector in the future and less to the Federal Government. It should also increase its interaction with other levels of government, particularly provincial. This change in orientation would be facilitated if the Science Council Secretariat were located in a city other than Ottawa. In principle, any large urban center would do, but for the convenience of the members, it should be in the central region of Canada and have a large airport with direct flights from as many provinces as possible. Winnipeg and Toronto are contenders but Montreal is favoured.

10. THAT THE SCIENCE COUNCIL BE REMOVED FROM THE ANNUAL BUDGETARY CYCLE OF THE FEDERAL GOVERNMENT.

A number of suggestions have been made to increase the independence of the Science Council from the Federal Government. Another step in this direction would be to remove it from the annual budget cycle and to support it with a negotiated five-year budget.

11. THAT THE PUBLIC ROLE OF THE SCIENCE COUNCIL BE EMPHASIZED.

Major role

It was seen that the impact of the Science Council has been mainly indirect. It is believed that this indirect impact can be increased if the Council consciously emphasizes the public role.

12. THAT THE TIME HORIZON OF THE SCIENCE COUNCIL STUDIES BE MEDIUM TO LONG RANGE.

The Science Council has serious weaknesses when it comes to giving advice on the short term. Government Departments, on the other hand, because of political and operational pressures, tend to pay greater attention to

the short-term problems. It appears natural that the Science Council should concentrate on the medium to long term issues (five years or more into the future).

13. THAT THE SCIENCE COUNCIL TAKE A MAJOR ROLE IN TECHNOLOGICAL FORECASTING AND ASSESSMENT.

Technological forecasting and assessment are, by their very nature, long term. Also they are most useful if the results are published, so valid choices can be made by an informed public. This suggests a major role for the Science Council in establishing a Canadian competence in these areas.

14. THAT THE FEASIBILITY OF HAVING THE COLLECTION OF H.G. MANPOWER DATA, CONTRACTED TO SCIENCE COUNCIL, BE EXAMINED.

H.Q. Manpower data should be collected by one body. With its focus on the public sector, the Science Council may have a useful role in collecting such data. In these days of somewhat strained Federal-Provincial relations, there might be less sensitivity about the Science Council collecting certain data in the field of post-secondary education than in the case of a Federal Government Department.

15. THAT THE SECRETARIAT STAFF BE STRENGTHENED IN THE AREAS OF ECONOMICS AND SOCIAL SCIENCE.

For the same reason as given in Recommendation 4 for the members, the staff also must have training and experience in a variety of fields. It is considered that additional strength is needed in economics and social science.

16. THAT THE SCIENCE COUNCIL BE ENCOURAGED TO BREAK OUT OF ITS PRESENT WORK PATTERN.

The Science Secretariat was established before the Science Council and, in anticipation of its creation, initiated a series of studies to provide a data base. These inventory studies were continued by the Science Council and extended to cover as many areas as possible

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in a relatively short time. The number of studies underway at any one time has increased to the point where the staff and members are overextended. The Council has been so caught up in the frenetic activity of getting out more and more Reports that its members do not have adequate time to think about its objectives, to think about future issues or even to think in sufficient depth about its current studies. One member described the Council as being caught up on an endless tread-mill of Reports which it cannot seem to get off. The Council is already thinking about up-dating some of its inventory studies. Before the cycle starts all over again, something must be done to help the Council break out of this pattern.

17. THAT THE DUTY IN THE SCIENCE COUNCIL ACT {Section 11(e)}, RELATING TO CANADA'S PARTICIPATION IN INTERNATIONAL SCIENTIFIC OR TECHNOLOGICAL AFFAIRS BE DELETED.

agree

This is a matter which does not seem appropriate to the role of the Science Council as has been developed in this report.

18. THAT THE MINISTER OF STATE FOR SCIENCE AND TECHNOLOGY OCCASIONALLY REFER TO THE SCIENCE COUNCIL FOR COMMENT OR STUDY MATTERS FOR WHICH THE COUNCIL MIGHT HAVE SOME SPECIAL COMPETENCE OR POINT OF VIEW.

not relevant

The Science Council could provide insights or points of view on some non-confidential matters which might be valuable to the Minister. An example is the priority of research support between broad areas. Advising on some shorter-range matters would help keep the interest of the Science Council members.

19. THAT THE SECRETARY OF MOSST, THROUGH THE MINISTER, UTILIZE THE SCIENCE COUNCIL AS A "SOUNDING BOARD AND OBJECTIVE CRITIC" IN POLICY DEVELOPMENT.

not relevant

Access to a body with the wide experience represented by the members of the Science Council could be extremely valuable to

the staff of MOSST, especially in the early stages of developing policy. This must be done well before a cabinet memorandum is commenced so that confidentiality will not be a problem.

