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4S Society for Social Studies of Science

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ABSTRACTS OF PAPERS OF THIRD ANNUAL MEETING

SESSION I. KEYNOTE SESSION

"Comments on the Fragmented History of the Psychology of Science"
Donald Campbell, Department of Psychology, Northwestern University,
Evanston, Illinois 60201

This consisted of informal comments on the following:

Fisch, Rudolph, "Psychology of Science," in J. Spiegel-Rosing & D. de S. Price, Science, Technology, and Society: A Cross-Disciplinary Perspective, London and Beverly Hills: Sage Publications, 1977, pp. 277-318. (This contains some 300 references, half of which would be psychology of science by a narrower definition, including 33 in a long series on "Psychology of the Scientist," edited by R. B. & C. H. Ammons beginning in 1962.) (Contrary to the program listing, Fisch was unable to attend the Bloomington meeting.)

Singer, B. F. "Towards a psychology of science." American Psychologist, 1972, 26, 1010-1016.

James, W. "Great men, great thoughts, and the environment." Atlantic Monthly, 1880, 46, 441-59 (October, No. 276).

James, W. "Necessary truths and the effects of experience," the final chapter of Principles of Psychology, N.Y.: Holt, 1890, Vol. II, 617-679. (Including this indicates that "psychology of science" is read as including psychological epistemology and cognitive theory of science, as well as psychology of scientists.)

Baldwin, J. M. Darwin and the humanities. Baltimore: Review Publishing Co., 1909; London: Allen & Unwin, 1910.

Baldwin, J. M. Thought and things, a study of the development and meaning of thought, or genetic logic. Vol. I: Functional logic or genetic theory of knowledge; Vol. II: Experimental logic or genetic theory of thought; Vol. III: Genetic epistemology. London: Swan Sonnenschein [in Muirhead's Library of Philosophy]; N.Y.: Macmillan, 1906, 1908, 1911.

Boring, E. G. History, psychology, and science: Selected papers. R. I. Watson & D. T. Campbell (Eds.). N.Y.: Wiley, 1963. (Contains Boring's many important papers on the psychology and sociology of science, dating from 1927 to 1963. A founding volume for the psychology of science. Out of print. Needs to be reissued.)

Lewin, K. Idee und Aufgabe der vergleichenden Wissenschaftslehre. Symposium, 1926, 1, 61-93. (Discussed in Heider, F. On Lewin's method and theory. Journal of Social Issues, Supplement Series, 1959, No. 13, 3-13.)

Köhler, W. The place of value in a world of facts. N.Y.: Liveright, 1938.

Craik, K. J. W. The nature of explanation. Cambridge: Cambridge University Press, 1943.

Michotte, A. E. La perception de la causalité. Louvain: Inst. sup. de Philosophie, Etudes Psychol. Vol. VI, 1946, (Eng. Trans: London, Methuen, 1963.)

Piaget, J. Introduction à l'épistémologie génétique. I. La Pensée mathématique, II. La pensée physique, and III. La pensée biologique, la pensée psychologique, et la pensée sociologique. Paris: Presses Universitaires de France, 1950.

Maslow, A. H. Cognition of the particular and of the generic. Psychological Review, 1948, 55, 22-40 (No. 1, Jan.).

Maslow, A. H. The psychology of science. New York: Harper & Row, 1966; Chicago: Henry Regnery (Gateway, paper), 1969.

Campbell, D. T. Methodological suggestions from a comparative psychology of knowledge processes. Inquiry, 1959, 152-182.

Campbell, D. T. Evolutionary epistemology. In P. A. Schilpp (Ed.). The philosophy of Karl R. Popper. Vol. 14, I & II. The library of living philosophers. LaSalle, Ill.: Open Court Publishing, 1974, 413-463, Vol. 14-I.

Campbell, D. T. Descriptive epistemology: psychological, sociological, and evolutionary. (Preliminary draft of the William James Lectures, Harvard University, Spring, 1977.)

SESSION II: SOCIAL PSYCHOLOGICAL PERSPECTIVES ON RESEARCH STYLE AND CAREER DEVELOPMENT

"The Application of Advances in Cognitive Psychology to the Study of Scientific Processes"

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Craig Alexander, Psychology Department, Ohio University, Athens, Ohio 45701

Joe Ipacs, Psychology Department, Ohio University, Athens, Ohio 45701

Researchers studying science have recently demonstrated increasing interest in cognitive factors and their relationship to scientific processes. However, these variables are generally considered from the sociologists', and not the psychologists' viewpoint. As a result, a number of important advances in cognitive psychology, which would likely prove useful to the study of science, have gone largely ignored. In this paper, two areas, Piaget's work in cognitive development, and work in hypothesis formation (e.g., Kahnman and Tversky), were presented as examples of advances in cognitive psychology that would likely contribute in an immediate and significant way to the study of science.

Jean Piaget, the famous Swiss psychologist, has been studying cognitive development for over 50 years. This work has greatly increased our understanding of cognitive development and cognitive functioning. Piaget's basic insight is that cognitive structures, in a step by step fashion, grow through the inter-related processes of accommodation (thinking shaped by external reality), and assimilation (thinking shaped by internal cognitive processes). These dual processes, at differing points in development, exist in either an equilibrated or disequilibrated state. This balance has critical implications for the manner in which reality is interpreted.

Although Piaget's most central goal has been to describe the cognitive processes of individuals, his theory can easily be generalized to group cognitive processes, i.e., the thinking of a group of scientists or scientists in a school. Such application can serve a number of purposes. For one, it can provide a model for the development or unfolding of scientific ideas within schools. Second, such application can help to clarify the debate about the contribution of external reality versus internal cognitive processes to the interpretation and evaluation of scientific findings and theories. From the Piagetian perspective, both aspects always contribute, and accepting this, one can move on to perhaps more productive questions: how do the relative contributions of these aspects shift under specific circumstances, what principles will explain the way these two aspects interact to form a construction of reality, etc. Further, Piaget also addresses other epistemological questions that involve areas central to the understanding of science, and provides an empirical strategy for investigating these questions.

Broad theories of cognition, like Piaget's, do not exhaust the type of potential contributions offered by cognitive psychologists. Theorizing involving a more limited domain, with associated increases in rigor and precision, are also available. An example of such research is the study of hypothesis formation. This research, which explores the parameters under which everyday individuals form hypotheses, and whether these hypotheses are maintained or altered in the face of varying types of evidence, can potentially lend understanding to parallel processes in the scientist, either through generalization of findings, or by providing a methodology for directly studying these processes. Concerning this last point, research in hypothesis formation provides methods that can be used for directly testing and exploring the thinking processes of scientists. There is a paucity of such direct tests, and they are certainly essential for a well rounded understanding of scientific cognitive functioning.

SESSION III: METHODOLOGICAL PROBLEMS AND POTENTIALS IN SCIENCE STUDIES

"An Anthropological Visit to a Scientific Laboratory"

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This paper is an excerpt from a report of a participation observation study of a biology laboratory. (B. LATOUR and S. WOOLGAR, *Laboratory Life: the social construction of scientific facts*, SAGE, forthcoming, Spring, 1979; see also the item by Bruno Latour in this issue.) One of the main points of departure of the project was the question: what can be gained by attempting to understand the activities and culture of working scientists as those of a primitive tribe? The main methodological imperatives of this "anthropological" perspective are, (i) empirical observation of activity through in situ monitoring of a scientific setting, (ii) critical analysis of the concepts, categories and terminology used by participants, and (iii) reflexive attention to the essential similarities of order construction in the activities of participant and analyst. The paper outlines the theoretical justification for adopting an "anthropological" perspective in the study of scientific activity. It is argued that an assessment of the feasibility of the "strong" programme in the sociology of scientific

knowledge can be best made by a micro-sociological study of routine scientific activity. Such an approach needs to demonstrate awareness and proficiency in the use of participants' concepts but requires an explanatory scheme which does not depend on these concepts. The adoption by analysts of one particular conceptual distinction, that between the "social" and the "technical," has both given rise to analytical difficulties and has detracted from an appreciation of the importance of this distinction as a participants' resource. The paper closes by illustrating the application of an "anthropological" perspective to one aspect of laboratory activity: the use of different statement types in participants' organisation of persuasion.

SESSION V: INDICATORS AND MODELS OF SCIENCE

"Bibliometric Characterization of Research Papers from U.S. Medical Schools"
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This paper will summarize a study which has been performed to characterize the aggregate properties of the research papers published by scientists affiliated with 123 U.S. medical schools in the 1973 to 1975 time period. Approximately 68,000 papers published by these scientists, in journals covered by the Science Citation Index, were used to ascertain the bibliometric relationship between the publication sizes of the schools and the subject, level (from basic to clinical), and influence (journal influence/paper) distributions of the papers. An extremely strong and linear relationship ($r = 0.95$) was found between the amount of NIH funds that the medical schools were receiving and the number of papers being produced. A positive and somewhat non-linear (often cube root) relationship was generally found between the publication size of the school and the school's influence; that is, the larger schools tend to publish in substantially more influential journals than the smaller schools, with the positive slope of the influence vs. size curve decreasing with school size. There seems to be relatively small differences in influence among the top third of the publishing schools, while there are relatively large differences in influence among the smaller schools. We interpret this as evidence for a "full participation threshold," which is usually attained only by the largest third of the schools. This "full participation threshold" was found both overall and within some of the subfields individually, and individually within each of the four basic to clinical research levels. In addition to these influence differences among schools of different size, there are also differences in areas of high relative activity. The smaller schools seem to be relatively active in such clinical specialties as dentistry, parasitology, microscopy, allergy and nutrition, while the large schools are particularly active in the much more basic fields of biochemistry and general biomedical research.

SESSION VII: CASE STUDIES OF SCIENTIFIC INNOVATION

"A Durkheimian Analysis of Scientific Knowledge: J.A. Udden and Particle Size Analysis"

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It is argued that two perspectives from the sociology of knowledge may be fruitfully applied to the study of the development of scientific knowledge. Firstly, the notion (drawn from the writings of Marx and also the tradition of symbolic interaction) that knowledge reflects social interests and is manipulated by actors in the course of interaction should be retained. This notion, which accords both with common sense and much writing in the sociology of science should, however, be supplemented with the Durkheimian insight that the patterns of social relations affect patterns of belief. By means of an example this paper brings these two, normally divergent traditions together; it is argued that both "interests" and Durkheimian "pattern" can be identified in the early development of American sedimentology.

"The Role of Inter-Specialty Migrants in Scientific Innovation: The Case of Research on the Stellar-Energy Problem, 1919-1938"

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In recent years historians and sociologists of science have given increasing attention to the role of inter-specialty migrants in scientific innovation. They have suggested that such migrants play a major part in the diffusion of methods, ideas, and orientations across specialty barriers and that, by doing so, these scientists play a disproportionate role in generating significant breakthroughs. While much anecdotal evidence has been adduced for this hypothesis, we still lack systematic studies that provide a satisfactory basis for gauging the relative importance of inter-specialty migrants. The case of research on the stellar-energy problem during the interwar years suggests that their importance has been exaggerated. Between its "recognition" in 1919 and its "solution" in 1938, ten scientists made serious attempts to solve this fundamental astronomical problem. By any reasonable definition of the category "inter-specialty migrant," less than half of these scientists were migrants at the time of working on the problem. The two who ultimately "solved" it--Bethe and Weizsäcker--were not among them.

"Philosophy and the Development of Scientific Psychology in Nineteenth-Century Germany"

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Although it is generally acknowledged that the modern science of psychology was produced in the mid-nineteenth century by the cross-fertilization of philosophy and physiology, few historians have tried to specify the exact role of philosophers in the evolution of modern psychology. Indeed, insofar as historians of psychology have paid any attention to philosophy at all, it has generally been in order to document the "obvious" fact that psychology emerged as a separate and scientific discipline by moving away from its philosophical parent. In this

paper I would like to outline some of my research which attempts to make more explicit the exact role of philosophers in the development of modern psychology in nineteenth-century Germany. The conclusion to which this research leads, I shall argue, is that although modern psychology has moved away from philosophy institutionally, and although modern psychologists have developed their own sense of professional identity, quite separate from that of philosophers, nonetheless the intellectual basis of the "New Psychology" in the nineteenth century was to a large extent the fulfillment of several distinct lines of philosophical thought. One line, represented by Immanuel Kant, Jakob Friedrich Fries, Johann Friedrich Herbart, and Friedrich Eduard Beneke, led to the development of the conception of the nature and methods of scientific psychology. The other, represented by the idealist philosophers and psychologists, influenced the development of the conception of the subject matter of scientific psychology as well as the demarcation of psychology into two distinct disciplines.

Although Immanuel Kant maintained that psychology could never be a true science, characterized by rational, mathematical, and experimental procedures, his image of what a true science should be provided the stimulus for the philosophical development of the conception of a psychology that was both mathematical and experimental. The first step towards this ironic resolution of Kant's thought was taken by Jakob Friedrich Fries who argued that psychology is indeed based upon empirical observations, as Kant had said, but that the analysis of psychological experience leads to the discovery of basic rational concepts upon which an apodictically rational science of psychology can be constructed. This step was followed by that of Johann Friedrich Herbart, who, on the basis of some of Kant's own concepts, proposed a way by which psychology could become a mathematical as well as rational science. Finally, Friedrich Eduard Beneke went beyond Herbart by maintaining that psychology could be an experimental as well as rational and mathematical science. Thus was formed the conceptualization and conviction that psychology could and should become an apodictic natural science utilizing mathematical and experimental procedures. Later psychologists fulfilled this philosophical vision.

