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THE FUTURE ROLE OF RESEARCH IN FOREST PATHOLOGY.

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Northern Forest Research Centre
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Edmonton

THE FUTURE ROLE OF RESEARCH IN FOREST PATHOLOGY

Introduction

If you look carefully at the program, you will see that I have been given the task of discussing the future role of research in WIFDWC. To keep my head as straight as possible on this subject, I have taken the liberty to replace the words "WIFDWC", which describe a conference of forest pathologists, with "Forest Pathology", which is a scientific discipline. The topic of my discussion is therefore "The future role of research in forest pathology".

I will spend some time discussing my interpretation of a proposed Science Policy, the organizational framework for the various types of research, and the facilities in which scientific investigation will be carried out. All of these are, at this time, only Science Policy recommendations, that may or may not be implemented by the various governments we are going to have in the next 20 years. It is only in the light of this predicted framework, and in the light of the future of forest industrial development on this continent, that the future role of research in forest pathology can be discussed. This means, that the basis of my predictions may be subject to sudden change, for this basis itself is a prediction. I am therefore notifying you herewith, that I am not going to be responsible for what I am about to say!

One of my basic assumptions is that our society, in the next twenty years, will still be profit-oriented. That those forces which are beginning to advocate zero population growth and zero economic growth, will still be no match for the political and economic elites who are benefitting from the status quo.

Most of you will agree with me that the merits of science are presently experiencing a period of intense questioning and debate in the developed countries of the world. The current atmosphere of uncertainty pervades the entire spectrum of scientific endeavour: the physical sciences, the life sciences, and the social sciences.

Forest Pathology is but one of the many disciplines in the life sciences in which past accomplishments are being appraised in the light of current needs, and in which serious attempts are being made to formulate new policies which will be in phase with predicted increases in rate of change in technologically advanced societies such as ours. A discussion of the "Future role of research in forest pathology" can therefore not be divorced from a consideration of the organizational and philosophical framework of a proposed Science Policy, which will have profound effects on all scientific work, not on forest pathology alone. Within the framework of predicted targets for Science Policy, I will make an attempt to predict what the future holds in store for research in our discipline.

In order to present my views in a structured way, I have found it necessary to define the various types of research in terms well known to all of you, and to discuss the proposed agencies and organizations that are believed to be particularly well suited to engage in these categories of research. For this part of my discussion, I refer to the Lamontagne Report, Volume 2, and less frequently to the so-called Keyboom Report, entitled: "Science in a Changing Environment - Proposals for a Departmental Science Policy".

Research Defined

Scientific activities comprise all activities concerned with the creation of new knowledge in the physical sciences, the life sciences and the social sciences, or with the applications of scientific knowledge for

useful purposes. Five classes of scientific activities are to be distinguished: i) research and development, ii) data collection, iii) scientific information, iv) testing and standardization, and v) education. To date, forest pathology has covered this entire spectrum of scientific activities in the Federal Research Laboratories, in Forest Products Laboratories, and in the Universities. In the future, forest pathology will continue to be engaged in all of these activities, but there will be considerable shifts in emphasis from one class of activity to another. I will discuss one of the five categories mentioned above, namely research and development. I do realize that many forest pathologists are presently chiefly engaged in data collection and others in scientific information. Dick Parmeter will discuss education.

Research and Development

This class of scientific activity has its own spectrum of distinguishing characteristics, ranging from "pure" or basic research, to applied research, or technical innovation. Applied research may be defined as original investigations undertaken in order to gain new scientific or technical knowledge. This is directed primarily towards a specific practical aim or objective, which is market oriented. In industrialized societies, we tend to associate Applied Research or Applied Science with Engineering, which is classed in the Physical Sciences. In Forest Pathology, research in the Forest Products Laboratories would most closely approach the definition of Applied Research.