SUPPLEMENTARY RECOMMENDATIONS

The role of the Science Council as developed earlier represents only one element of a science policy advisory system. To obtain the most value of this system it must be considered as a whole. Piece-meal changes or greatly uneven development of the constituent elements should be avoided as they could hinder the effectiveness and even damage the system as a whole. The following recommendations are not intended to be comprehensive but simply illustrate how other elements with roles complementary to that of the Science Council might be strengthened to improve the entire system.

1. THAT THE ROLE OF MOSST AS A FORMULATOR AND COORDINATOR OF SCIENCE POLICY IN THE FEDERAL GOVERNMENT BE STRENGTHENED.

   If MOSST has only a weak position in the Federal Government, it will be, in effect, an advisory body. In this case, there would be no sense in having two advisory bodies in the same area and one or the other should be abandoned.

2. THAT THE SCIENCE AND TECHNICAL SOCIETIES BE SUBSIDIZED FROM PUBLIC FUNDS.

   The science and technical societies could play an active role in Canada's science policy advisory system if they were strengthened. They are the natural spokesmen for science. Also they could be effective critics and useful in pointing out opportunities. Because of special problems faced by such societies in Canada, they are unable to assume these roles without some financial help. This subsidization must be provided in such a way as to maintain the independence of the societies. Also, commitments should be made for a sufficient

period at a time (say 5 years) to permit them to plan their activities well in advance.

3. THAT SCIENCE POLICY RESEARCH BE ENCOURAGED IN THE UNIVERSITIES.

Much more research is needed on science policy issues than the Science Council will be able to do on its own. Development of science policy research in the universities would help accomplish this end as well as providing trained manpower for this area. A combination of institutional grants (to establish a few strong groups) and research contracts to individuals, is suggested as the mechanism for encouraging this development.

addition

SECTION III
ANNEX B

May 9, 1973.

Dr. H. E. Petch,
Vice-President, Academic,
University of Waterloo,
Waterloo, Ontario.

Dear Dr. Petch,

I apologize for the inordinate delay in replying to your letter of March 19th., however, we seem to have two problems; first, preoccupation with some rather urgent reports and second, the feeling that I wanted to give the question of the role of the Science Council some thought before attempting to answer your letter. You have asked for my impression of the impact of the Science Council and I must first confess that I have not previously tried to gauge the impact of the work of the Council. In many ways I wish the question might be posed to me one or two years hence since, from my standpoint, it may be somewhat early to judge whether or not the role of the Science Council has been effective.

As Dr. Beaulnes is aware, I am involved in what I have termed the science or technology based service industry; the consultant and research work done in this company brings us in close contact with many companies in several industries and I am inclined to look at bodies such as the Science Council in terms of their impact on the neglected side of our science community - the private sector.

I have read most of the Science Council studies and reports that bear on biological research or Canadian industry and I am encouraged by a trend which one can perceive in recent Science Council reports, this trend is exemplified in the Recommendations of Report No. 17, i.e. a greater emphasis on applied biological research in Canada and more collaboration between industry, government and universities. I believe, like many others, that we have serious problems in this country related to the size of the research capability in the

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academic sector, its apparent inability to set priorities for itself within university and the difficulty of university graduates in finding suitable employment. I have a great interest in this problem as I believe it to be one of the most serious facing our country and recent visits to several of our universities in the west do not inspire optimism with respect to the role that these particular universities might play in finding solutions to these problems.

I believe that the Science Council, by reviewing the role of science in Canada, publishing their findings and making recommendations based on them, has performed a much needed service. However, it will take time before the impact of the work of the Science Council is apparent, this is where my hang-up lies. More time will be required before a judgement can be made. Meanwhile I am optimistic and I hope these comments are of value.

Yours sincerely,

addition

SECTION III
Annex C

Dr. H. E. Petch
Vice-President, Academic
University of Waterloo
Waterloo, Ontario

Dear Dr. Petch:

I am writing in reply to your letter of March 19, 1973 in which you asked me for my impressions of the impact of the Science Council. I believe the impact of the Science Council on the science community will ultimately be determined by its impact on our government.

It has never been obvious to me that it was necessary to create the Science Council and the Science Secretariat and more recently, the Ministry of State for Science and Technology when the original terms of reference of the National Research Council provided for most of the roles more recently allocated to these organizations. The National Research Council tended to concentrate its efforts in those areas where it could achieve success such as the university scholarship and research support programs and tended to neglect other areas particularly the areas allocated to these newer organizations. I am sure the late Dr. Stacey would have pursued the activities envisaged for these new agencies with vigor if he had received any encouragement from government.

