regarding the nature and quality of the data produced by such studies, and the way in which the data can and should be used. For example, when is a threshold a true threshold and when is it a culturally determined number?; and how do we assign differential weights to the various components making up a set of environmental indicators?

Environmental scientists must come to grips with the problems of mathematical modeling of environmental systems. Some models are based on oversimplifications, while other models for smaller systems are highly multivariate with all variables incorporated in the modeling procedure. Which is the best approach for a given system? How sensitive are environmental models to changes in assumptions?

The half-day symposium entitled "An Evaluation of Forrester-type Growth Models" (26 December), arranged by Otomar J. Bartos of the University of Colorado, will examine growth simulations by comparing them with the known past. While these tests encounter numerous technical difficulties, a comparison of the actual development of four American cities with that predicted by the model suggests that the simulation is too pessimistic.

Does this comparison constitute a meaningful test of the model? What other ways of evaluating the model are there? What improvements, if any, are possible? The scientists participating in this symposium will seek answers to these questions.

Achieving Public Interests in Management of Land Resources

In Congress, in state legislatures, in county and regional planning bodies, and among the concerned public, there is a growing recognition that more effective land-use control is necessary to achieve more attractive, functional, rational, and environmentally sound patterns of land-use. The problems involved in the management of land resources are familiar, but rational solutions have been lacking.

Despite the apparent wide consensus on the importance of land-use controls to improve the quality of life, protect the environment, and meet the needs of population growth, the actual techniques of social control to accomplish land-use objectives are still quite primitive. Existing constitutional doctrines and legal theories for such control are narrowly based and social institutions for rationalizing the interrelated elements of land-use into effective public policies are woefully inadequate.

The symposium "Property Rights and Controls: Techniques and Institutions for Achieving Public Interests in Management of Land Resources" (27 December, Washington Hilton), arranged by Norman Wengert of Colorado State University, will examine what is known and what needs to be done to develop improved land-use controls.

Attorneys, economists, land management experts, sociologists, regional planners, political scientists, and others will be included in the program. Particular topics on which individuals will speak include: constitutional limitations on the control of land-use; relationships between population density or dispersal and land-use settlement and control; policies and problems related to land-use controls in megalopolis; managing growth in a fragile environment; prospects and problems of new towns; emerging federal interests in land-use controls and developing patterns of intergovernmental relations; and the political realities of land-use control.

This symposium promises to be one of the outstanding programs in this year's meeting as well as one having considerable relevance for the greater Washington, D.C., area.

NEPA: In Context, in Detail, in Court

Three programs in this year's meeting will focus on aspects of the National Environmental Policy Act (NEPA). One will examine broadly the act itself in the context of recent court decisions; the philosophy, methodology, and vigor of government agencies complying with NEPA; and the developments in environmental impact analysis.

A second will focus on the changes in the design requirements and the economic and national security issues surrounding the Trans-Alaska pipeline in order to examine the social-environmental decision process.

The third will examine and assess collaboration between lawyers and scientists in the environmental and public interest areas.

The National Environmental Policy Act of 1969 establishes a new standard of public accountability for the federal administrative agencies. NEPA places added responsibilities upon the agencies and the public alike to develop an environmental ethic and higher level of planning for public projects.

The act requires that the agencies now issue a comprehensive environmental impact statement on each federal action significantly affecting the quality of the human environment. As is now well known, noncompliance with the requirements of NEPA creates a cause of action enforceable by a citizen's lawsuit in the federal courts.

Despite the issuance of the primarily procedural guidelines of the Council on Environmental Quality and the development of the preliminary interagency draft review procedure, there is still a wide disparity in the quality of the statements which the agencies prepare. It has been the courts which have sharpened the substantive content of the impact statements.

Practical uncertainty still surrounds the state of the art of systematic environmental analysis and a proper balance must be struck between the data demanded for compliance with the act and the expense, staffing, and time limitations imposed upon the agencies.

At the Interface of Law and Science

The symposium entitled "The National Environmental Policy Act: At the Interface of Law and Environmental Science" (28 December), arranged by James W. Curlin of the Environmental Policy Division of the Library of Congress, will bring together lawyers, scientists, and administrators to discuss various aspects of NEPA in an interdisciplinary forum. Legislative history of the act will be discussed in the context of recent court decisions.

Agency representatives have been asked to discuss the current philosophy and methodology applied by their respective agencies in complying with NEPA. Representatives of the conservation organizations and intervener groups will comment on what they preceive as weaknesses or strengths of the agencies' approaches. Environmental scientists will discuss current developments in the methodology of envi-

ronmental impact analysis and the potential for applying the developing knowledge of ecosystem analysis and regional analysis to the evaluation of environmental impacts.

Hopefully the symposium will stimulate those in the environmental sciences into considering the practical needs for better methods of environmental impact analysis geared to the needs of the agencies and responsive to the desires of the conservation organizations and public interest groups.