At the same time that Fries, Herbart, and Beneke were developing the empirical aspect of Kant's legacy, the majority of German philosophers took their lead from the transcendental aspect of Kant's philosophy. Karl Leonhard Reinhold, Johann Gottlieb Fichte, Friedrich Wilhelm von Schelling, and Georg Wilhelm Friedrich Hegel transformed this transcendental dimension into a philosophy of absolute idealism. As a consistent consequence of this absolute idealism, their philosophies were anti-individualistic, and in that regard, anti-psychological. However, their doctrines had many psychological implications. These were developed by their followers, a number of whom were specifically interested in developing psychology into a "science." From these philosophical psychologists, such as G. E. A. Mehmel, Karl Fortlage, Karl Friedrich Burdach, Karl Gustav Carus, Johann Eduard Erdmann, Carl Ludwig Michelet, and Karl Friedrich Rosenkranz, came the systematic elaboration of concepts which later became the primary concern of the "New Psychology." For instance, from the idealist tradition came the concern about consciousness, ego, personality, imagination, and will, which was a prominent part of later psychology. Also, from the idealist tradition came the philosophy of identity, the emphasis upon historical or genetic analysis, and the adherence to dialectical reasoning which led to Gustav Theodor Fechner's development of psychophysics and provided the initial stimulus to comparative psychology in Germany. Beyond this, the

idealistic tradition also influenced the development of voluntarism and the development of a social-psychological perspective, both of which came to typify late-nineteenth-century theories about the higher cognitive processes. Indeed, it was the idealistic tradition which contributed most fundamentally to Wilhelm Wundt's division of psychological research into "experimental psychology" and "folk psychology."

Despite these various influences, however, German idealism did not influence the theoretical development of the concept of psychology in general. In fact, it opposed the development of psychology into an experimental and mathematical science. Thus, the contributions of the two lines of influence which we have traced from philosophy to psychology are quite distinct; yet they are also complementary. From Fries, Herbart, and Beneke came the conception of psychology as a mathematical, experimental science. From the idealists came the conception of certain subject matters as well as the voluntaristic and genetic perspectives which occupied the first generations of scientific psychologists. Both lines of influence extended from Kant, through various philosophers, and to modern psychology. This leads me to the conclusion that, as far as the conceptual foundation of psychology is concerned, the "New Psychology" was indeed the child of philosophy as well as of the experimental study of sensory physiology. And it seems clear to me that this child did not move quite so far from its parent as some commentators have insisted.

ROUNDTABLE SESSIONS VIII

"Notes from the Cancer Underground: The Laetrile Controversy"

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At no time in American history has there been a more effective challenge to medical expertise and authority than that mounted by the contemporary Laetrile movement. Despite opposition from the Food and Drug Administration, the American Medical Association, the American Cancer Society and virtually all of the American medical and scientific community, support for this purported cancer preventive and/or cure continues to grow.

Our research on Laetrile has explored two general themes. We have examined the macro-social factors which have influenced decision-making and public policy about Laetrile and we have described and analyzed the social characteristics of participants in the Laetrile movement.

"Possibility and Limitation of Participation According to Function in German National Laboratories"

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In response to scientific and technical employees' demands for a redistribution of authority and to intraorganizational conflict, the Federal Minister for Education and Science institutionalized "participation according to function" in the German national laboratories in the early 1970s. Since then representatives who have been elected by scientific and technical employees participate

in decision-making bodies at four organizational levels in the publicly funded legally independent research establishments. Compared to other participation systems, which have been measured in terms of the degree of employees' control over any single decision, the issues over which that control is exercised and the organizational level at which it is experienced, the formal system of "participation according to function" would permit a medium level of influence. The conditions of scientific and technical employees' actual influence on organizational decision-making and its future development were assessed on the basis of seventy-three interviews with research managers and scientific and technical employees, and thirty-two other interviews, which were conducted in 1973, on the analysis of governmental and organizational files, and on the evaluation reports of the groups and organizations involved.

The formal system of participation was delimited in two principal ways. The right to participation was restricted to those employees who presumably had scientific-technical competence, as indicated by their position in the system of pay groups and job classifications. Participation was restricted to certain management functions, such as organizational goal setting, programming, budgeting, scheduling of research and development etc., hence did, with some exceptions, not apply to personnel control through hiring, firing, rewarding, promotion of individual managers and employees. The actual employee influence on research managers was assessed as limited and as doubtful for the future by the employees.

The causes for this limitation lie in the provisions of the formal system, because these deal only with a few of the social processes which constitute organized research. Therefore participation according to function represents a case of formal cooptation. Since the legitimacy of the authority of research managers and government officials had been called into question by employee groups, the institutionalization of participation was a successful attempt to correct a state of imbalance by formal measures. It also fulfilled the administrative function of establishing more channels for communication with and direction of scientific-technical staff. The forms of participation were emphasized but the locus of personnel control remained in the hands of research managers. The ministerial leadership did not envision the transfer of a large amount of actual power to employees but the sharing of responsibilities for decisions.

SESSION X: HISTORICAL AND PHILOSOPHICAL PERSPECTIVES IN SCIENCE STUDIES

"The Natural-Selection Model in the Historiography of Science"

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There are several fairly distinct models which historians of science have employed in delineating their subject. In the major histories of science composed since the Renaissance, one can discriminate patterns dictated by four models and their varieties: the static model, which supposes that science does not advance at all, but is a body of doctrine infused or discovered at a particular time and only passed on to succeeding generations; the growth model, according to which science progresses by steady increment toward true theories; the revolutionary model, which suggests that a fundamental conceptual upheaval is required to put a discipline on the road to modern science; the gestalt model, which implies the perceptual sets induced by and relative to particular cultural environments provide the structure for the historical interpretation of scientific ideas. During the last several decades, of course, two other models of the scientific enterprise have played an increasingly

important role in the writing of history of science (as well as other types of history): psychoanalytic models, or more generally, psychological models which incorporate the resources of modern depth psychology; and Marxist models, which look for the economic determinates of scientific ideas.

But there is one further model, the one which I would like to discuss in this paper. It was introduced in the late 19th century by adherents to the evolutionary theories of Charles Darwin, and in this decade it has received some historiographic and philosophic consideration, though only modest use in the actual writing of history of science. This is the natural-selection model of scientific advance. In this paper I will explore the several proposed versions of the natural-selection model, its difference from other evolutionary models and other essential characteristics, and its implications as a model for the writing of history of science.

"Physics, Mysticism, and Society: A Sociological Perspective on Distinguishing and Relating Alternate Realities"

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In an earlier paper, I pointed out some of the pitfalls of physics-mysticism parallelism--the thesis, advocated by F. Capra, L. LeShan, and others, that there are parallels, analogies, and convergences between modern physics and mysticism.* My objective in that paper was to provide a prolegomenon to the sociological study of physics-mysticism parallelism. The present paper is a study of the sociocultural roots and implications of physics-mysticism parallelism. I develop sociological accounts of (1) mysticism, (2) physics, and (3) the relationships between physics and mysticism in contemporary society. My objective here is the same, in part, as my objective in the earlier paper: to provide a critical reconnaissance. Unlike the earlier paper, however, this one focuses on sociological and anthropological theory in the study of parallelism.

The paper is divided into four main sections. In the first section, I outline a sociological perspective on mysticism. I begin with a discussion of the mystification of mysticism and mystery by parallelists. This suggests the need for a demystification of mysticism and mystery, which I carry out drawing on arguments from the sociology of religion. Special attention is given to the arguments in Durkheim, Weber, and Marx, and to such contemporary developments as Mary Douglas' social anthropology of knowledge, Clifford Geertz' anthropology of religion, and E. Bourguignon's psychological and social anthropology of altered states of consciousness. The focus of my analysis is religion in India, and especially mysticism in Hinduism and Buddhism. I point out that my arguments here can also be applied to Taoism in China. Finally, I discuss a general sociology of mysticism, and a psycho-social theory of mysticism.

In the second section, I discuss physics as an adaptation to the sociocultural milieu. I examine physics-mysticism parallelism as a special case of science-religion parallelism, and point out that various forms of parallelism and

*Sal P. Restivo, "Parallels and Paradoxes in Modern Physics and Eastern Mysticism: Part I - A Critical Reconnaissance," Social Studies of Science, Vol. 8, No. 2, 1978.

anti-parallelism have emerged in the struggles over convergence, divergence, and demarcation in science and religion. I explore a basis for a general theory of parallelism by drawing attention to four periods in history in which parallelist and anti-parallelist arguments have been important: (1) the late Renaissance, (2) 1850-1920 in Europe and the United States, (3) Weimar Germany (Paul Forman's study of physics and culture in Germany from 1918-1927 is crucial here, and a model in some ways for my effort), and (4) Western Europe and the United States in the 1930s. This analysis suggests certain affinities between social organization, values, and external relations in physics and mysticism which may account for parallelist (as well as anti-parallelist) arguments.

The third section of the paper deals with contemporary physics-mysticism parallelism and the sociocultural milieu. I review the theoretical contributions of R. Collins, J.M. Yinger, E. Tiryakian, and others to the sociology of mysticism, the occult, modern science, and society. A number of principles emerge from this review which find support in my research, and which I draw on in developing a sociology of alternate realities and altered states of consciousness, and of wholism, past and present. Challenges to parallelism are discussed, and their similarity to challenges which developed in earlier periods is pointed out. This section concludes with a general recapitulation and summary stressing a conflict view of physics-mysticism parallelism. I emphasize intellectual conflict, struggles for power, ideology, and false consciousness as factors in physics-mysticism parallelism. I also discuss the relevance of cognitive dissonance theory for understanding the psychology of parallelism. This conclusion is consistent with the sceptical, "debunking" tone of the main sections of my earlier paper. I noted in the concluding section of that paper, however, that there were reasons for moderating the debunking tone; here too I reach a similar conclusion (drawing, for example, on Tiryakian's evaluation of esoteric culture). The speculations on a relational theory of inquiry which I offered in the closing paragraphs of my earlier paper are developed and expanded more systematically in the fourth and final section of this paper.

In section four, I offer the conjecture that parallelism can be understood, in part, in terms of the evolution of culture and inquiry. The stage for this conjecture is partially established in various parts of the first three sections of the paper. I bring these materials together, discuss the relationship between various types of consensus and forms of knowledge, and outline a relational theory of inquiry. This theory continues a trend to relational thought noted by the physicist-philosopher Lancelot Whyte in 1972, adumbrated in the works of Whitehead, Korzybski, and others, and now crystallizing in a variety of fields, notably in the philosophy of science (C.A. Hooker), metaphysics (H. Robinson), quantum physics (D. Bohm), and social philosophy (J. Ogilvy).

The current phase of my study of parallelism emphasizes comparative, historical, and macrosociological methods, perspectives, and theories. Several case studies of parallelism at the level of organizations and social movements in contemporary society are being planned, and some are already in progress. These include (1) science and religion in Bahaism, (2) physics and mysticism in the Transcendental Meditation movement; (3) physics and mysticism in intentional communities (such as the Sufi community in New Lebanon, N.Y.), and (4) interview and questionnaire data on conceptions of the relationships between physics and mysticism, and science and religion, in the American physics community. Some preliminary results from these studies will be reported on in this paper.

ROUNDTABLE SESSIONS XI

"The Future of Engineering Communication: A Study of the Effect of Changing Methods of Scientific and Technological Information Storage and Dissemination on Engineering"

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The Futures Group currently is conducting research on the effects of changes in the field of scientific and technical information (STI) on the engineering profession. The principal objectives of this study are to

Produce a profile of information used by technologists of various disciplines and specialties, including information type, content, cost, frequency of use, means of delivery, etc.

Identify major modes of communication and patterns of use in these technical fields.

Describe how the information profile, use patterns, and communication modes may change if assumed STI programs become available.

Study how the discipline and consequently the professional societies may change if the information profile, use patterns, and communication modes change.

Identify policy implications for STI participants, public policy-makers, and the profession itself.

By means of a poll, a broad spectrum of technologists will be asked to provide information on their use of STI. The study will focus on U.S. technologists in industry, academia, government and business organizations, and will provide a basis for future STI funding and decisionmaking.

The research is being conducted by The Futures Group, under a grant from the National Science Foundation, and with the cooperation of the Engineers Joint Council, the Institute of Electrical and Electronic Engineers, Inc., and other scientific and technical societies. Professor Derek J. de Solla Price will be a consultant to the project. The Principal Investigator is Dr. Hedvah Lang Shuchman, Manager of Science Policy Studies at The Futures Group.

SESSION XII: ENERGY, TECHNOLOGY, AND SOCIETY

"Formation of Attitudes Toward Nuclear Power"

John Wilkes, Social Science and Policy Studies, Worcester Polytechnic Institute, Worcester, Massachusetts 01609

There has been a considerable effort to follow public opinion about important and controversial technologies. Nuclear power has received considerable attention in national polls. Efforts have also been made to study how the public assesses risks associated with catastrophic but rare events. However, the way in which people come to decisions about such technical topics in the face of conflicting claims, technical uncertainty, and a confusing diversity of interpretations may have little to do with the perception of risks per se.

This paper represents a modest attempt to consider two prior questions, (1) Is there a relationship between the level of lay knowledge about the subject matter an individual has and his or her opinion of nuclear power? (2) What is the general structure of attitudes toward technology and basic social institutions held by anti and pro-nuclear populations and do these bear upon their opinion of Nuclear Power?

These questions are worth pursuing because they lie at the crux of the relationship between Science and Society; at least they do in a society which uses Vannevar Bush's justification for the support of science. To the extent that basic research is viewed as a reservoir of knowledge from which will grow technological fruits; it would seem that science has a considerable stake in the taste those fruits leave in the mouth of the body politic. Hence the process by which the Nuclear "Solution" became redefined as a social "problem" is of considerable interest to the sociology of science.

A comparative study of 106 Sophomore and Junior college students drawn equally from 2 schools with different climates of opinion on nuclear power provides the basis for the present examination of attitudes toward technology. The sample was stratified in two ways to enhance comparability. Worcester Polytechnic Institute (the Pro Nuclear location) and Clark University (the Anti Nuclear site) are neighboring institutions of the same approximate size with very different academic orientations and hence, few similar courses of study. An effort was made to give each school equal representation and to over-represent those relatively minor areas of similarity in coursework. The main academic areas of each school are represented by the 3 most important and most popular majors in each college.

Sampling Frame

	WPI		Clark	
Comparable (Minor) Fields	Chemistry	10	Chemistry	10
	Management	10	Economics	10
	Life Sciences	10	Biology	10
Divergent (Dominant) Fields	Civil Eng.	10	Pol. Sci.	10
	Mech. Eng.	10	Geography	10
	Elec. Eng.	<u>10</u>	Psychology	<u>10</u>
		60		60

As expected, the two locations differ in terms of their support for Nuclear Power as measured by an item used in the 1976 Harris Poll on the subject. Two thirds of those expressing an opinion at WPI are Pro Nuclear and two thirds of the Clark Students are Anti Nuclear.