In its wisdom our government has created these new organizations to fill these gaps. I, for one, have spent considerable effort to help make them successful and will continue to do so.

What has been the success of these newer organizations in these areas after making a great effort during the past several years! Less attention is paid to science and technology in the decision-making process in Canada now than prior to the creation of the Science Council. This is not peculiar to Canada but seems to be a characteristic of North America today. The Science Council has produced numerous reports. Some are very good.

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There is one major characteristic; more money should be spent on science and technology. The Science Council has not established firm priorities among these. In this vacuum the decision is made on recommendations prepared by economists who are far less capable of predicting future developments than qualified scientists and technologists. Dr. Bob Uffen made some very relevant remarks on how decisions are made at Treasury Board level in Canada at the CRMA meeting in Montreal three years ago.

I suggest that better organizations are not sufficient for successful science counselling which I believe must be the purpose of the Science Council. What is far more important are people with the speaking and other abilities of Dr. Edmund Teller. In this respect I was impressed by Dr. Gaudry's address to the CRMA in Ottawa last year. We need more of this.

Dr. F. Ronald Hayes has written a book which is presently being printed by the University of Toronto press. The title is "Chaining of Prometheus - Evolution of a Power Structure for Canadian Science". I expect that this book will be available in July which may be too late for your report. However, I am sure Dr. Hayes will be most pleased to talk to you and I am also sure that you will find it worthwhile to talk to Dr. Hayes.

Wishing you every success.

Yours sincerely,

addition

SECTION III
Annex D

Annex D

Dr. H.E. Petch, F.R.S.C.,
Vice-President (Academic),
University of Waterloo,
Waterloo, Ontario.

Dear Dr. Petch:

Re: Science Council

I shall endeavour to comment on the questions raised in your letter and also in the one written by Dr. Beaulnes to the Chairman of the Science Council.

Note: I understand "science policy" to mean the application of all scientific resources in the development of a public policy for Canada (I do not mean developing a "policy for science" only).

1. Science Council - SCITEC and the Royal Society

These three bodies have quite separate niches in the science policy generating ecosystem, as does the Senate Committee and MoSST itself. I see very little overlap in these components. The Royal Society of Canada has, in a historical context, been conspicuous by its failure to become a focus of science policy generation or even an effective lobby on behalf of the scientific community. Belatedly, it may have woken up to its missed opportunity to serve Canada but I remain to be convinced that in its present rather atherosclerotic and moribund state it can be taken too seriously in the context under discussion.

As a rather select or more precisely, restricted community of scholars it functions in much the same way as the other scientific societies and its very structure may actually detract from the cohesive mechanism needed for serious efforts in creating science policy. The procedure for selecting Fellows is sufficiently perplexing that I cannot consider it representative

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of even the scientific elite of the country. While the Royal Society certainly contains many able and distinguished members, a number of really first class scientists are not members.

I am prepared to accept the Royal Society as a rather distinguished, if slightly faded private club, but would totally reject the suggestion that it is either representative of the best in Canadian science or has any serious potential for imaginative contributions to science policy in its present form.

SCITEC

This organization could have become a useful grass roots lobby for the scientific community and a focus for policy debate by the societies. To date the organization has been little more than a stage for a few strutting politicians of science. It did at least attempt a critique of the Senate Committee's report No. 2 so it must be given credit for trying. At the most optimistic, it might become a responsible voice for collective scientific opinion and make proposals or provide suggestions of potential value, to MoSST for example. However, its role should be clearly understood to be representing the scientific community and therefore constitute a lobby group; albeit such a role would be valuable. It would be premature to condemn the organization and one can only hope that the process of maturation will be initiated shortly.

MoSST

A brief comment is necessary even though you are more familiar with the Ministry than I am. MoSST has as its primary role, I presume, the management of scientific resources within the federal government. An important secondary responsibility would be an active concern for and policy support of science in other sectors, such as industry and the universities. In the latter context, MoSST could be a valuable adviser to, say, the Treasury Board in making appropriations to line departments and granting agencies. At this time, MoSST is probably vulnerable inasmuch as it is being watched with circumspection and not a little concern by departments with large vested interests in the present federal scientific establishment. Skillfully managed, MoSST could become a powerful and constructive force in the management of science in Canada. However, without strong support at the cabinet level and judicious strategy and tactics, it could equally become an impotent collector and distributor of scientific information.

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Senate Committee

While I have several reservations about the recommendations made so far, I believe that the committee was a valuable catalyst if not a purgative for Canadian science and science policy. This committee's deliberations signaled the end of a comfortable and somewhat complacent era for science in Canada and accountability moved from an obscure place in the dictionary to page one of public consciousness.