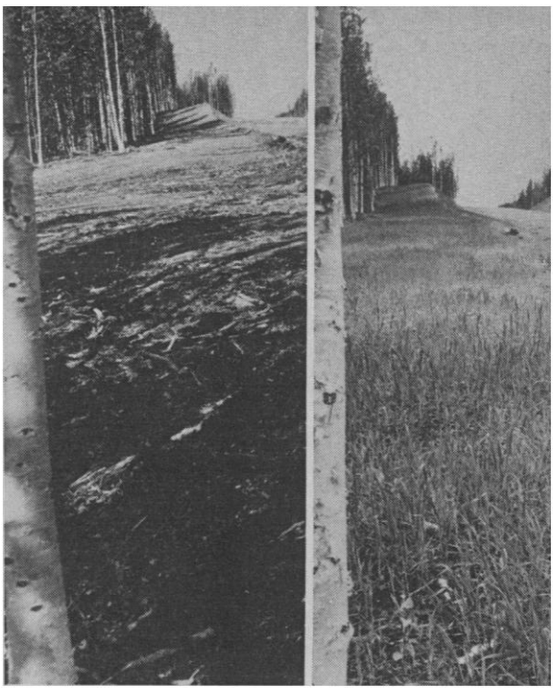
The Trans-Alaska Pipeline

The Trans-Alaska Pipeline is a prime example of a new social-environmental decision-making process which has been and still is evolving. It is doubtful that any proposed development or land-use change has received as much public attention, investment of time and money, or exchange of legal and scientific information as the pipeline.

Although attention is now focused on the case before the courts, the fundamental issue is the extent to which NEPA, and the environmental impact statement procedure it requires, can ensure a thorough analysis of alternatives and a complete examination of the design requirements necessary to protect the environment. A case study of the pipeline presents an ideal opportunity to focus on the possible and probable results of the proposed development and the results of the impact statement process, as compared to the procedural requirements of the law. The basic question to be answered remains, "How important is the environment?"

Three major groups are at the center of the debate: the Department of Interior and its Secretary, Rogers C. B. Morton; the Alyeska Pipeline Service Co., a consortium of seven major private oil companies; and the Conservation-Citizen's Action Organizations—The Wilderness Society, Environmental Defense Fund, Inc., and Friends of the Earth—working through the Center for Law and Social Policy.

The center gained the support of an active group of scientists and lawyers, who rapidly produced four huge volumes of scientifically based opinion in an attempt to persuade Mr. Morton that the impact statement was not adequate. Mr. Morton did not agree, and on 11 May 1972 he announced that he would issue the permits requested by Alyeska. On 15 August 1972 District Judge George L. Hart, Jr., dissolved the injunction he imposed in April 1971. It is anticipated that the case will reach the Supreme Court by early 1973.



A section alongside the 56-mile road between Livengood and the Yukon River in Alaska; (left) in July 1970, just after construction, and (right) in August 1970, after reseeding with quick-growing annuals to help prevent erosion. [Alyeska Pipeline Service Company]

Given this dramatic setting, it is timely that the AAAS examine the meaning and effectiveness of NEPA and the social-environmental decision-making process of this major case.

A 1-day symposium entitled "Anatomy of a Social-Environmental Decision: The Trans-Alaska Pipeline" is arranged by Gordon A. Enk of the Institute of Man and Science. It will be an in-depth examination of this significant and far-reaching case.

The symposium will focus on two sets of issues: the changes in the design requirements imposed on the Alyeska construction; and the economic and national security arguments surrounding the case.

The morning session of the symposium will examine the scientific information and decision-making process behind the three design requirement changes which occurred during the impact statement process.

The impact statement clearly showed that insufficient attention had been given to using available knowledge of the effects of oil spills in marine environments and available predictive models to determine those effects. In the afternoon session, a four-member panel on each issue (economic and national security) will examine the strengths and weaknesses of the positions of the federal government, Alyeska, and the citizen's group.

This symposium will present an opportunity to study a dynamic topic, while it is still dynamic.

Scientists in the Legal System

Society's increasing dependence upon science and its continuing reliance upon law to resolve conflicts prompts an examination of how scientists contribute to the legal system and how to better incorporate the viewpoints of science and scientists in that system.

The scientific and legal systems stem from a common historical purpose of ascertaining the truth, but the approach of each differs markedly. Lawyers need the best possible answers as soon as possible, whereas scientists generally do not work under such limitations.

Lawyers need to become more familiar with science and scientific philosophy. Science now is an integral component of our culture and in fact pervades many of the current local, national, and international political issues—issues that will be decided almost exclusively by nonscientists.

Although scientists seem to be awakening to the realization that a need exists for their talents within the legal system, they cannot expect to influence society through law without some knowledge of how that system utilizes science.

During the 1-day symposium entitled "Scientists in the Legal System: Tolerated Meddlers or Essential Contributors?" (29 December), arranged by William A. Thomas, Environmental Program, Oak Ridge National Laboratory, distinguished lawyers who have worked with scientists under varying circumstances will discuss these issues in a series of short, provocative presentations.

The morning session will examine the interface between science and law as competing or cooperating social forces. The afternoon will examine specific instances of how scientists contribute their knowledge and ideas to help courts reach sound decisions, legislatures enact scientifically defensible laws, regulatory agencies function competently, and citizen groups serve society better.

The symposium will present an overview of how the legal system operates and hopefully impart an appreciation of how essential to its operation is science and how scientists as individuals can serve both professions.