The particular interpretations of the nuclear debate which I wish to evaluate in terms of information gathered about knowledge of Nuclear Power, attitudes toward technology, confidence in social institutions and certain personal characteristics are as follows:

- (1) Knowledge of the subject will increase support for nuclear power because resistance is based on irrational fears and misconceptions based upon Nuclear Power's association with the "bomb," (i.e., Doubts are based on a perception of risk fostered by the legacy of past disagreement amongst supposed "experts" and misinformation of opponents about environmental and safety issues).

- (2) One's perception of nuclear power is an outgrowth of a very personal assessment of the probability of catastrophic risks in the face of uncertainty. It is a value issue affected by basic personality differences which lead one to be pessimistic or optimistic about the chances of an accident and its likely consequences.
- (3) The Nuclear Power opposition is basically anti-technology and their sympathizers are anxious about the growth of the technological society. Hence the Nuclear Power controversy is primarily symbolic and strategic, an opportunity to express resistance and limit the energy supplies needed to support the continued development of large scale technology (i.e., It is a question of lifestyle so particular environmental concessions are futile).
- (4) The nuclear power controversy represents a crisis of confidence in key social institutions of society. This widespread doubt includes those leaders expected to develop and control the nuclear program (i.e., It is a question of alienation from Government and Science exacerbated by the Watergate experience).*

No striking overall differences in levels of knowledge about nuclear power were found between the engineers and liberal arts students, when the scores of Clark University and WPI students were compared.** A small group of the technical students were extremely knowledgeable about the subject and strongly in favor of nuclear development, but there was no discernible relationship between levels of knowledge and opinions about nuclear power overall.

Personality characteristics did not prove to be useful predictors of opinions about nuclear power either, though two personal attributes, sex and political orientations were related to views about nuclear power even when the differences between the subpopulations were taken into account.

The crucial differences proved to be attitudinal, particularly the overall structure of attitudes at the two sites which represented different climates of opinion. These differences in world view affected the definition of the "problem" presented by nuclear power, the image of technology and technologists, and the interpretation of the situation. This was particularly evident in the different selection of institutional actors considered relevant to one's view of nuclear power in each setting. The relationship between beliefs about who is in control of the nuclear program and beliefs about who can indeed be trusted seems to be one of the crucial differences between the two climates of opinion. In short, the engineering and art students associate different institutions with the nuclear program and evaluate it in terms of these general associations.

Such evaluations are affected to some extent by career plans or vested interests, for example the engineers have somewhat more confidence in industry than the arts students. However, the more important difference is that the engineers associate nuclear power with science while the arts students associate it with industry and government, as well as science. This has a dramatic affect on the view of nuclear power since both populations have far more confidence in science than industry or government.

*This interpretation is similar to the one Gamson placed upon the Fluoride controversy.

**This is consistent with an existing study of University of Tennessee students. See subpopulations and their comparison study of the "technical" and "mass" attitudes toward the Clinch River Breeder Project.

Hence, confidence in science is related to opinion of nuclear power, but this interesting twist allows respondents in an antinuclear climate of opinion to dissociate science from nuclear power enough to hold science in considerable regard while being quite ambivalent about nuclear technology or rejecting it entirely.

SESSION XIII: SCIENCE POLICY, ORGANIZATION, AND PRACTICE

"The Concept of the R&D Bargain as a Tool of Policy Analysis"

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I have developed a qualitative model of the micro socio-economic aspects of research and development, based on the concept that the several parties involved in any research or development project--the researcher, the financier, the host institution, et al.,--are linked in a many-sided bargain. That is to say, the resources given, the rewards received, and the roles played in a project are governed by agreements embodied in formal contracts, informal understandings, institutionalized expectations.

Each participant in the bargain plays a distinctive role and expects to receive, that is, appropriate, from its exchanges, some reward of exclusive value to it in its own sphere of operations. Each therefore contributes a resource needed to sustain the research or development activity. Initially at least, the bargain is varying sum; each participant expects to benefit because, in general, its objectives do not conflict with those of any other.

The bargain is generally initiated by a key participant concerned with supporting the production of some type of new knowledge. Other participants may seek rewards or returns associated with the presence or managerial processes of the research or development project or simply with the fact that a significant finding or research application has been made. The bargain shapes up and plays out over time in the series of decisions on the material and non-material resource allocations to the project and in the actual transactions that take place.

Several uses of the bargain model in public policy analysis can be mentioned here.

The model serves as the framework for a systematic approach to analyzing: the resources required to field a given type of research or development project, the distinctive relationships between participants, and the changes in relationships that take place, over time, as a particular party becomes involved in a number of projects of a given type, that is, as its scale of resource commitment significantly increases. This analysis also illuminates the causes of some of the difficulties of perspective and standards encountered by Federal agencies in their attempts to comply with the Congressional mandate to "evaluate" their research projects. (I take the intellectual activities internal to the research as given.)

The model further suggests criteria that can be used in constructing a typology--based on the characteristics of different kinds of bargains--that may have other uses beyond the conventional basic-applied-development and government-industry-university typologies.

The differences between the objectives of various participants in a given research or development project have sometimes been considered troublesome policy problems. The bargain model demonstrates that it is only because these objectives differ and therefore lead to different participant roles and contributions that a given research arrangement or bargain comes into existence and is seen through to a productive finish.

Since the bargain underlying an individual project is the basic building block of all sector and national aggregates, the model is a useful complement, at the micro level, to the many analyses, in the literature, of the socio-economic relationships at the aggregate level between government, universities, industry, scientific disciplines, etc.

I will demonstrate the analytical potential of the model primarily with reference to federally-financed academic research and secondarily with respect to company-financed intra-mural development.

"Governing the 'Republic of Science': An Analysis of National Science Foundation Officials' Attitudes About Managed Science"

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To understand science policy, such as it exists, one must begin to understand the micro-level processes of decision-making for science, because science policy consists of thousands of discrete and generally uncoordinated decisions. This study, which is based on questionnaire data obtained from 188 National Science Foundation (NSF) officials, attempts to explain respondents' attitudes concerning four dimensions of "managed science" (each concerning the role of government in managing scientific research and the production and distribution of knowledge). The four dimensions of managed science are labeled "Social Objectives," "Autonomy," "Basic Science" and "Private Efficiency" and each is measured in terms of several questionnaire items. Variations in attitudes about managed science are accounted for by four hypotheses. The "Straight Arrow Hypothesis" accounts for variance according to the psychology of the scientist, especially the degree to which "objectivist" and "positivist" conceptions of science have been internalized. This hypothesis is well supported by the findings. According to the "Bureaucratic Hypothesis," certain norms of science--particularly the autonomy norm--are displaced as a result of the bureaucratic socialization (measured in terms of organizational identification, civil service status, length of federal employment). This hypothesis is largely supported, though those employed longer by the federal government are less likely to support social objectives in funding decisions. The "Status Hypothesis" contends that science bureaucrats of higher status (in terms of academic field, university degree and salary) are less supportive of managed science. This hypothesis is supported. It is concluded that there are important and policy relevant effects to be understood by further investigation of the organizational characteristics, personnel structures and personnel attributes in the science bureaucracy.

THOUGHT AND OPINION

GO AND SEE--For an Anthropological Study of Working Scientists

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There have been long debates in the social studies of science concerning the relative influence of "internal" and "external" factors. The two scientists who had the following dialog, were not aware of these debates: (they are watching numbers flashing out of a gamma counter, I am working as a technician just behind them)

Clark: Look at these figures, it's not bad . . .

Spot: Well, believe in my experience, when it's not much more above hundred it's not good, it's noise.

Clark: the noise is pretty consistent, though . . .

Spot: It does not change much, but with this noise you can't convince people, I mean good people . . .

Clark is a young predoctoral fellow; Spot is a German assistant who chose to come to this prestigious laboratory. Clark considers that the ratio of signal to noise is a good one; Spot, looking at the same numbers, takes it as a bad ratio. Clark, a bit offended, insists that the baseline is stable and the signal "clearly" distinct from the background. Spot agrees but evaluates simultaneously the kind of people to whom these data could be shown as "proof." For Clark and "bad people" there is a signal here; for Spot and "good people," there is no information at all, just noise. Thus, the assessment of data is consciously linked to the operation of convincing others and varies according to the individual who is doing the interpreting and with the audience. What could be more insulated from "external" factors than the act of reading crude data out of a computer print-out? What is less "internal" than the "worth" of the fellow scientists? Nevertheless these two scientists clearly trespass our artificial divisions.

Anecdotes of this sort convinced me to do a two year study of only one biology laboratory, and to observe what scientists really do and say they do. The principle of field studies is common in all areas of sociology, but almost unknown in sociology of science (except for K. KNORR, no one has spent more than a few weeks or months in one laboratory). The reason for this is interesting. Social scientists are interested either in the non-technical aspects of science (MERTON and what can be broadly called "American sociology of science"), or when they are interested in the content of the science (EDGE, MULKAY, LEMAIN and most of the "English sociology of science"), they accept what scientists say of themselves at face-value, and come up with accounts of what scientists did or thought, which are similar in style to what the participants would have said, although their accounts are more accurate and less self-serving than scientists'. In sum, whether social scientists have assumed outsider or insider roles, they have respected scientists and have not checked how the informants really work. My approach is slightly different; I want to stay an outsider and to account in my own terms for what scientists say and do, but I want to do this inside a laboratory and at a much closer range than everything which has been done so far. This strategy of being insider and outsider is characteristic of anthropology, and needs to be brought into our field because we all are much too familiar with what science is to be able to analyze it.

The consequence of this methodological requisite is very simple in theory, although it is difficult to implement in practice. What scientists do has to be documented in the laboratory with tape-recorded conversations, observation, participant-observation, drafts, letters, grant applications, data-sheet, interviews; what scientists say they do is only one aspect of analysis. Consequently words like "important discovery," "experience," "method," "proof," "instrument," "data," have to be interpreted and accounted for in sociological terms, exactly like the words "mantré," "erbi" or "antomitouné" when a culture of the Ivory Coast laguna is to be studied. The anthropologist does not know, or more exactly, does not want to know, what "experiment" means; he wants to look at it exactly like he looked at the "erbi" process when he was in Africa the year prior to his experience in the biology laboratory. In the field study that I wrote with S. WOOLGAR* we constantly tried to provide a sociological interpretation of many words now tacitly defined, but our task was complicated by our identity as social scientists.

The principal virtue of the sort of approach I advocate, is that it allows a sociological description of the contents of a science--although I confess, it works only on tiny portions of the scientific production. For instance, these two scientists are discussing a competitor's article:

Smith: I should do the whole sequencing but I don't have enough time . . .

Wilson (looking at the paper): But these guys from England put only the amino acid analysis in their paper, that's bad manners.

Smith: . . . and it's dangerous, because there is definite variance between pig and ovine sequence. You can't deduce the sequence from the amino acid analysis.

What is at stake here is the construction of one "fact"* the chemical structure of Béta, a brain small protein. In this small excerpt, problems of timing, etiquette, danger and deduction are raised. Let me look only at the last one. In a less stringent group, in a less tight competition, for a less important molecule, in another part of Smith's career, it might have been possible to behave as the "English guys" and to deduce the sequence from the amino acid content. In this excerpt, it is "dangerous" to do so; the danger lies in the fact that a subsequent article could show that ovine molecule was in fact different from porcine.* No matter what the detailed analysis could be, the point is that we observed in situ the microprocesses that ended up in the construction of a chemical structure that is now in textbooks. In other words, the argument that sociologists only deal with peripheral aspects of science does not hold any more, if one can account for the very nature of a given fact, by using only sociological explanations.

The main problem of this anthropological stand is that it obliges us to redefine what we mean by "social." In the Continental tradition anecdotes such as the ones I quoted here show that science is thoroughly a "social" construction; for MARX, for BACHELARD or for FOUCAULT, "social" refers to practices of interpretation and no difference is made a priori between cognitive and "material" factors (BACHELARD talks for instance of "the workers of the proof"). In the English speaking tradition, "social" necessarily refers to non-cognitive and non-material factors, and thus always leaves some residual character. If the notion of "social" is so different from one tradition to the other, the nature of the

proofs one has to provide in order to make social explanation of scientific fact is necessarily also different. In our monograph* for instance, we showed the process of construction of facts after having weeded out all the anecdotes where the social, political, economical or psychological influences were too obvious. It is my feeling that a large debate in the 4S about what has to be taken as a thorough social interpretation of a scientific fact, would help in bridging gaps between the English, the American and the Continental traditions in "social" studies of science.

Long term field studies of scientists at work made by some one who is agnostic in matters of science, is certainly not a panacea, (besides, it is very exacting for the observer and for the informants!). However, the objection often made against this approach does not seem quite true. It is often said that by studying small groups of scientists the larger macro factors become invisible, but the opposite is the case. When some one, for instance, says about one of his colleagues:

When I consider all the investment I made in this substance in the laboratory and I don't even have a good assay for it. If Ray is unable to set up this assay he will be fired.

The factors in this situation--grants (2 Million dollars have been invested in ten years on this substance), group structure (Ray's career and position are at stake) and precision of the data ("good" assay)--cannot be arrayed with an artificial division between micro and macro phenomena. The outside of the laboratory is inside it and can be studied and analysed in situ.

In conclusion, even if one cannot support a genuinely anthropological approach to analysis of science, one has to admit that we cannot rely only on interviews, on reminiscences of aged scientists, or on documents provided by historians. By going into laboratories and observing our informants at work, accepting what they say with extreme caution, we will extend only to science an approach sociologists have brought to every branch of sociology. "No privilege," should be our motto; providing, of course, that we apply it to our own science.

*For all details see Bruno LATOUR and Steve WOOLGAR: Laboratory Life: the social construction of scientific facts (SAGE, Los Angeles)--to be published Spring 1979.