This committee represents, to me, an important but transient event in the evolution of a science policy in Canada.

It is against this diverse background that any observations about the Science Council should be made.

2. Impact of Science Council

My opinions must be both subjective and qualitative and therefore of questionable value.

The reports have been valuable sources of information, comparable to good quality reviews in the scientific literature. Many contain messages which require approval and support from the cabinet or ministries to reach the stage of implementation. The extent of their impact in this context is beyond my ability to assess. Since there is no mechanism by which policy formulating units of government can be accountable, in a tangible way (to provide a response to recommendations by the Council) measurement of efficacy becomes a problem. However, at the very least, many reports should have been a stimulus and source of information to thoughtful policy makers in various departments and to organizations outside government. Some sound recommendations (e.g. satelite) were either ignored by the cabinet or implemented too late (e.g. STOL proposal) but others were significant factors in government policy making (e.g. water resources, innovation in industry, etc.).

One must appreciate that any governing body should have access to several sources of advice and may have priorities and political realities to contend with which alter the weight given to a particular recommendation. Advisers must be prepared to give sound advice but expect to be ignored occasionally. Sometimes the reports have been diluted to reduce pithy observations or controversial points which should have been retained.

However, the reports visible and important as they are represent only one role of the Council. Having produced a product, the next step requires salesmanship and effective after sales service. This component of Council responsibility has been practiced in a spotty fashion (see role of Chairman).

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Reports should be followed by personal action on the part of the Chairman and to a lesser extent by the Executive Director. This process requires time and effort and should be followed up by further action on the part of the Council as to the fate of its recommendations with updating commentaries, and even frank lobbying, when circumstances dictate. I think the latter area shows room for improvement.

The government should also be prepared to seek advice from Council on various issues from time to time which do not call for public reports.

Even with the existence of MoSST, operating effectively, input from a mainly non-government group could prove of great value in the decision-making process and in anticipating consequences of proposals (e.g. the pros and cons of contracting out). The government has chosen to seek such advice in an infrequent manner, it seems to me, but that is the cabinet's problem not the Council's. I am also unaware of the extent to which the cabinet has asked for studies on particular topics.

3. Present and future role of the Council

The Science Council, with its composition from the three sectors, and with regular turnover of members provides an invaluable dimension of informed opinion which is not shackled to the bureaucracy or consumed with self interest. It provides the science policy-making process with a credibility which could never be achieved by any government department. The independent and public stance of the Council is a much greater asset than may be realized by those who have the perspective of the Civil Service. Certainly the credibility of the Council is improving in the scientific community, as a result of expressed opinions and reports by Council.

4. Comments on the present Council

Some Council members do not appear to pull their weight and should be frankly told to produce or resign. However, measurement of input by Council members is in itself difficult, as some perform best in small groups or committees or may make a significant contribution over a short span of time. Nevertheless, the Science Council shares with the cabinet and the rest of humanity the problem of some deadwood. Appointments should be initially for one year, renewable for a full three year term to afford a gracious escape mechanism. In this respect, the Council is not particularly overburdened but the appointment to posts should be supplied as to the expected

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commitment. Since the selection process is something of a mystery, I cannot comment except to say that it needs rationalization and improvements.

The Chairmanship of the Council is one matter I am most concerned about.

The absence of a full-time Chairman or even a half-time Chairman is a matter for the gravest concern. At the present time the Executive Director carries almost the full burden of Chairman in addition to his own considerable responsibilities; this is a totally unacceptable situation. I am, therefore, not sure whether the recent reappointment of the Chairman constituted a misunderstanding of his role by the cabinet or an intimation that it is not going to take the Council seriously.

The Chairman, in addition to being the leader of the Council, should be its constant advocate at the cabinet level. He should invest considerable effort in conversing with appropriate Ministers and leaders of industry on a regular basis in order to gain their confidence and convey his message. Without this vital activity, much effort of the Council could be of questionable value.

I shall now be quite specific. Dr. Gaudry is a most gracious man but to expect him to devote the required effort to the Council, while running one of the largest universities in the country, is quite preposterous. I was prepared to accept his Chairmanship for a year as a bridge with the Solandt Era but I am dismayed that he has now accepted reappointment at a critical time for the Science Council. It is quite clear that Dr. Gaudry cannot possibly discharge his responsibilities much beyond running the meetings and I would take issue with anyone who claimed otherwise.

The input from the Vice-Chairman is difficult for me to assess, although my impression of Mr. Pallister is of a very able and engaging person. He, too, has other consuming concerns.

Therefore, as a matter of priority either the Chairman or Vice-Chairman must be full time and have a clear and firm commitment to the mission of the Council. The Chairman should work closely with MoSST, to maintain close liaison while keeping the separate missions disentangled.