Basic Research is conceptually divided into two types:

- i) Curiosity-oriented basic research
- ii) Mission-oriented basic research

i) Curiosity-oriented basic research stands alone. The purpose of curiosity oriented basic research is imposed by the inner logic of the discipline, and problems are chosen by the researcher on the two criteria that (1) they are likely to be soluble and (2) the solutions will be relevant to current concepts in the discipline. In such research the problems can not be defined by persons outside the discipline and the solutions are usually completely restricted to the framework of abstract concepts within the discipline. The proposed organizational base for curiosity-oriented basic research is the universities, but more about this later.

ii) Mission-oriented basic research is less abstract and autonomous because the goal lies outside the particular scientific discipline. The actual scientific work is still done by the methodology of basic science, but its intrinsic purpose is mediated by an extrinsic purpose. The choice of extrinsic goals can not be determined by the methodology of science. The objective of mission-oriented basic research, may, for example, be a response to the technological requirements of a practical mission, and these requirements can even indirectly nurture the field of curiosity oriented research. I will argue later that most of the published research in forest pathology in the last twenty years may be considered curiosity-oriented research which developed from a formulation of economically impractical mission-oriented requirements. The proposed organizational base for mission-oriented basic research will be Research Institutes administered by a National Research Academy.

The Development of a Science Policy Framework

How do responsible people in the Canadian Federal Government value scientific activities in society? They see three broad purposes in society: i) cultural enrichment; ii) economic growth; iii) public welfare. They feel that the main tasks of science policy can be most easily identified within the framework of these three major purposes. They state that cultural enrichment must increasingly become an aim of our society, and that scientific discovery and the advancement of pure knowledge is a vital element of our cultural life and civilization. They recommend that affluent societies in particular must encourage basic science for reasons similar to those demanding that they support the arts, that is to say, as a sector of high culture and disinterested intellectual activity. The Senate Special Committee on Science Policy lists the following main considerations as basic to the development of a Science Policy:

- 1) Curiosity-oriented, basic research is responsible for the life and progress of science
- 2) The rate of increase in curiosity-oriented basic research activity in Canada during the sixties, was one of the highest in the world. (You may remember that Bart Van Der Kamp warned us in 1969 in Olympia that the rate of growth of science was unhealthy and could not be supported by the country much longer.) As a result of this period of rapid growth, this country is now spending a higher proportion of its Research and Development budget on basic research, than many other advanced countries.
- 3) We must therefore now enter a period of transition toward maturity in which emphasis is placed on quality rather than quantity.

- 4) We must not be hypocritical about the motives for our curiosity-oriented basic research activities. The goal namely the development of science itself, should be clearly realized. It should not be necessary to put forward proposals for such work under the cloak of an extrinsic pragmatic goal.
- 5) Excellent or promising basic scientists must be strongly supported.

Research Facilities

Curiosity-oriented basic research will be carried out in universities and similar institutions of higher learning, mission-oriented basic research will be carried out in federal research institutes, and applied research or technical innovation and development will be carried out in private industry.

Universities

The basic function of Universities and similar Institutions will be teaching and research aimed at training students in scientific investigation and scientific methodology. The primary responsibility of University teachers will be teaching, not research. The publish or perish syndrome will be removed from the career development of University teachers.

Curiosity-oriented basic research will be carried out by scientists using University facilities. In principle, research scientists will not be responsible to faculty or students. Their salaries and research funding will be the exclusive responsibility of the federal government, which will institute three grant-giving foundations, one each for the physical sciences, the life sciences, and the social sciences, to finance curiosity-oriented basic research.

Federal Research Institutes

Mission-oriented basic research will be carried out in Research Institutes. Problem recognition and the formulation of goals and objectives will be the joint responsibility of the "Customer" (whether it be Private Industry or a Provincial or State Agency) and the research workers. Research projects will not be long-term, but short-term projects, and will probably be financed on a contract basis. Mission-oriented research projects will be tackled by teams of scientists rather than by individuals, and it is anticipated that these teams of scientists will dissolve at the completion of 2- or 3-year projects, and that new teams with different combinations of scientists will be formed at the commencement of new 2- to 3-year projects. It is also predicted that there will be an increased mobility of scientists, who may be assigned to new research teams in other regions of the country. I personally feel that there will be ^{resistance} ~~a revolt~~ in society against "suitcase careers", and that this aspect of future mission-oriented basic research will have to be very carefully evaluated in terms of public welfare, which is one of the three broad purposes of society, as responsible people in the Canadian Federal Government see it.