Research Activity of the Institute for Science Organization of the
Hungarian Academy of Sciences

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In the early sixties some university researchers began to investigate science policy and research organization in Hungary. The dynamic development in scientific life, characterizing that period, prompted the Hungarian Academy of Sciences to establish an independent organizational framework concerning the self-examination of scientific research. Therefore in 1967 the Institute for Science Organization of the Hungarian Academy of Sciences was set up, as

one of the institutions responsible for research in the fields of science policy and research organization.

The scope of activity of the institute is:

- (a) preparation of decisions and resolutions concerning science policy and research organization in fields belonging to the sphere of authority of the Academy's managing organs and bodies by research studies and scientific analyses as well as preparation of recommendations and proposals in matters of science policy and research organization, serving the common interest of the Academy and other management organs of scientific research;
- (b) research in some specific subject fields of science policy, research organization and economics of research.

The personnel of the institute number nearly 40, 18 of whom are researchers. Its material support is provided by the national budget; it is a non-profit institution.

Previously the activity of the institute in the field of science policy aimed at the delineation and summary of national science policy characteristics. Now this activity entails mainly the comparative analyses of different national science policies and as far as possible has good contacts with programmes of international organizations, e.g., UNESCO, ICSU. Recently researchers of the institute have participated in the preparation and scientific comparative analyses of the MINESPOL II documents (Second UNESCO Conference of Ministers Responsible for Science and Technology Policy in the European and North American Region, Belgrade, September, 1978).

Ever since its establishment, the institute has been conducting theoretical and methodological studies in forecasting and planning scientific research activity. As part of these studies the institute elaborated the long-range perspectives of Hungarian scientific-technological potential and several concrete studies analysing the expected development of the qualitative and quantitative composition of scientific manpower. This activity is related to the current working programmes of the UN Economic Commission for Europe (ECE) and the Council of Mutual Economic Assistance (CMEA). The institute was co-organizer of the Second Hungarian Conference of Future Studies, October, 1978.

The studies on planning of scientific research support, first of all, the current updating of the whole research planning system. This work at the same time attends to the elaboration of theoretical and methodological bases of the long-range and medium-term research plans, but the activity covers the studies on methods of selecting research priorities, financing of research and the elaboration of the principles concerning the training of science managers, too. The researchers of the institute engaged in this field summarized in a recent paper a methodology for a new kind of national medium-term research plan.

In the field of the economics of research the group conducts various activities. Articles and a monograph were written about the possibilities of conceptualization, measurement and calculation of research effectiveness and efficiency. For some years the institute has participated in a UNESCO programme, related to the organization and performance of research units. A team of the institute deals with scientometrics.

A series of publications of the institute is the "Tudomány-szervezési Füzetek" (Studies on Science Organization," a series of small monographs, in Hungarian) published by the Publishing House of the Hungarian Academy of Sciences, (Akadémiai Kiado), Budapest. Apart from it, four to five issues of the "Prognosztika" ("Prognostics") are published each year. This is a periodical of the institute, in Hungarian. The researchers of the institute publish their studies, besides the above-mentioned publications, in "Magyar Tudomány" ("Hungarian Science," the central monthly of the Academy) and in "Tudományszervezési Tajekoztato" ("Bulletin of Science Organization," published by the Library of the Hungarian Academy).

News From Nowhere (with apologies to William Morris . . . an occasional look at events in Britain and Europe)

Steve Woolgar
Brunel University

(1) "Anthropological and Ethnomethodological analyses of Science"

A small "Fury" meeting (the idea was conceived during a journey in a Plymouth Fury immediately after the 1976 Cornell conference) was held on 4th-6th January at Bad Homburg, West Germany, under the auspices of the Werner-Reimers-Stiftung and organised by Peter Weingart and Wolf Lepenies. Papers were presented by:

Bruno Latour (CNAM, Paris, France) "What Does It Mean To Study Science?"

David Bloor (University of Edinburgh, Scotland) "An Anthropological Approach to Industrial Scientists: An Empirical Test of Mary Douglas' Grid and Group Theory"

Harry Collins (University of Bath, England) "Understanding Science"

Steve Woolgar (Brunel University, England) "What can Ethnomethodology Tell Us about Science as a Topic?"

John Law (University of Keele, England) "Ethnomethodology and Theory in the Sociology of Knowledge"

Karin Knorr (University of Pennsylvania) "The Political Knowledge of Truth"

Richard Dolby (University of Kent, England) "Controversy and Consensus in the Growth of Scientific Knowledge"

(2) "Sociology of Belief: Ideas and Interests"

This meeting was held at the University of Leeds on 8-9th January under the auspices of the British Sociological Association Theory Group. Papers were presented to about 50 participants by:

Phillip Pettit (University of Bradford) "Self-Criticism and Cognitive Sociology"

Mike Mulkey (University of York) "Rules, Interpretation and the Growth of Knowledge"

Bob Towler (University of Leeds) "Beliefs and Beliefs"

Barry Barnes (University of Edinburgh) "Similarity"

David Bloor (University of Edinburgh) "Polyhedra and the Abominations of Leviticus"

Richard Bernstein (Haverford College, Pennsylvania) "What's Wrong With the New Sociology of Science"

(3) The British Sociological Association: Sociology of Science Study Group plan the following meetings:

13th February

"What Can Ethnomethodology Contribute to the Sociology of Science?"

9-12th April

"Legal Argument and Scientific Knowledge"

Late May/early June

"The Social Construction of Contemporary Physics"

Further details of these meetings can be obtained from Harry Collins, University of Bath.

FOURTH ANNUAL MEETING

The Fourth Annual Meeting will be held in Washington, D.C. from

2 to 4 November 1979

The meetings will be at the L'Enfant Plaza Hotel in Washington.

The opening keynote speaker will be Donald Kennedy, Commissioner of the Food and Drug Administration.

REGISTRATION FORMS AND HOTEL RESERVATION FORMS WILL BE PRINTED IN THE NEXT NEWSLETTER (VOL 4:2).

PLAN NOW TO ATTEND!

Science Indicators Redux*

David E. Drew
Claremont Graduate School

Science Indicators 1976 (National Science Board, 1977) is a substantial contribution to our knowledge about the state of science. The authors are to be complimented on this systematic presentation of a wide array of indices about the scientific enterprise. The three volume Science Indicator series has been welcomed especially by those of us who favor development of longitudinal data sets about important issues. Any critical comments below are intended to suggest constructive changes and should not obscure my basic enthusiasm for this volume.

In preparing my assessment of Science Indicators 1976 (SI/76) I have had the advantage of reading a draft of Robert McGinnis's (1978) excellent review. In this paper I shall try to avoid redundant discussion of points he addressed, merely citing areas of agreement. I shall focus on five issues that I believe are central to the future intellectual and organizational success of Science Indicators. They are:

- Increasing the policy relevance of Science Indicators
- Adding more output indicators tapping quality
- Improving the quality of data available to the authors
- Rethinking the volume's treatment of basic research
- Incorporating market factors in the discussion of technology development

Policy Relevance

Should Science Indicators be a crisp policy statement for the congress? Or a report to scientists on the health of their field? Or a presentation of new research results about the sociology of science? The present document seems to have been written as a compromise reflecting indecision about these, and other, goals.

I propose a simple solution: create several reports--three in fact--one explicitly designed to achieve each goal.

The problem goes beyond the question of formatting. Documents prepared for different purposes and audiences draw upon different data sources, employ varying analytical models and address different issues.

Under this presentation plan, Report I would be a brief policy document aimed at administrators, the congress and others who participate in decisions that affect the national scientific enterprise. This report would summarize the "health" of science, note and discuss problem areas, and draw out the implications of new statistical data for policy.

* I want to acknowledge the following colleagues who commented on an earlier draft of this review: Stephen G. Brush, William Commings, Ann Barthelmes Drew, Carolos Kroytbosch and Jack Schuster.

Report II would be a technical document. The intended audience would be scientists interested in new data about their own fields and those that Derek Price has labelled "the invisible college about invisible colleges"--sociologists of science. New findings would be buttressed by full presentation of the methodology, data sources, analytical techniques, and so forth.

Report III would consist of all data accumulated in the studies commissioned for the Science Indicators report. The data files should be clean, well-documented, and available free to all those interested in pursuing further analyses of the state of science.

A possible fourth category should be noted. All background reports prepared for NSF and cited in SI should be distributed widely to the scientific community.

This notion is not unprecedented. In fact, it is immodestly modeled on the approach my colleagues and I used in reporting an evaluation of NSF's Science Development program several years ago. Our documentation included (1) a detailed technical report (Drew, 1975), (2) a policy report drafted by the study advisory panel (under the leadership of John Millett) summarizing the findings and their implications (National Board on Graduate Education, 1975) and (3) a fully documented data file containing indices of science department structure and functioning for all major research universities over a 15 year period.

While some would disagree, I believe the last item--the data--is fully as valuable as the first two. For example, researchers and analysts have drawn upon the data from the Science Development study in preparing new reports.

Report I will be the most difficult for scientifically trained personnel to prepare--for the same reasons that scientists traditionally have trouble communicating with policy-makers. The two groups have different goals, pressures, values and perspectives. For example, anthropologist Russell Bernard (1974, p. 262) quotes one researcher as saying "people in Washington ask us for the wrong advice. They want us to solve problems that creep up on them but they never ask a scientist if the questions they ask are important ones. So all we ever get asked to do is bail the bastards out of some political crisis."

The unfortunate reality is that a well-reasoned objective, extensive report like Science Indicators does not have the sex appeal--or the impact--that a report loudly advancing one dramatic conclusion will show. For example, in 1965 Daniel Patrick Moynihan, then Assistant Secretary of Labor, published a report on black Americans. His conclusion was that many highly publicized minority problems such as unemployment, housing and so forth were by-products of a fundamental breakdown in the Negro family characterized by the absence of a father figure. This report influenced President Johnson (who drew upon it in a Howard University commencement address and convened a White House conference) and provoked much debate. Its critics noted that the monograph essentially contained persuasive arguments for one theory and was not an objective study. Some felt Moynihan's selection and presentation of data and previous research findings were biased in favor of his dramatic hypothesis.

If Report I is to be viable it must incorporate an awareness of the dynamics of policy development and it must address the important issues in current debates about science. In short, it will be a policy document, not a scientific report.

What might a decision-maker seek in a Science Indicators report? The answer, presumably, is data that will address such questions as:

Given finite funds, what kinds of scientists/departments/universities/ industrial organizations should he/she support?
What different kinds of payoffs are associated with funding basic vs. applied research?
What are the relative merits of institutional vs. project support?
Are we producing too many, or too few, highly trained personnel?
How do the answers to each of these questions vary by discipline?

The sociology of science is not sufficiently developed to provide precise answers for such questions. But future issues of Science Indicators could draw more heavily upon our admittedly limited understanding of the scientific process in some specific ways.

I share the McGinnis view that Science Indicators should seek and provide data that are more finely disaggregated. Also, I agree that incorporation of multivariate--or, for that matter, less sophisticated--analyses would bolster these volumes.

However, I do not share the McGinnis concern "with those features that are omitted from the interior of the model. What is missing there is virtually the entire cognitive and social structure of science." As policy analysts we all would benefit from a greater understanding of the cognitive and social structure of science. But asking these authors to provide it is like requesting international indicators of governmental structures from the State Department and expecting those analysts to incorporate a solid theory of world peace. How much consensus can we find among the membership of 48, for example, about the cognitive and social structure of science?

In short, I agree with the authors of Science Indicators 1976:

These relationships would be much clearer if there were an explicit model available of the research enterprise, both in itself and in relation to the rest of society. Such an ideal model would help to fix the significance of each indicator and would enable the various indicators to be correlated. The models that exist, however, are less than adequate for this purpose (p. viii).

More About Quality

I am concerned that insufficient attention has been given to incorporating the notion of quality in the Science Indicators output indicators. To begin with, there are too few output measures in this volume. Admittedly, some of the measures, e.g., patents, citations, Nobel laureates, tap quality (although the Nobel index has such a low base rate that its usefulness is limited

Future issues of Science Indicators could include attempts to assess quality directly. After all, the ultimate goal of all this scientific activity is excellence--major new breakthroughs in fundamental science, new solutions to old problems, high quality high technology, and so forth.

An illustration of an output indicator that fails to incorporate quality can be found in the section "Research Outputs and Applications" in Chapter 3. Many believe basic research is the cornerstone of science and this is the section in which the outputs of basic research are examined. It contains less than two pages of text. More to the point, "The study involved the selection of a set of U.S. scientific and engineering journals which were intended to be representative of the total literature in each field." (p. 88, emphasis added.) For such an important analysis why were representative--or only representative--journals selected? Why not leading journals, defined in a meaningful, objective manner such as average citation rate per issue or, better yet, per article? (Incidentally, some research has shown that rate of publication by faculty in leading journals correlates almost perfectly with peer review assessments of science department quality; see Drew and Karpf, 1975).

Admittedly, the inclusion of quality judgments in Science Indicators can provoke epistemological disputes and even political attacks, but I believe such judgments are required in the preparation of a useful profile of science. Moreover, operational definitions of quality can be developed with rigor, objectivity and creativity. For an example, see the 1977 National Science Board report on peer review. In that study professionals in four fields were asked to identify major advances in their disciplines (a surprising degree of consensus emerged). The advances then were analyzed in terms of funding and organizational factors. While this methodology can be criticized and is not a panacea, it represents one laudable attempt to incorporate quality in an indicator of scientific output. More such attempts would greatly enhance Science Indicators.

Data Sources for Science Indicators

My major concern is the poor quality of data about U.S. science available to policy analysts such as the authors of the Science Indicators reports.

According to a nineteenth century British judge:

The Government are very keen on amassing statistics. They collect them, add them, raise them to the nth power, take the cube root and prepare wonderful diagrams. But you must never forget that every one of these figures comes in the first instance from the village watchman, who just puts down what he damn pleases (Stamp, 1929, p. 255).

Elsewhere (Drew, 1978) I have discussed the flaws in the information system about academic science. I believe that fewer information requests could be made by federal agencies (and related national organizations) but the data would be more useful if presently diverse retrieval activities were better coordinated.