I realize that the Executive Director can perform some of these tasks but he cannot be all things to all men.

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5. Future of the Council

Noting my remarks above as to the management needs, I would suggest the following.

The Council should place its efforts on medium and long term projects and leave immediate policy problems and the science management coordinating function within government to MoSST (which will have plenty to do).

The Council by its very independence, and with sufficient resources, can play a very valuable role in providing research input significant to future policy-making without fear or favour. Public credibility requires a respectable level of independence and it is in the government interest to support and occasionally tolerate opinions and advice from such a body. The Council can, in addition to its policy research and advisory functions, be a valuable agent in stimulating debate and providing a forum for informed and controversial points of view. Up to now I must admit the Council has been too stuffy and rather restrained in private debate or public commentary except on a few occasions.

I also believe that a well informed and authoritative Science Council, with public credibility, will help the government of the time by keeping it "honest" and less apt to loose policy decisions of expediency. Such a role would actually strengthen MoSST's dealings with both the cabinet and the more carnivorous line departments. If we do indeed have a real democracy, then an outspoken but responsible and authoritative voice on science policy will be one of its pillars.

Another role of the Council is to act as an interface between government and the public (both general and scientific). No department could ever do this job effectively, no matter how well intended. Furthermore, federal-provincial one upmanship being what it is, any effective mechanism to coordinate science policy in Canada and involve the provinces (and provide needed support) must be safely clear of the BNA Act. In this area, the Council is just beginning to tool up and has great promise.

In summary then, the Science Council may have a few cobwebs and has been a bit of a Pollyanna on occasion, when it should have been D'Artagnon but by enlarge it has played a most valuable role as a focus of real science policy advice and it has a distinct and important role for the future which will complement but not conflict with MoSST. If it is ever reduced to a ministerial advisory council, without an independent and public role, it should be abolished and if this comes to pass, Canada will be the poorer.

Univ... ... ...
Waterloo, Ontario

Dear Howard:-

I am sorry that the pressure of the close of an academic year has made it impossible for me to respond before this to your most welcome letter of 19 March.

I want very much to be able to say that the Science Council has made a demonstrable impact on the scientific community. I believe in some areas it has had an impact, but not an impact necessarily through the enlightened choice of the workers in the scientific community. By this I mean that I feel that granting agencies and political (and quasi-political) decisions have been made, based on Science Council recommendations and actions which have affected the scientific community. These have not always been good, but they have had an impact. Recently Pat McTaggart-Cowan was here and he made a statement which I have to admit stunned many members of his audience. He said that it was very much the plan of the Science Council to get the ideas in action before the reports presenting these ideas were made public. Now, I know that to a certain extent this is a desirable thing, but I have heard comments that it is a practice in large measure to be regretted. If the reports are written to elicit discussions and to get the scientific community thinking about an issue, it does seem rather anti-climatic that the community has to be told that what they are supposedly discussing (and are to decide) is already well on its way to being a closed issue.

By and large, the Science Council reports are excellent studies of important areas of science in Canada. I have welcomed them and I have learned from them, but I also find that many scientists are afraid of big science and the big science machinery.

The Science Council should continue its work and should continue to deliberate and to evaluate the status of Canadian science.

If there was only some way that the bench scientist could be more intimately involved.

Waterloo, Ontario.

Dear Dr. Petch:

Thank you for your letter of March 23rd, regarding your review of the Science Council Act and related matters.

I am glad to reply for although I have not been a member of the Science Council I have served on many of the councils and committees in Ottawa and I have been the chairman of one science council committee and a member of two others.

I assess their condition by two philosophical considerations. The first is the importance of distinguishing between the presentation of information and the offering of advice. All too often these are confused, even in the minds of scientists, therefore there is much to be said for bodies which do not offer advice, but which merely collect and present the best information available, including, in many cases, divergent opinions on a scientific matter. Many bodies and people are always ready to give the Government advice, but before action is taken scientific advice must be tempered by political and financial considerations and the vested interests of concerned groups.

It is interesting to note that although the National Academy of Sciences is commanded by law to advise the American Government it does so rather reluctantly and chiefly relies for its strength on no less than 550 continuing panels of experts which employ 8000 unpaid scientists, most of whom are not fellows of the Academy and some of whom are Canadians. The Royal Society in London goes further and never offers advice, although it holds weekly meetings to present the individual views of scientists. It also maintains continuing panels of experts.

The second philosophical consideration is the question of what type of organization best enables scientists to offer advice or express opinions. To my mind there are two desirable approaches.