Industries

Applied Research or Technical Innovation and Development will be carried out by industry. This type of research will be almost exclusively of a technical, not a biological nature, and will therefore be of only marginal interest to the biologist. Forest Products pathologists will have the closest contact with Applied Research.

Forest Pathology and the Future of North American Forest Industries

I realize that my discussion up to this point has been entirely oriented to the Canadian scene. However, it was recognized by Lamontagne and his Committee that no country lives in a vacuum, and that Canada in particular will reflect, to a considerable degree, the type of science policy that will develop in the United States.

So how does Forest Pathology in North America fit into this framework of Science Policy? Remember that we now make predictions about one scientific discipline, the future of which will not only depend on the implementation of the recommended Science Policy, but also on predictions of the development of forest industry in North America.

I will now make a few predictions about the future of forest industries.

1. The cost of labour will continue to rise. Mechanization of harvesting and processing will continue to offset high labour costs. The consequences of increased mechanization in tree harvesting, and increases in labour costs are that individual tree treatment will become economically even more impractical than it is today. Hence forest disease control measures requiring individual tree treatment will be economically even more impractical in the future than they are today.
2. When annual harvests approach the Annual Allowable Cut, forest disease problems associated with mature and overmature forests will be all but eliminated.
3. There will be an increase in the number of tree nurseries in North America. Pathology problems in seed storage, and seedling pathology, will be reduced to acceptable limits by improvements in tree nursery management

and increases in numbers of nurseries will hopefully, but not necessarily, provide potential jobs for forest pathologists.

4. Increases in production costs will increase the value of dimension lumber and pulp chips. Prevention of the deterioration of wood products in storage or in use will increase in importance. Forest Products Pathology has therefore a bright future.

5. There is a definite possibility that forest industries in North America will continue to face increasing public opposition to mechanized harvesting practices which imply clearcutting on an ever increasing scale. I think we will live to see American and Canadian Forest industries expanding and harvesting more pulp and dimension lumber in tropical forests than in north temperate zone and subarctic forests in the next twenty years.

The Future Role of Research in Forest Pathology

I have conjured up a future framework for you, on which forest pathology research depends. Let me now put meat on this skeleton.

1. Curiosity-oriented basic forest pathology research will be conducted mainly in Universities. There will be no need to pretend that the results of curiosity-oriented basic forest pathology research will save American and Canadian forest industries or the public millions of dollars upon completion of the research project. The only justification for curiosity-oriented basic forest pathology research will be to increase our understanding of the processes of host-parasite interactions, or to increase our knowledge of the biology and physiology of trees subjected to biotic or abiotic stress. Only the best scientists will get financial support for curiosity-oriented basic forest pathology research. They will not be required to teach.

2. Mission-oriented basic forest pathology research will be conducted in Institutes for Life Sciences. There will be very close coordination, at the highest management level, with forest industries, and with Provincial or State Natural Resource Management Agencies. Forest Pathology problems will be identified, and the goals and objectives formulated by representatives of these agencies and forest pathologists at the highest management level. From a purely economic point of view, forest disease problems in western forests will be considered of minor importance, in view of sky-rocketing labour and equipment costs, and in view of the fact that more sound wood is presently wasted in crude processing than is lost because of disease. We will therefore not see an increase in numbers of forest pathologists who are actively engaged in what we have up to now called mission-oriented research. ~~The bright~~

3. The bright note in predictions of future research in forest pathology, is the work that will be carried out in Forest Products Laboratories. As I mentioned earlier, the deterioration of dimension lumber in storage, or in use, or of pulp chips in storage, represents a significant loss in investment. The goals and objectives of research projects in forest products pathology are therefore easily formulated, and there is no need to drift off into curiosity-oriented basic research because problem recognition, and the formulation of goals and objectives were done by pathologists without consultation with the industries they were supposed to serve. Because of their very close links with industry however, forest products pathologists will be conducting research which will be partly mission-oriented basic research, but also applied research, since its goals and objectives are market-oriented, and therefore clearly formulated.