The problem is that it is difficult, if not impossible, to relate data from different organizations. This is necessary because different agencies or groups retrieve the best (or the only) data about different characteristics of science departments. For example, NSF has the best data on federal expenditures by discipline, while the National Research Council (NRC) has virtually complete information about Ph.D.'s and their job placement. The following are some of the problems one encounters:

Academic fields are defined and classified differently. For example, in the NRC Doctorate Record File Ph.D.'s indicate their own fields (which may not match their departments), while the key file about National Institutes of Health funding references actual departments, and NSF's funding file aggregates departments into "disciplines."

During the past decade many state universities developed strong branch campuses with graduate programs. Agencies vary as to whether they report activities at the main campus only or at the main campus and branch campuses identified separately, or lumped together. As a further complexity, the point at which a branch campus is considered sufficiently active to be recognized by an agency (or, in fact, by the university itself) varies.

Some files fail to separate data about the medical or agriculture schools from data about the main unit. Thus, all federal expenditures for biochemistry are reported as one datum for a particular university.

The astute reader will realize that successive sections of Science Indicators 1976 had to be based on data derived from different definitions.

Policy analysts frequently discover that indicators of the same phenomenon provided by two agencies do not agree. One reason is that different organizations use different sources. For example, the NRC polls doctorate recipients. The NSF gets enrollments from department chairman. The National Center for Educational Statistics retrieves both enrollment and Ph.D. statistics from university-level administrators such as registrars.

And definitional problems affect data about industrial science as well. Manfield (1968, p. 53) notes:

The accounting procedures in many firms are not designed to yield these kind of data; for example, firms have difficulty isolating R & D costs from routine testing or quality control, from the cost of production, and from other work performed in operating divisions. Sometimes there is double counting when firms include R & D performed by subcontractors.

Under accounting regulations which existed prior to some fundamental changes in 1974, it was unclear exactly how much industry itself (as opposed to the government) spent on R & D. New guidelines which have been in full effect since 1975 have obviated this problem. But prior to that, "Procter and Gamble Co., for example, properly listed its costly surveys of consumer preferences as R & D expenses, while American Telephone and Telegraph just

as properly reported as an R & D cost only the most advanced scientific and exploratory development at Bell Telephone Laboratories, Inc." (McAuley, 1976, p.63)

Similarly, note the comment in Science Indicators 1976 about "the difficulty in separating R & D obligations from other programmatic obligations of federal agencies (p. 45).

Several years before publication of the first Science Indicators report, Harold Orlans (1973, p. 159) concluded an excellent review of these problems in data about US Science:

"The volume of American research and development is so vast and its character so diverse that it is difficult to describe or summarize it all in terms that are equally meaningful, accurate and comparable across the entire spectrum of activity. . . . the fact of the matter is that these national statistics are more useful in political and intellectual arguments than in actual administrative decisions, for which far more specific, detailed, coherent, and reliable information is necessary." Orlans concludes "R & D statistics need not be discarded, but they badly need to be re-examined and reconstituted in fresh forms more pertinent to the problems which beset us--including the problems created by science and technology."

(Incidentally, apropos the Price suggestion for cutting "the Gordian ampersand," Orlans' title, "D & R in the United States" indicated clearly which activity he feels should receive more attention in data about science.)

How to reconstitute R & D statistics? In the editorial cited above I joined those who have appealed for greater cooperation among federal agencies and national organizations. In addition, I believe we should listen to that British judge and study carefully the origins of these data in the field. For example, in the case of academic science, we should study information flow in the university. How might the same research project be perceived, and defined or categorized, differently by the principal investigator, the department chairman, the dean, the comptroller and so forth? In other words, how does choice of a respondent within a university predetermine the shape of government statistical data?

How is information about projects changed and redefined as it flows from one of these potential "watchmen" to another? Would data about the same project be reported differently in a public or private institution, in a centralized or decentralized management system, in a university with a grants office or one without?

Given sufficient knowledge about the way the same reality is described by different watchmen in different institutional environments some federal agencies may choose to retrieve data through intensive examination of a carefully selected sample of universities rather than investing equivalent time and money in a relatively superficial census.

Rethinking the "Basic Research" Concept

For most science indicators there are few (or no) conceptual problems: counting the number of graduate students enrolled in a given department does not involve profound philosophical issues. But some data flaws result from more deeply-rooted epistemological problems. Specifically, the notion of "basic research"--so important in science policy--needs to be reconsidered carefully (if not, indeed, "junked," à la McGinnis).

Twenty years ago Charles Kidd (1959, p. 368) wrote

. . . basic research has not yet been defined--and may never be defined--so as to permit an ambiguous, objective measurement of the dollars spent for basic research in this country.

Kidd continued by describing the data retrieval problem as it existed at that time.

Somewhere between the offices in Washington which hand out research funds and distribute questionnaires and the offices in universities which receive funds and answer questionnaires, the meaning of the definitions of basic research undergoes a metamorphosis that permits one set of observers to find the quantity to be twice as large as the other observers say it is. Such a discrepancy raises a number of questions, including the nature of the definitions that provide such a flexible yardstick (p. 368).

The situation has not improved during the past two decades, as this quote from Science Indicators 1976 demonstrates.

There is, for example, uncertainty regarding the precision with which "basic" research can be distinguished from "applied" research. A particular research effort may be identified as basic or applied, depending on whether the classification is made by the sponsor of the research or by the organization or individual performing it. Furthermore, differences among sectors in the assignment of costs to basic research make it difficult to compare expenditures and the magnitude of research efforts among the sectors. Industrial firms, for example, include in their reported expenditures for basic research an annual depreciation cost of the facilities used in the research; universities and Federal laboratories do not. The construction costs of large, Government-financed research facilities such as the Fermi National Accelerator Laboratory are not included as basic research expenditures. However, each sector's trends are consistently defined over time (p. 71).

These definitional problems are exacerbated when Science Indicators reports research findings from sources outside the U.S. Even a relatively sophisticated reader may have difficulty reconciling trend data from an international study which show an increase in U.S. government expenditures for the "advancement of knowledge" since 1972 (p. 8) with the data in Chapter 3 which show a decline in U.S. (constant dollar) expenditures for basic research during the

same period. Of course, one statistic is a percentage and the other isn't. But how to reconcile the "advancement of knowledge" notion--which is different from "national defense," "space research" and "health" with "basic research." Perhaps one shouldn't try. But it's tempting.

The basic research concept is a part of the vocabulary of scientists, administrators and policymakers. Any policy about government data retrieval must recognize this fact. Ideally, any new conceptualization of the scientific enterprise would be collapsible into a basic-applied differentiation.

However, the world is more complex than this. At a minimum this distinction reflects a continuum. Further, basic research in sociology is fundamentally different from basic research in biology or physics or mathematics. That is, the poles of the spectrum refer to entirely different activities, thought processes, and theories in different scientific disciplines.

If one starts with two labels, basic and applied, and tries to force the rich variety of scientific research into this procrustean pair of categories the result not only is an unjustified reduction of complexity and loss of information, but the creation of a simple model which can be destructive. Philosophers use the term "nominalistic fallacy" to refer to a process in which it is assumed that because a word exists it refers to something real, tangible and identifiable. It might better be called the Humpty Dumpty syndrome: "When I choose a word it means just what I want it to mean--neither more nor less." My concern is not with whether there are real studies which could be labeled basic or applied, but with the loss of information, and the distortion in policy, which can result from a simplistic application of that distinction.

In the paper mentioned earlier, Charles V. Kidd compiled definitions of basic research. He found that some definitions rested on the intention of the investigator, some on the research process and some on the nature of the findings. Kidd concluded that "the array of criteria used to describe the research process must be viewed not as literal descriptive definitions but as statements of the probability of producing a basic finding" (p. 372, *my italics*).

Incidentally, there are similar definitional problems in trying to separate applied research from development and development from production. When the Navy develops a prototype airplane, this is called "development," when it develops prototype submarines, this is labeled "production" (Orlans, 1973).

In short, I believe considerable attention should be directed to clarifying both what we mean by basic research and how to measure it.

The Importance of Market Pull

Chapter 4 of Science Indicators 1976, devoted to "Industrial R & D and Innovation," omits an important factor research (and experience) has shown

to be crucial to industrial innovation: the pull of the market. Two opposing theories of innovation emphasize the creation of new technology by scientists and engineers on the one hand vs. the importance of market incentives on the other--"technology push" vs. demand pull." The overwhelming evidence shows that the latter is a more important determinant of innovation than the former. Pavitt and Wald (1971) examined the findings from four empirical studies (Carter and Williams, 1957; Goldhar, 1969; Langrish, 1969; Myers and Marquis, 1969); each study demonstrated the strong impact of market forces.

Former presidential science advisor, Edward E. David, Jr., (1977, p. 8) recently commented:

A corollary of this model of innovation as an interlinked chain of activities is that market pull is more important than was probably thought in the early 60s. Technology push is there, but as a decisive force, it is rarer than was believed. The point to be made is that potent forces on technology arise from the output side. These forces can be either positive or negative.

As a more pragmatic level, Business Week recently quoted a steel company official:

When a customer wants something, we go into the lab. We take a dim view of going too far beyond our customer's end product development. There may be a development down the road, but it would be of benefit for every steel company, and we can't afford to do research for the entire industry. Futuristic research is the kind of thing that the guys using our products ought to do (McAuley, 1976, p.8)

Of course, this dichotomy also represents an oversimplification. Both factors can interact in a complex fashion.

Science Indicators 1976, unfortunately, includes no indicators--in fact, no discussion--of market pull. Even granting the difficulties in obtaining useful data about national and international markets, one would hope that this imbalance will be corrected in future volumes.

In conclusion I believe the authors of Science Indicators 1976 have done an excellent job of marshalling statistical information about U.S. science. Suggestions about possible lines of improvement are offered by a reviewer who essentially is appreciative and enthusiastic.

REFERENCES

- Bernard, H., "Scientists and Policymakers: An Ethnography of Communication," Human Organization 33 (1974) 261-275.
- Carter, C. and B. Williams, Industry and Technical Progress: Factors Governing the Speed of Application of Science. England: Oxford University Press, 1957.
- David, E., "National Policies for Science and Technology: U.S. Innovation and World Leadership--Facts and Fallacies," The International Journal of Management 20 (1977) 7-10.
- Drew, D., "Needed: Better Data About Academic Science," Science 200 (April 28, 1978) 385.
- _____, Science Development: An Evaluation Study. Washington, DC: National Academy of Sciences, 1975.
- _____, and R. Karpf, "Evaluating Science Departments: A New Index," P-5521, The Rand Corporation, Santa Monica, CA, 1975.
- Goldhar, J., cited by N. Ruzic in Industrial Research, U.S.A., 1969.
- Kidd, C. V., "Basic Research--Description Versus Definition," Science 129 (Feb. 13, 1959) 368.
- Langrish, J., Innovation in Industry: Some Results of the Queen's Award Study. England: University of Manchester, 1969.
- Mansfield, E., The Economics of Technological Change. New York: W.W. Norton, 1968.
- McAuley, R., "Where Private Industry Puts Its Research Money," Business Week (June 28, 1976) 62-84.
- McGinnis, R., "Science Indicators/1976: A Critique," 4S Newsletter, 3:4 (Fall 1978):14-29.
- Moynihan, D., The Negro Family: The Case for National Action. Washington, DC: U.S. Government Printing Office, 1965.
- Myers, S., Successful Industrial Innovations. Washington, DC: National Science Foundation, NSF 19-17, 1969.
- National Board on Graduate Education, Science Development, University Development and the Federal Government. Washington, DC: National Academy of Sciences, 1974.
- National Science Board, Report to the Congress Regarding Peer Review Procedures at the National Science Foundation, NSB 77-468, November, 1977.
- National Science Board, Science Indicators/1972, 1973; Science Indicators/1974, 1975; Science Indicators/1976, 1977.

Orlans, H., "'D & R' Allocations in the United States," Science Studies 3
(1973) 119-159.

Pavitt, K. and S. Wald, The Conditions for Success in Technological Innovation.
Paris: Organization for Economic Cooperation and Development, 1971.

Stamp, J., Some Economic Factors in Modern Life. London: P.S. King & Son, 1929.

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SOCIAL SCIENCE & MEDICINE MEDICAL ANTHROPOLOGY

Multilingual Journal (Largely English) - Abstracts in English

VOL. 12 NO. 2B APRIL 1978

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RECENT PUBLICATIONS

PEER REVIEW IN THE NATIONAL SCIENCE FOUNDATION--Phase One of a Study,
by Stephen Cole, Leonard Rubin and Jonathan R. Cole for the Committee
on Science and Public Policy, National Academy of Sciences

This book is a report of the National Academy of Sciences sponsored study
of the operation of peer review. It is based on in-depth interviews with
70 scientists who have been involved at all points in the peer review
system, as well as on data from the NSF files.

Table of Contents

Introduction

Formal Structure of Decision Making / Comparison of NSF and NIH Peer
Review / Criticisms of Peer Review / Review of Literature on Peer
Review / Description of the Research

Program Director Activity Prior to Decision Making

Preproposal Activity of Program Directors / Prereview Evaluation by
Program Directors / Selection of Panel Members / Selection of Mail
Reviewers

Relation Between Review and Applicant Characteristics as an Influence on Ratings

Influences of Characteristics of Applicants on Reviewer Ratings

"Track Record" and Peer Review Ratings / Location at Prestigious Departments
and Peer Review Ratings / Professional Age and Peer Review Ratings / Com-
bining the Nine Characteristics / Significance of Findings

Interpretations of Reviews by Program Directors

Interpretative Process / Types of Peer Review Cases / A Paradox about
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Accumulation Advantage / Influence of Past Research Output / Past
Granting History / Rank of Current Department / Professional Age /
Other Characteristics of Applicants / Combined Effects of the Nine
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Amount of Money Applied for and Funding Decisions / Tabular Analysis
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Post-Decision-Making Activities of the Program Director

Handling Declinations / Negotiating Budgets / Monitoring Research
Performance

Criteria for Selection of Grants

Sample, Data, and Methods

References

ISBN 0-309-02788-8; 1978, xiv + 192 pages, paperbound, \$10.75.