The first is that a minister should be advised in secret by permanent civil servants. Because these men and women are secure in their positions and do not state their views publicly they can offer advice freely and the minister is able, if he so desires, to reject their advice without harm to the civil servant or loss of face

to anyone. Canada is well known to be fortunate in having been able to attract many of the ablest men in Canada to the Civil Service, which has a well founded reputation for excellence. Nevertheless I can say, having been a civil servant myself, and having grown up as the son of a civil servant, that the views of civil servants although generally sound, tend to be conservative.

The second form of desirable organization is a body which is completely independent of the government which is in a position to offer advice and opinions openly. In this case the government has no responsibility for the views since it did not appoint the members and can ignore the advice without detriment to either party.

It seems to me that other forms of organization such as the appointment by the government of councils to offer advice in public are less sound. Unfortunately in Canada this is the usual course followed for example in the National Research Council, the Defence Research Board, the National Advisory Councils for many other ministries; and now the Science Council. In practically all these bodies members are appointed for a three year term subject to one renewal. It is true that these bodies have enlisted the services at one time or another of many of the ablest Canadian scientists, but this should not disguise the fact that these appointments are political. What else can one say on reading a certificate which one receives on appointment from the Governor General stating that one has been appointed "by and with the advice of the Privy Council for Canada".

Since in general the appointments have been good ones, the system has seemed to work well on the surface. Unfortunately this is deceiving because most of the councils do not do all that they might. On the one hand they are harmless and create no fuss. An extremely senior scientist from another country told me that after he had spent some days in Ottawa on behalf of the Lamontagne Committee, he "could not believe that the situation in Ottawa was genuine because it all seemed too cosy to be true". All of these bodies do some things well. They distribute grants and scholarships fairly and they discuss many relatively minor technical problems well. It is in major matters of science policy that they fail. The method of appointment inhibits free expression of opinions. These councils tend to follow government policy instead of helping to create it. They rarely criticize.

This is because the method of appointment has been such as to ensure that no one is appointed for long who is outspoken. Those who have been appointed have been for the most part university men in their middle years who have been dependent upon the government for research grants. Furthermore, remuneration and opportunities for travel - both to meetings of the Councils in Canada and to international meetings - have been plums largely at the control of the presidents of these councils so that the members have rarely raised any controversial issues. The scientists have been happy to receive their individual grants, their travel allowances and their freedom to choose any kind of research they have liked, whether it is likely to be useful to Canada or not.

It is the Government which has not been satisfied with the advice it has received nor with the scientific effort in Canada, and this has been made abundantly clear by the reports of the Glassco Commission, the Lamontagne Committee, the O.E.C.D. Report and the Report by Mr. R. S. Ritchie.

The National Research Council was founded in 1916 to give advice but it is well known that it found it next to impossible under the circumstances to do so. Instead of recognizing that it was the system that was at fault the government set up a whole series of other advisory boards and commissions to different departments in the same manner, which were also supposed to give advice but which in fact, like the Research Council, have been kept busy with details.

When the government found that these bodies were also not fulfilling a broad enough function, it created the Science Council and again the same method was used. In its first few years the Council has been extremely industrious. It has appointed a number of committees for brief terms to investigate matters and on the whole these have been useful, but it seems likely that the method of appointment of members will ensure that it will soon become a decreasing value as have the other councils.

I do not wish to attack the Science Council or the other Councils. I have already praised Canadian civil servants. It is the system not the efforts of these bodies which has been poor. What I want to point out is that two things are lacking.

The first is the need for panels of experts to deal with technical matters on which the members, although subject to some rotation and change, serve long enough to become truly knowledgeable. It was my feeling when I served as Chairman of the Committee on Water Resources and as a member of the Committee on Earth Sciences of the Science Council, that just when I had developed an interest and some background knowledge of the subjects that these committees were thanked and disbanded. In contrast, I notice, when I was asked by the Department of Indian and Northern Affairs to prepare a paper for the Mont Gabriel Conference, that my chief source of abundant and reliable technical information about the Canadian Arctic and about Canadian resources were reports published by panels of the National Academy of Sciences in Washington. With the winding down of the National Research Council associate committees and the very short terms of the Science Council committees there are no such bodies in Canada on which people serve for many years and develop a true expertise and experience.

The reason I had confidence in these American reports was because they were compiled by men including several Canadians with a wide variety of backgrounds who were appointed not by the government but by the National Academy. They were unpaid and they served for long periods. They could present their candid views with the maximum freedom.

Academies like the National Academy of Sciences and the Royal Society of London exist in every major country of the world. They have it in common that they have strong charters and are often old, that the fellows are appointed for life solely on the grounds of scientific excellence (some academies have a special clause whereby a few members may be appointed for contributions to help science).