Reliable knowledge

An exploration of the grounds for belief in science

JOHN ZIMAN, FRS

Henry Dorton Willis Professor of Physics, University of Bristol

CAMBRIDGE UNIVERSITY PRESS

CAMBRIDGE

LONDON • NEW YORK • MELBOURNE

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- 1.1 The challenge
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- 1.3 The model
- 1.4 Consensibility and consensuality

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- 2.2 Mathematics as the ideal language
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- 2.4 The mathematical machine
- 2.5 Metaphors and models
- 2.6 The logic of experience
- 2.7 Physics and physicalism
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3 Common observation

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5 The stuff of reality

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- 5.10 How much is real?

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Sociology of Science

Jerry Gaston

Editor

Jossey-Bass Publishers

San Francisco • Washington • London • 1978

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FORTHCOMING PUBLICATIONS

Scientometrics

Vol. 1, No. 4 (Scheduled date of publication: May, 1979)

Contents

Z.M. Mulchenko, Yu.V. Granovsky, A.B. Strakhov (USSR): On Scientometrical Characteristics of Information Activities of Leading Scientists

Y.M. Rabkin, J.-J. Lafitte-Houssat (Canada): Cooperative Research in Petroleum Chemistry

V. Brozek, P. Karen (Czechoslovakia): Dynamics of Information Flow in the Field of Rare Earth Carbides Research

E. Garfield (USA): Is Citation Analysis a Legitimate Evaluation Tool?

J. Vlachy (Czechoslovakia): Quotations and Scientometrics

News

(Abstracts to above papers)

Z.M. Mulchenko, Yu.V. Granovsky, A.B. Strakhov (USSR): On Scientometrical Characteristics of Information Activities of Leading Scientists

A comparative analysis of the information activities of leading scientists has been carried out, including 5 Soviet chemists and 5 foreign ones, and 8 Soviet physicists, specialist in low temperature physics. Within chemists there has appeared a tendency to a new form of scientific activities, namely ephemeron teams which favour the "production line" mode of getting new information. In physics, the traditional scheme is preserved: leading scientists publish few articles and have few co-authors. The ephemeron teams produce an expanding information: new objects and processes are studied from the previously elaborated point of view. The specific average citation rate (number of references per number of papers) is a criterion for separating the publications of the "intellectual industry" from the pilot studies full of novel ideas.

Y.M. Rabkin, J.-J. Lafitte-Houssat (Canada): Cooperative Research in Petroleum Chemistry

The American Petroleum Institute (API) Research Project 6 has been chosen as a model to study the science organization in petroleum chemistry. The quantitative analysis of scientific publications, references, citations and citation lags elucidates the cooperative nature of Project 6.

V. Brozek, P. Karen (Czechoslovakia): Dynamics of Information Flow in the Field of Rare Earth Carbides Research

Dynamics of the research of rare earth carbide compounds are analysed by the information flow method. Papers concerning the matter indicated in the Chemical Abstracts as well as in surveys of professional literature since 1895 are categorised into a three-dimensional system of 29 descriptors, according to their date of publication. A new, finer unit of scientific

production volume is used for the information flow quantification. Selected complete time arrays are approximated using either an exponential curve and the Gompertz function; the growth constants for the time array are also calculated. Development until 1975 is estimated on the basis on the course of the approximated arrays up to 1973 and is compared with the actual state.

E. Garfield (USA): Is Citation Analysis a Legitimate Evaluation Tool?

A comprehensive discussion on the use of citation analysis to rate scientific performance and the controversy surrounding it. The general adverse criticism that citation counts include an excessive number of negative citations (citations to incorrect results worthy of attack), self-citations (citations to the works of the citing authors), and citations to methodological papers is analyzed. Included are a discussion of measurement problems such as counting citations for multiauthored papers, distinguishing between more than one person with the same last name (homographs), and what it is that citation analysis actually measures. It is concluded that as the scientific enterprise becomes larger and more complex and its role in society more critical, it will become more difficult, expensive and necessary to evaluate and identify the largest contributors. When properly used, citation analysis can introduce a useful measure of objectivity into the evaluation process at relatively low financial cost.

J. Vlachy (Czechoslovakia): Quotations and Scientometrics

[No abstract]

CALL FOR PAPERS

Technology and Society Division is requesting papers on the following topics for presentation at the Winter Annual Meeting in New York City, December 1979. Two copies of abstracts (200-500 words) or completed manuscripts of the papers may be submitted to: Professor A.M. Dhanak, Department of Mechanical Engineering, Michigan State University, East Lansing, MI 48824. The deadline for the abstracts: April 30, 1979.

Papers on the following topics will be considered to be especially suitable: (1) Technology assessment - analysis, forecasting, social impacts, ethical values, methodologies; (2) Energy and environmental assessments; (3) Assessments of solar energy and of other alternate energy sources; (4) Technology transfer - the use of new and innovative engineering practices in public sector management, technology transfer to Government Organizations and case studies; (5) Analysis and/or proposed models of engineering ethics; (6) Appropriate technology for developing and developed nations; (7) Socio-technical programs and ethics courses in engineering education; (8) Emerging technologies; (9) Legislative and legal problems relating to the role of technology; (10) General aspects dealing with interactions between technology and society.

Submitted abstracts or papers will be reviewed as to their appropriateness for the planned sessions and the authors will be notified of the acceptance of the papers for preprint publications and presentations.

Grants Awarded by the NSF Ethics and Values in Science and
Technology (EVIST) Program During Fiscal Year 1978

"Values and the Public Works Practitioner" (Partial support provided
by NEH).

Daniel L. Babcock, University of Missouri,
Rolla, Missouri 65201

\$25,500
Ref: OSS78-05729

"Ethical Problems in Social Science Research with Human Subjects"

Tom L. Beauchamp, Georgetown University
Washington, D. C. 20057

\$195,000
Ref: OSS78-17720

"Social Values and Clinical Medicine: An Interdisciplinary Conference"

Eric J. Cassell, Cornell University College of Medicine
New York, New York 10021

\$96,000
Ref: OSS78-17838

"Ethical Issues in the Delivery of Health Care Within Detention and
Correctional Institutions"

Nancy N. Dubler, Montefiore Hospital and Medical Center
Bronx, New York 10467

\$73,000
Ref: OSS77-16859

"Ethical Issues in Biomedical Decision Making: Four Case Studies"
(Partial support provided by NEH)

Diana B. Dutton and John P. Bunker
Stanford University
Stanford, California 94305

\$134,500
Ref: OSS77-26502

"Ethical Components of Peer Review in Medicine"

Eliot Freidson, Center for Policy Research, Inc.
New York, New York 10027

\$107,400
Ref: OSS78-17195

"Ethics and Values in Agricultural Research: A Case Study"

William Friedland, University of California
Santa Cruz, California 95060

\$73,500

Ref: OSS77-24678

"Workshops on Ethical Problems in the Production, Use and Regulation of Toxic Substances"

Albert J. Fritsch, Technical Information Project
Washington, D. C. 20036

\$79, 800

Ref: OSS77-24713

"Case Studies of Value Issues in the Application of Technology in Law Enforcement" (Partial support provided by NEH).

Raymond G. Hunt, Institute for the Study of Contemporary
Social Problems
Seattle, Washington 98105

\$161,450

Ref: OSS77-24548

"Value Issues in the Controversy over Recombinant DNA Research" (Partial support provided by NEH).

Sheldon Krinsky, Tufts University
Medford, Massachusetts 02155

\$58,200

Ref: OSS78-16469

"Value Issues in the Control of Technology-Related Damage" (Partial support provided by NEH).

Jane C. Kronick, Bryn Mawr College
Bryn Mawr, Pennsylvania 19010

\$116,600

Ref: OSS78-18023

"Bibliography of Engineering Ethics" (Partial support provided by NEH)

Robert F. Ladenson, Illinois Institute of Technology
Chicago, Illinois 60616

\$39,500

Ref: OSS77-24571

"International Conference on Ethical and Value Issues in the Social Assessment of Science" (Partial support provided by NEH)

Everett Mendelsohn, Harvard University
Cambridge, Massachusetts 02138

\$26,900

Ref: OSS78-00107

"Value Issues in Research on the Biological Effects of Microwave Radiation: A Case Study"

Nicholas H. Steneck, University of Michigan
Ann Arbor, Michigan 48109

\$31,600

Ref: OSS78-06675

"Values and Value Changes in the Formulation of the Pittsburgh Air Pollution Control Statutes" (Partial support provided by NEH).

Joel Tarr, Carnegie-Mellon University
Pittsburgh, Pennsylvania 15213

\$49,900

Ref: OSS78-17308

"Ethical Considerations in the Natural Sciences: A Workshop for College Science Teachers"

Morton Tavel, Vassar College
Poughkeepsie, New York 12601

\$90,100

Ref: OSS78-09891

"Ethical Problems of Fieldwork in Anthropology and Sociology"

Murray L. Wax, Washington University
St. Louis, Missouri 63130

\$136,000

Ref: OSS77-16288

"Workshops on Ethical Issues in Engineering" (Partial Support provided by NEH)

Vivian Weil, Illinois Institute of Technology
Chicago, Illinois 60616

\$62,500

Ref: OSS78-07276

"Social Impacts of the Recombinant DNA Controversy" (Supplementary Grant)

Charles Weiner, Massachusetts Institute of Technology
Cambridge, Massachusetts 02139

\$19,000

Ref: OSS78-16890

"Social Impacts of the Recombinant DNA Controversy--Documentation of the Responses of the Scientific Community, Government and the Public"

Charles Weiner, Principal Investigator
Massachusetts Institute of Technology

Summary:

This project will continue to document the value perceptions, motivations, and actions of scientists and others involved in the growing national debate surrounding the recombinant DNA case. As a result of efforts to date, a rich collection of unique source materials for study of the ethical and value issues associated with this debate has been assembled and catalogued.

The new project will document a somewhat different stage of controversy which has developed as a result of increased government and public involvement. It will involve the monitoring and recording of events as they unfold; conducting taped interviews with key participants; collecting written documents, including published materials and unpublished memoranda, reports and correspondence.

In view of the interest in the recombinant DNA case, special efforts will be made to disseminate the results of the project while the documentation work is in progress. Periodic bulletins describing new resources as they become available for research will be distributed to potential users. Key documents will be used to prepare detailed accounts of developments of special interest to serve as bases for scholarly studies. An audio and video cassette consisting of brief excerpts from the collected taped interviews will be made in order to explore the usefulness of such materials for educational purposes.

The documentation and dissemination activities to be carried out during the course of the project will provide valuable information and resources for a variety of studies and will also stimulate further research and teaching on the ethical and value implications of the recombinant DNA case.

"Workshop on Values and the Public Works Practitioner"

Daniel L. Babcock, Principal Investigator
University of Missouri - Rolla

Summary:

Decisions on public works largely determine the quality of the external environment and represent a large portion of local government budgets. This project seeks to sensitize engineering professionals in the public works field to the ethical and social issues implicit in the decisions made about priorities for public works projects and in the conduct of their professional work. It will realize its goal by means of a one-day workshop on Values and the Public Works Practitioner to be offered on the day preceding the October 1978 Annual Congress of American Public Works Association as part of the official program of the congress. The workshop is being designed to provide a blend of participants with engineering experience, expertise in philosophy and values and experience in the administration of public works programs. Its substantive focus will be on value issues in decision-making about public works and on the social responsibility of public works engineers. Abstracts of the prepared presentations are being made available to all interested members of the Association prior to the workshop. Proceedings will be prepared by the project staff and distributed free of charge to a 1700-person leadership list maintained by the Association, as well as to other interested individuals and organizations, including the ethics committees of all major engineering societies. They will also be widely advertized in major engineering journals and made available to groups or individuals who request them.

"Ethical Problems in Social Science Research Involving Human Subjects"

Tom L. Beauchamp, Principal Investigator
Georgetown University

Summary:

The objectives of this project are: (1) to identify and clarify areas where current ethical problems in social science research on human subjects have become amenable to empirical, procedural and methodological inquiry; and (2) to organize and examine current ideas and approaches for resolving the most important of these problems. Examples include problems of informed consent, privacy, weighing risks and benefits, and assessing the value of research itself.

The objectives of the project will be realized in a two phase effort: (1) scholarly and bibliographical work to develop a broad conceptual framework and identify resources for further study, and (2) a conference to examine approaches for resolving selected ethical problems, to explore ways to incorporate these approaches into professional education and to stimulate discussion of the problems among broad sectors of the public.

The project will yield a state-of-the art handbook, envisaged as a major resource for social scientists, educators and philosophers, as well as papers for publication in the professional literature and presentation at professional society meetings.

"Social Values and Clinical Medicine: An Interdisciplinary Conference" .

Eric J. Cassell, Principal Investigator
Cornell University

Summary:

The overall goal of this project is to explore the implications, for medical practice and for society as a whole, of the view that the patient and not the disease should be the proper object and subject of medicine. This goal will be approached by means of a conference which will focus on the relationships between medicine and ethics in terms of the realities of clinical practice and medical education. Participants will include physicians and other health care professionals, health care consumers, philosophers, medical sociologists, historians, policy makers, administrators and economists, science writers and members of the public in the Metropolitan New York area. Topics to be addressed include: (1) Ethical issues in the doctor-patient relationship; (2) the nature and limitations of clinical medicine; (3) relationships between structure and form in medical theory; (4) implications of new perceptions in medicine for other fields of science; and (5) implications for medical education.

The conference will result in a special edition of a leading medical journal, publications in journals of philosophy, articles in large circulation non-specialist journals, and an experimental module for use in pre-medical and medical instruction.

"Ethical Issues in the Delivery of Health Care Within Detention and Correctional Institutions"

Nancy N. Dubler, Principal Investigator
Montefiore Hospital and Medical Center

Summary:

Complex ethical and legal problems are encountered in the provision of adequate medical care to inmates of detention and correctional institutions. These include: (1) the nature of the doctor-patient relationship; (2) problems of confidentiality; (3) informed consent to treatment, to experimentation, and to behavior modification and physical intervention programs; and (4) problems in defining adequate treatment.

The objectives of this project are to: (1) sensitize health care professionals, students and trainees to the ethical and social issues inherent in the provision of health services to incarcerated persons, and to provide them with the skills needed to identify, articulate and analyze those issues; and (2) to develop teaching methodologies and materials that will permit the extension of this work to other institutions.