It is unfortunate that my recent investigations of the matter which I have written up elsewhere show that the Canadian academy, The Royal Society of Canada, has less government support than the academy of any other major country. Its grant is only one thousandth that of the National Academy and one hundredth that of the Royal Society of London. On the other hand, the Canadian fellows by paying higher fees do more to support their academy than those in any other major country. It is sometimes held that because fellows are appointed for life to avoid political manoeuvring they are old and inactive. The fallacy of this argument is that when an academy is supported and is active much of its strength lies in its panels, whose members are usually younger and far more numerous than the fellows. The National Academy has 8000 panelists but only 1000 fellows.

I am not quite sure what your report is to do but I think that you might emphasize the fact that Canada has an abundance of excellent civil servants, many of whom are scientists (although practically none of these are in senior positions), but that it has a system of politically appointed committees which are impotent to make strong recommendations about science policy. Canada fails to support its academy which would enable its senior scholars to express opinions freely. It is this lack of an independent voice and lack of continuity in its councils that has been a handicap to Canadian science.

It is a curious thing but it is the government committees that have been complaining about the state of science in Canada and not the scientists. The government has done little to interest Canadian scientists in Canadian science policy and it has to a considerable extent driven them to seek their reputation abroad. One can do this without going abroad. The only time since 1950 I ever published in Canada any of my ideas which I considered important was in one case wher the paper had been rejected in the USA.

From an international point of view Canadians have done extremely well. Three of the dozen major scientific unions of the world (physics, chemistry and geophysics) have at the moment Canadian general secretaries, and by examing the Year Book of the International Council of Scientific Unions, I find that Canadians play a greater part in international scientific committees in proportion to their numbers than do those of any other country. Although they are a long way behind the U.S.A. and the U.S.S.R. in total numbers they are very close to the three major countries of Europe and far ahead of all other countries. This suggests that Canadians have found it easier to make a reputation for themselves abroad than at home.

I am grateful to the Canadian granting agencies for ample money to do the research I have wanted, but I have found the environment in Canada stultifying. I never felt free to speak openly at National Research Council or Defence Research meetings and few opportunities were ever given to present opinions. As soon as I had become interested in Science Council committees, they were disbanded. I have not found Canadian technical societies or Canadian journals very good outlets. I think the reason is the discouragement of controversy. The Canadian Journal of Earth Sciences, for example, has just stated that its policy is not to publish symposia (vol. 9, No. 12, page i). Unfortunately it is in symposia, panels, discussions and controversy that the greatest interest often lies.

The sad fact is that in Canadian science all major power and major sources of funds are in the hands of the government, of councils appointed by the Privy Council and in sub-committees appointed by the president of these councils. There is no independence These bodies have not abused their power, but being sensible and human they do not appoint controversial figures or those likely to disagree with their views.

Every other major country supports an independent academy better than Canada. These are not radical bodies, they have in the long run to maintain a symbiotic relationship with their governments. Even in the communist countries academicians are not appointed by the Cabinet, but by their fellow scientists and yet they are allowed great power.

In Canada the direction of science is completely politicized and this is the whole of what is wrong with it.

These are dictated reactions as I have no time for more, but I hope they are of some use. I should be glad to have even a brief reaction to them as I should like to rewrite them in better form for publication.

With best wishes,

Yours sincerely,

Dr. H. E. Petch,
Vice-President, Academic,
University of Waterloo,
Waterloo, Ontario.

Dear Howard,

After receiving your letter about the Science Council I started to try to concentrate my thoughts on its work and its impact, but soon realized that I had very little real knowledge about its activities or overall programme. This is much more a self-criticism than a criticism of the Council; my shelves give ample evidence that it has produced documents and reports enabling it to easily survive a 'publish or perish' test! Why have I not read them? Two reasons come to mind: the first and obvious one is , of course, that time is limited and I just haven't been able to get around to them; the second is perhaps more subtle and is related to the inability of the Council to do anything except 'recommend'. It is up to others to implement and 'the others' naturally have minds of their own and will implement their own ideas in their own order of priority, only using the Science Council's ideas as suggestions or hints. If time is limited one tends to listen to the words of the 'implementers' more carefully than to those of the 'advisers'.

I think I am saying that the Science Council has not had much effect yet but that gradually, by osmosis almost, its ideas will change policy but at a rather slow rate, and with priorities set by others.

First, I should comment on my impression that it has not had much effect yet. I have been for many years a member of NRC and must confess that I tended to concentrate more on the day-to-day activities than on the larger policy

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questions. I did not see a major effect of any external agencies on the day-to-day activities - these developed in the way one might expect in any implementing agency and the decisions were usually taken by NRC itself ; useful and constructive consultation occurred occasionally but not as a matter of course. It is difficult for me to decide whether the Science Council or any other group affected the long range policy of NRC; for a while NRC went through a period of great fear, but nevertheless continued to evolve its own overall policies. I really don't think the Science Council greatly influenced these policies, but, as I said above, it may well do so in the future if the NRC continues to exist in its present form.