The project is being carried out by an interdisciplinary team consisting of an attorney, a philosopher, a psychologist and a community organizer at the Spofford Juvenile Center and the Rikers Island Correctional Complex in New York City. An advisory committee of physicians and former inmates at the Rikers Island facility are overseeing the work of the project.

"Ethical Issues in Biomedical Decision-Making: Four Case Studies"

Diana B. Dutton and John Bunker, Principal Investigators
Stanford University

Summary:

The overall objective of this project is to articulate, explore and analyze some of the normative problems which arise in conjunction with biomedical innovation. The problem areas which provide the framework for this study are: (a) the decision-making process itself, (b) issues of informed consent and (c) issues of reparative and distributive justice. The study will proceed by focusing on four specific case studies within which these issues have actually arisen: 1) the DES case, 2) the artificial heart program; 3) the swine flu vaccination program and 4) recombinant DNA research.

The project involves two related components: a continuing scholarly research seminar in which the cases will be developed and criticized, and a series of workshops for groups of scientists, legislators and citizens who are concerned with the specific case issues or with health consumer issues. The involvement of these groups in the project will provide different perspectives on the four cases and will explicate the various value issues raised by innovations in biomedical research. These types of information will be fed back into the research seminar to supplement the data for the case studies derived from more conventional scholarly sources. Likewise, the results of the deliberations of the seminar will be communicated to diverse groups by means of the public workshops.

Published materials from the project will include research papers and reports and a book designed for a general readership.

"Ethical Components of Peer Review in Medicine"

Eliot Freidson, Principal Investigator
Center for Policy Research, Inc.

Summary:

The goal of this study is to explore the ethical factors influencing peer review procedures in medicine, ie, those formal and informal procedures by which physicians identify, evaluate, educate and discipline those of their colleagues whose conduct does not conform to accepted standards. Its specific objectives are: (1) to identify attitudes concerning professional deviance and social control; (2) to analyze the influence of these attitudes on peer review processes and outcomes; and (3) to clarify the ethical dilemmas that characterize self-regulation in medicine. The study is designed as an exploratory, qualitative investigation that will assemble qualitative data and permit in-depth probing of attitudes and values that are not easily articulated. The data will come from a detailed examination of a sample of case studies of management of professional misconduct, and a field study of selected formal review committees in New York City.

The anticipated outcomes of the project include a monograph for general readership; short papers for dissemination to policy makers, peer review committees and community groups; and articles for publication in scholarly and policy journals.

"Ethics and Values in Agricultural Research: A Case Study Ethics and Values"

William Friedland, Principal Investigator
University of California - Santa Cruz

Summary:

The application of the results of scientific research to economic activity often leads to social changes. Thus ethical issues are involved not only in the way scientific research is conducted, but also in setting priorities for that research itself.

The objectives of this project are: 1) to explore the ethical issues that are implicit and explicit in setting priorities for research in agriculture; and 2) to sensitize agricultural research scientists to the ethical problems associated with their work. These objectives are being realized by means of a series of small workshops followed by a larger summary conference which bring the project staff together with members of the agricultural research community and with representatives of other sectors of the agricultural economic and social system, such as growers, farm workers, retailers, consumers, farm bureau representatives and state legislators. The workshops are organized with the intent of setting out the value assumptions of the various participants and identifying the broad ethical issues associated with decision-making processes in agricultural research. In order to assure coherence, the workshops focus upon the social and economic systems involved in lettuce production in the state of California, taking that system as a case study of the more general set of problems. The results of the project will include a monograph delineating ethical issues in determining research priorities in the lettuce production sector, and a more general analysis of broad ethical issues associated with agricultural research and production in general.

"Workshops on Ethical Problems in the Production, Use and Regulation of Toxic Substances"

Albert J. Fritsch, Principal Investigator
Technical Information Project

Summary:

The production, use and regulation of toxic substances pose difficult ethical problems for interested parties and for society as a whole, such as: how can the proprietary rights of industry be reconciled with the need to obtain information on which to base safeguards to the health of workers and citizens? How can the use of toxic substances be properly regulated, given uncertainties about their effects on health? and who is responsible for alerting the public to the hazards of toxic substances?

This project is following up a 1977 National Conference on Toxic Substances and Trade Secrecy by conducting a series of four focused workshops dealing with the rights and responsibilities of: 1) industry and labor unions, 2) research scientists and engineers, 3) government and 4) the general public. Participants will be selected by an interdisciplinary steering committee from among those who respond to a widely distributed call for participants and papers. Workshop proceedings will be widely advertised. In addition, selected materials will be disseminated to specific audiences, including industry, labor unions, university chemistry departments and public interest groups.

"Case Studies of Value Dilemmas in Law Enforcement"

Raymond G. Hunt, Principal Investigator

Institute for the Study of Contemporary Social Problems

Summary:

New and largely unexamined ethical problems, related to the classical dilemma of how to attain just ends by coercive means, are associated with the introduction of sophisticated technologies into police work. The objective of this project is to identify and develop criteria that will help to resolve the most important of those problems with reference to two specific types of technology: (1) computers, and (2) modern weaponry.

The project is being carried out in three phases: (1) formulation of the factual and normative issues from the perspectives of philosophy, sociology, law and political science; (2) refinement and explication of those issues through interviews with law enforcement personnel, judges, legislators, and citizen-group representatives in six communities in the United States; and (3) preparation of an ethical-legal analysis of the value issues associated with the two specific technologies that will include criteria for resolving the normative issues identified during the first two phases.

The results of the project will be made available to law enforcement agencies throughout the United States, and to governmental and non-governmental groups that are concerned with problems of modern law enforcement.

"A Study of Value Issues in the Controversy over Recombinant DNA Research"

Sheldon Krinsky, Principal Investigator

Tufts University

Summary:

The overall objective of this project is to study the implicit and explicit value issues underlying the assessments, by scientists and non-scientists, of the risks and benefits associated with recombinant DNA research. Its primary focus will be on the controversy in the United States from its inception prior to the Asilomar Conference in 1974 to the present. The study will build upon the extensive collection of materials on the public and professional dimensions of the recombinant DNA controversy presently housed at the MIT archives.

The project will seek answers to the questions: 1) can the assessment of risks and benefits of scientific research be a rational and objective process? and 2) how do non-scientific factors, and in particular the social values of interested non-scientists, enter into the risk assessment process? Its primary outcome will be a monograph analyzing the way risks benefits of recombinant DNA research have been treated, exploring the arguments and counter arguments developed through different phases of the debate and locating the sources of disagreement.

The monograph resulting from the project will be useful to scientists, to philosophers of science and to others who are concerned with the interactions of science, technology and society.

"Value Issues in the Control of Technology-Related Damage: A Comparative Study of Emerging Policies in the United States and New Zealand"

Jane C. Kronick, Principal Investigator
Bryn Mawr College

Summary:

Serious value questions associated with the issues of responsibility and liability are emerging in the United States and in other industrialized countries as a result of the increasing frequency of accidents resulting from the widespread application of innovative technologies. These questions include: who is responsible for the costs to victims of technological activities? to what extent should governments assume responsibility? how should the incidence of such costs be controlled?

The objective of this study is to conduct a critical, normative analysis of the value assumptions, conflicts and trade-offs associated with emerging policies for control and compensation in four areas: 1) personal injuries from toxic substances; 2) personal injuries from defective consumer products, including drugs; 3) personal and property damage related to energy production systems, particularly nuclear and oil; and 4) damage to privacy interests from computerized information systems. By means of this analysis the project staff will investigate the hypothesis that the United States is moving toward a political consensus that society as a whole should bear the costs to victims of technology.

Primary sources of data for the study include: 1) legislation, pending legislation and administrative regulations; 2) Congressional Hearings; and 3) key court decisions. An earlier study of the value assumptions and trade-offs that underlay passage of the New Zealand Accident Compensation Act of 1972 will provide a point of departure for the present study.

"Bibliography of Engineering Ethics"

Robert F. Ladenson, Principal Investigator
Illinois Institute of Technology

Summary:

The primary objective of this project is to stimulate discussion and analysis of ethical questions within the engineering profession. To that end, the Center for the Study of Ethics in the Professions at the Illinois Institute of Technology will compile, publish and disseminate a selected, annotated bibliography of engineering ethics targeted to the interests of practicing engineers and teachers of engineering. The bibliography will be a valuable resource for: 1) individuals and groups, including local chapters of engineering societies, who are formulating ethical codes or who are seeking to analyze and resolve specific ethical problems and cases; and 2) teachers in college and university engineering department who are planning and teaching courses in the area of technology and society.

The selection and annotation of the material to be incorporated into the bibliography is being monitored by an interdisciplinary faculty group at the Illinois Institute of Technology. Draft copies of the bibliography will be distributed for critical comment to approximately one hundred individuals with interest and expertise in engineering ethics. The final bibliography will be distributed free of charge to professional engineering societies (including local chapters), college and university engineering departments, professional journals of

"International Conference on Ethical and Value Issues in the
Social Assessment of Science"

Everett Mendelsohn, Principal Investigator
Harvard University

Summary:

During the past decade, the implicit value assumptions of basic scientific research in a number of fields, including biomedicine, and the behavioral sciences, have been subject to external or social assessment in most of the industrialized countries of the world. This assessment, which has been exercised both by the formal actions of governments and by a range of informal citizens' group activities, can be regarded in part as a conflict between the ethical resuppositions of science and those of other societal institutions.

This project used the occasion of a small international conference in West Germany during May 1978 to carry out a preliminary, cross-national and comparative study of the value dimensions of the social assessment of science. Participants were drawn from the United States and from both Western and Eastern Europe. A focal discussion paper was circulated in advance of the conference so that authors of specific conference papers had a common focus for their presentations. Edited versions of the conference papers are being published. In addition, an evaluation is being made of whether a long-term comparative and cross-national research project could provide important insights into the complex ethical and value issues associated with the social assessment of science phenomena.

"Value Issues on the Biological Effects of Microwave Radiation:
A Case Study"

Nicholas H. Steneck, Principal Investigator
University of Michigan

Summary:

The objective of this project is to explore the value presuppositions that operated within the scientific community and the larger society to determine priorities for research on the biological effects of microwave radiation between 1945, when microwave technologies became available for non-military purposes, through 1965, when the widespread deployment of microwave devices made it imperative to have scientific data on which to base adequate safety standards. These data depend critically upon the specific biological effects of microwave radiation. Until the early 1960's it was assumed, in the United States, that only thermal effects would be important. As a result, little or no research on more subtle non-thermal effects of microwave radiation was either encouraged or pursued.

The project will try to determine why neither the internal mechanisms of science nor any social mechanisms stimulated research in this area of potential importance to the health of the public, analyzing the results as a case study in changing perspectives about ethical standards and social expectations of science. The staff, which consists of a physicist, a physiologist, an historian of science and a philosopher, is studying the scientific and technical literature on microwave research and development and conducting interviews with persons who were involved in those areas in order to develop a detailed historical and normative case study. The project will result in a book suitable for use in college courses in

"Values and Value Changes in Formulation of the Pittsburgh Air Pollution Control Statutes"

Joel A. Tarr, Principal Investigator
Carnegie-Mellon University

Summary:

The objective of this project is to analyze the value perceptions and conflicts among the various scientific and non-scientific groups who were involved in the formulation of air pollution control legislation in Pittsburgh and Allegheny County (Pennsylvania) between 1940 and 1960. Since the scientific and public debates that led to that body of law involved many of the same technical and value issues that are associated with the current national energy policy debate, this analysis will serve to illuminate the present day situation. Specific issues to be addressed include:

(1) The roles and values of scientific and non-scientific groups in formulation of the policies; (2) Value conflicts and tradeoffs in the policy formulation process; and (3) Changes in community attitudes and roles resulting from implementation of these policies.

The study will be carried out by an interdisciplinary group which will include: an historian, experienced in the techniques of technology assessment; a philosopher, expert in values and public policy; an engineer, expert in air pollution control technologies; and an expert in air pollution regulatory legislation. It will result in a monograph of interest to scientists and engineers, philosophers, policy makers and others who are concerned with the formulation of energy policy.

"Ethical Considerations in the Natural Sciences: A Workshop for College Science Teachers"

Morton A. Tavel, Principal Investigator
Vassar College

Summary:

The objective of this project is to provide approximately one hundred experienced college science teachers with an introduction to pedagogical methods to help them: a) incorporate significant ethical components into their introductory science courses, and b) design courses on special ethical problems associated with contemporary developments in science. This objective will be realized by means of a one-day workshop held in conjunction with the Seventh Annual Conference of Teachers of Introductory College Science Courses to be held at Vassar College in October 1978. Participants will be drawn from the Northeastern United States, and will include many teachers who have not previously dealt with ethical issues in their courses. For that reason emphasis will be placed on providing sufficient material to permit the teachers to develop trial courses. A follow-up questionnaire mailed out after six months will be used to evaluate their subsequent use of their workshop experiences.

The project will be guided and evaluated by an interdisciplinary advisory committee. Faculty at the workshop will include college science teachers, non-academic scientists and humanists.

"Ethical Problems of Fieldwork"

Murray L. Wax, Principal Investigator
Washington University

Summary:

Fieldwork is a basic research method of anthropology and, to some extent, of sociology. While numerous perplexing ethical problems are encountered in the course of fieldwork, most of them have not been subject to systematic and critical evaluation.

The goals of this project are: 1) to define and delineate these problems; 2) to subject them to analysis by professional fieldworkers, philosophers and representatives of groups who have been studied by fieldworkers in order to heighten the sensibilities of fieldworkers to these problems; 3) to involve professional associations in self-monitoring projects; and 4) to improve the ethical preparation of graduate students for the conduct of fieldwork.

A major project activity will be a literature search focussing on both the substantive literatures on fieldwork and the records of professional associations concerning ethical problems. A second major activity will be a set of three workshops with participants to include professional fieldworkers, ethicists and representatives of groups who have been studied by fieldworkers. Several written products will emerge from the project: 1) an historical and interpretive review of the ethical problems of fieldwork; 2) an annotated bibliography; 3) results of a survey of experienced fieldworkers about ethical dilemmas they have encountered; and 4) a set of materials for instructing graduate students who are about to embark on careers in fieldwork.