A much more significant body from the short-term point of view seems to be the MOSST. And it is frankly one about which I am a little apprehensive. This is perhaps because the 'permanence' of its most senior members almost automatically leads to them becoming steadily further and further out of touch with realities of the scientific world. The short-term appointments are re-assuring, but when the permanent members are ambitious, and perhaps even power hungry, the situation is a bit worrying.

To come back to the Science Council, I hope that it will continue in roughly its present form. Its recommendations are at least public and can therefore be commented on by scientists at large. Its advice appears to have been very well researched and, in general, is receiving acclaim - though here I am quoting others, since I have not read even a modest fraction of its reports. Its membership rotates and there is therefore no fear of it losing touch. Furthermore, its members have so far been individuals of the highest calibre in whom most of the scientific community can have confidence.

A very fundamental question arises when one thinks about the Science Council, MOSST, Scitec, Senate Committees etc. etc.: can one really influence th

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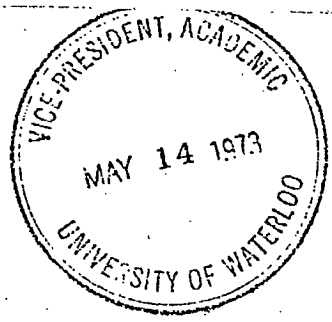
development of science by creating scientific policies ? I used to think one could do so profoundly, but I have gradually changed my mind. Scientists will nearly always work best when they do what they want to do. It is only when there is a national emergency or an almost overwhelming economic necessity that a tremendous scientific effort can be polarized and directed. Neither of these situations exist at the moment.

Certainly, more oriented, relevant or applied development work will be done in the near future, but the driving force will not be planning but rather increased economic reasons. These will not be overwhelming and will therefore only produce relatively minor and slow reorientations of the national scientific effort. I predict that they will not be greatly influenced by MOSST. However, they may (gradually and on a long time scale) be influenced by the Science Council.

In summary I must again confess that I write without great knowledge! But, whereas it must be apparent that I remain to be convinced about the usefulness of MOSST, I feel that the Science Council performs a needed task and personally would support its retention in its present form.

Yours sincerely,

May 11, 1973



Dr. H. E. Petch,
Vice-President,
University of Waterloo,
Waterloo, Ontario.

Dear Dr. Petch:

I apologize for the delay in replying to your enquiry about opinions on the impact of the Science Council and its activities on the scientific community. On investigation I find that I have not read all of the reports, and that I have a number of questions about the role of the Science Council. Perhaps these gaps in my knowledge which seem to be shared by a number of people to whom I have talked are an indication that the awareness of the Science Council and activities is not as great as it should be.

My general impression is that the Science Council is respected as a body, but there has been some criticism that the selection of some of its members has been based more on representational considerations than on scientific knowledge. In view of the fact that the Council is small and has a limited number of people from any discipline, weak areas of membership lead to major neglect of certain disciplines. Most would agree that it is valuable to have a knowledgeable advisory body to government, but that such a body will only serve the purpose for which it was intended if it is highly respected both by government and the scientific community.

While the Science Council should be broad enough to cover the full spectrum of science, it is difficult for it to do specific jobs without extensive use of outside people and at the same time keep a reasonably small membership. It is also the case that many of the issues being analyzed by the Science Council are complex ones and involve both social and economic

considerations as well as scientific factors. Since the social and economic considerations may be of paramount importance in terms of implementation of the recommendations by government, any weakness in these areas in the reports will seriously handicap the chance of implementation.

Most of the reports have been carefully done and the conclusions represent a valuable overview which, until very recently, was missing on the Canadian scene. Some of the reports have been criticized for major gaps or limited viewpoint. In general the impact of the good reports seems to have been less than one would have anticipated both from the standpoint of action by government and understanding by the scientific community. The reports do not seem to have been as widely read as one would have expected in view of the effort which has gone into them.

Many would be enthusiastic about the independent situation of a Science Council which is advisory to government, that is, independence in relation to the operating departments. On the other hand, if the Ministry of State for Science and Technology is to be the active policy vehicle at Federal level, then a separate and independent Science Council poses the danger of duplication of effort and dual channels of recommendations on science policy. Furthermore, there may be some doubt whether the independent location is of assistance in influencing government to implement policy recommendations. Unless the Science Council truly represents all of science, then other interest groups in the selected areas may well have greater clout in policy recommendations.

Yours sincerely,