"Workshops on Ethical Issues in Engineering"

Vivian Weil, Principal Investigator
Illinois Institute of Technology

Summary:

The objective of this project is to help members of undergraduate engineering and philosophy faculties prepare themselves to teach courses on ethical issues in engineering. This objective will be realized by means of an intensive two-week workshop during July 1979 for faculty members at institutions in the mid-West and South. Participant selection will stress the intellectual caliber and seriousness of the applicants' interest in the substance of the workshop, their potential for contributing to the workshop, and their potential for making use of their workshop experiences at their home institutions.

A curriculum report summarizing schemes for courses developed at the workshops will be produced in order to provide help in course development to those who do not participate in the workshop.

National Science Foundation
Ethics and Values in Science and Technology Program

Fiscal Year 1979 Grants--First Quarter

Drugs as Medical Technology: Ethical Issues in the Treatment
of Borderline Hypertension

Principal Investigator:

Sally Guttmacher
Columbia University
New York, NY 10032

Amount: \$90,100

Duration: 12 months starting May 1, 1979

To be supported for an additional 18 months,
subject to availability of funds.

Reference: OSS78-06821

Project Summary

Chemical intervention is increasingly part of the normal course of medical treatment. However, in a significant number of cases of long-term drug use, the personal and social consequences of the treatment regimen have not been adequately investigated. Nor have the values implicit in the adoption of drugs as a method of problem-solving been adequately examined.

This project will examine the ethical issues raised by an important case that illustrates these issues: the chemical control of a somewhat ambiguous medical condition, borderline hypertension, about which considerable debate concerning the costs and benefits of various treatment modes has been generated. The fact that the proportion of borderline hypertensives among the black population in the United States is three times that of the general population raises issues of special significance concerning the definition, diagnosis and treatment of the disorder.

The results of the study will be used to illuminate ethical issues encountered in other cases of routine, non-dramatic medical practice. Issues to be examined include: (1) value assumptions underlying the evolving medical conception of borderline hypertension; (2) the appropriateness of differing conceptions of health in assessing treatment alternatives; (3) strategies for

assessing risks and benefits of alternative treatments; and (4) possible differences in diagnosis and treatment depending on the patient and on the institutional setting.

The project methodology will involve: (1) structured interviews with clinicians, researchers, administrators of treatment programs, and patients; (2) workshops with participation from each of these groups to explicate the issues of concern; and (3) a continuing interdisciplinary research seminar to refine and analyze the information derived from the interviews and workshops. The results of the project will include a monograph for the general public, as well as papers for publication in the professional literature and for presentation at professional society symposia.

EVIST Program
FY 1979 Grants (cont.)

Ethical Issues in Research on Human Reproduction:

A National Workshop

Principal Investigator:

Helen Holmes
Federation of Organizations for Professional Women
2000 P St., NW
Washington, DC 20037

Amount: \$81,114

Duration: 22 months starting December 1, 1978.

Reference: OSS78-24508

NB: This project is jointly supported by the National Science Foundation and the National Endowment for the Humanities.

Project Summary

The objectives of this project are to explore the ethical issues associated with the determination of priorities for research on human reproduction and for applications of that research, and to determine whether there is any basis for the allegation that these priorities have been distorted because too few women have had opportunities to make serious inputs into the determination of them.

These issues will be addressed at a five-day workshop, to be held during the summer of 1979, in which a group of up to 45 scholars and lay persons from several disciplines, including biology, ethics, medicine, law, sociology, philosophy, social work and history will participate. Approximately half the participants will be selected from among applicants who respond to a widely disseminated announcement. The remainder will be invited specialists with recognized expertise and interest in the issues of concern to the project.

The project will attempt to determine whether the policy debate in these areas can be broadened substantially by means of a fuller participation by women. Specific outputs will include an edited symposium volume, papers prepared for publication in various professional journals and symposia at professional society meetings.

EVIST Program
FY 1979 Grants (cont.)

The Influence of the Values of Behavioral Scientists
on Research and on American Society, 1945-76.

Principal Investigator:

Leonard Krasner
Psychology Department
State University of New York
Stony Brook, New York 11790

Amount: \$83,908

Duration: 24 months starting February 1, 1979

Reference: OSS78-24572

NB: This project is jointly supported by the National Science Foundation and the National Endowment for the Humanities.

Project Summary

The principal goal of this project is to explore the relationships between the ethical and value systems implicitly and explicitly espoused by leading behavior modification scientists, and both the research they conduct and its impact on various practices in such settings as classrooms, mental hospitals, the criminal justice system and political institutions. Although the project is specifically concerned with the relationships between the espoused values and research priorities of behavior modification scientists, the analytical, philosophical framework to be developed will also be applicable to other scientific disciplines.

Source materials for the project will include the professional and non-professional writings of all leading behavior modification scientists who have been active since World War II; a large number of unpublished documents that have been collected by the Principal Investigator, including transcripts of interviews with seminal thinkers in the behaviorist movement; as well as additional, similar materials to be collected during the course of the study.

A primary objective of the project is to stimulate informed debates both within the behavior modification community and among the concerned public about the issues of concern. Hence, there will be two forms of dissemination: (1) A series of presentations at professional meetings of behaviorists and applied philosophers; and (2) a book aimed at the general public.

EVIST Program
FY 1979 Grants (cont)

Science and Ethical Responsibility: A National Workshop
for Undergraduate and Graduate Students

Principal Investigator:

Sanford A. Lakoff
Department of Political Science
University of California/ San Diego
LaJolla, California 92093

Amount: \$80,591

Duration: 18 months starting November 15, 1978

Reference: OSS78-24990

NB: This project is jointly supported by the National Science Foundation and the National Endowment for the Humanities.

Project Summary

The objectives of this project are: (1) to sensitize outstanding students in science, engineering and the humanities to significant ethical issues associated with science and technology; (2) to provide an opportunity for them to explore those issues in association with distinguished scientists and humanists; and (3) to prepare materials based on their explorations for use in college and university courses.

These objectives will be realized by bringing approximately 75 advanced undergraduate and graduate students from throughout the country together in June 1979 for a widely advertized, week-long conference on Science and Ethical Responsibility. Students will be selected to participate on basis of essays on specific ethical issues associated with the conduct and applications of science. Approximately two-thirds will be drawn from the natural sciences and engineering and the remainder from the social sciences and humanities. Faculty and guest lecturers will include nationally recognized scientists, engineers and humanists, many of whom have been associated with the International Pugwash Conferences.

Following the conference, participants will rewrite their essays in the light of the conference discussions. The best of these will be published in a volume to be disseminated to programs on science and society throughout the country and to other interested individuals and groups.

NEH - SEMINARS

The National Endowment for the Humanities has announced that its program of Summer Seminars for College Teachers will offer 123 eight-week seminars during the summer of 1979. Twelve college teachers will be selected to attend each seminar, and participants will receive a stipend of \$2,500 to cover travel expenses to and from the seminar location, books and other research expenses, and living expenses. The purpose of the program is to provide opportunities for faculty members from undergraduate and two-year colleges to work with distinguished scholars in their fields at institutions with library collections suitable for advanced study. The 1979 Summer Seminars for College Teachers brochure, which lists seminar topics, directors, and locations, are available from college department chairpersons or from the Division of Fellowships, National Endowment for the Humanities, 806 15th Street, N.W., Washington, D.C. 20506. College teachers interested in applying to a seminar should write to the seminar director (directors' addresses are listed in the brochure) for detailed information and for application materials. The deadline for submitting applications to directors will be April 1, 1979.

Smith, David H.
Department of Religious Studies
Indiana University
Bloomington, Indiana 47401

Liberty, Equality, and Fidelity in Bioethics

June 18-August 10, 1979

After reading philosophical and religious approaches to ethical theory, this seminar will survey a number of topics in bioethics. These will include experimentation on human subjects, the relationship between physician and patient, truth and confidentiality, eugenics, abortion, death and dying, and the distribution of medical resources. Special emphasis will be given to the difficulties involved in formulating a consistent method in normative ethics and to fiduciary relationships as loci of value. The seminar is intended for teachers of diverse backgrounds who deal with some aspect of bioethics in the classroom.

Murdoch, John E.
Department of the History of Science
Science Center 235
Harvard University
Cambridge, Massachusetts 02138

The Unity of Learning in the Later Middle Ages

June 25-August 17, 1979

The purpose of the seminar will be to examine the shifting relations between philosophy and theology in the later Middle Ages of the Latin West. Its thesis will be that there did exist common ground uniting these disciplines and that the nature of this unity changed, concomitant with changes in philosophy and theology themselves, during the period from 1250 to 1350. The seminar will begin by studying the institutional context of medieval learning, the university,

in order to observe the relations it fostered between reason and faith, and how these affected the separability or inseparability of philosophy and theology. As its central task, the seminar will analyze selected texts from these two disciplines to illustrate the give and take that developed between them. Medievalists, as well as historians of philosophy, or of religion or theology, are encouraged to apply.

Mendelsohn, Everett I.
Department of the History of Science
Science Center 235
Harvard University
Cambridge, Massachusetts 02138

The Social History of Modern Science

June 25-August 17, 1979

The seminar will apply the disciplines of history, sociology, and philosophy to a study of the nature of science--its structure, processes, and social relations. The seminar will combine chronological framework (for the seventeenth through the early twentieth centuries), methodological analysis (of the research procedures and modes of interpretation in the social history of science), and topical focus (on patterns of institutionalization, relations between science and various social elements, scientific careers, etc.). Teachers of the history of science, history, sociology, philosophy, and of the sciences are invited to apply.

Klein, Martin J.
c/o Yale Summer Programs Office
320 W. L. Harkness Hall
Yale Station
New Haven, Connecticut 06520

Physicists in Historical Context

June 18-August 10, 1979

This seminar will study several major figures in the history of modern physical science. The focus will be on the scientist at work: a particular individual in a definite historical setting facing certain problems with the resources available. Among those to be considered are Galileo, Newton, Carnot, Maxwell, Rutherford, and Einstein. Participants will read and discuss works by these scientists and also recent historical scholarship dealing with these works. Some of the discussions will stress the problems and methods of the historian of science. Teachers of history and of the physical sciences will be welcome; participants will not need more than an elementary understanding of physics.

Hacking, Ian
Department of Philosophy
Stanford University
Stanford, California 94305

The Importance of History to the Philosophy of Science

June 18-August 10, 1979

The seminar will study the impact of the new historiography of science on the philosophy of science. Participants will consider the work of T.S. Kuhn, Imre Lakatos, and Paul Feyerabend, which calls into question assumptions about rationality made by logical empiricism. They will also investigate new approaches to the history of science that have consequences for the theory of knowledge, including the sociological studies of Robert Merton, Marxist sociology of knowledge, and Michel Foucault's Archaeology of Knowledge. Current issues in the philosophy of language and the theory of reference will also be discussed as they relate to the interests of the seminar. Teachers of philosophy, history, and general science are encouraged to apply.

Freidson, Eliot
Rm. 325, 19 University Place
Department of Sociology
New York University
New York, New York 10003

Professions: Servants or Masters?

June 11-August 3, 1979

This seminar will explore the roles of the professions in contemporary society. It will begin with analysis of radical criticism (by Illich, Gaylin, and others) that raises basic questions about the sources of, and justification for, the very existence of the professions. Concentrating on medicine and law, the seminar will examine sociological and historical studies by Freidson and Auerbach, and discuss selections from the work of Parsons, Alford, Stevens, Berlant, Carlin, and Reuschmeyer. Briefer studies of engineering, social work, accounting, teaching, and science will also be discussed. Finally, the seminar will evaluate the three major theoretical approaches to the professions: the traditional approach which emphasizes the analytical importance of professional values and knowledge; the Chicago approach which emphasizes the face-to-face interaction in work institutions; and the recently emergent approach which emphasizes the importance of historical, economic, and political forces to the creation and maintenance of professional power. The seminar is open to teachers of sociology, history, political science, and economics.

Project on Ethical Dilemmas in Medicine

COLUMBIA UNIVERSITY TO STUDY ETHICAL DILEMMAS IN MEDICINE. Supported by a \$400,000 grant from the Edward Mallinckrodt, Jr., Foundation, in St. Louis, Missouri, the Columbia University Faculty of Medicine will embark on a 4-year interdisciplinary project to study the ethical dilemmas and value conflicts connected with modern health care practice entitled: "Development of Educational Materials on Issues of Ethics and Values in Health Care." The Columbia team will explore a series of clinical cases in which value conflicts and ethical dilemmas are important. Participating with Dr. Schoenberg in this work will be Professor Richard Kuhns of the Philosophy Department and Dr. Steven Marcus, Delacorte Professor of the Humanities and Chairman of the English Department. Interdisciplinary study teams of health professionals, humanists, social scientists, and consumers, will study the cases in great detail, clarifying the values at stake, pinpointing the nature of the conflicts, exploring possible approaches to their resolutions, and generating questions for further research. To generate teaching materials for students in the health professions, the case records will be put into written and videotape form together with the comments of the individuals involved and the discipline-oriented view of the team members.

To make possible a study of "Ethical Issues in Psychiatry and Mental Health Care," the Health Sciences Division of Columbia University has been awarded a grant of \$158,779 from the van Ameringen Foundation. Principal Investigator for the project is Dr. Schoenberg, Associate Dean for Academic Programs at the Columbia University College of Physicians and Surgeons.

Dr. Robert J. Weiss, Director, Center for Community Health Systems and Professor of Psychiatry and Social Medicine, will be Co-Principal Investigator for the project with Dr. Schoenberg. Dr. Eric Marcus, a member of the Department of Psychiatry of the College of Physicians and Surgeons, who is trained as a cultural anthropologist, will serve as Project Director.

The award from the van Ameringen Foundation will support a 3-year program that will explicate ethical and value issues in psychiatry and will identify their consequences for the quality of mental health care. The project will also develop educational materials for use by students of psychiatry, psychiatric nursing, psychology, social work, and related fields, as well as by legislators, social planners, policy makers, humanists, and consumers. This study will proceed in parallel with interdisciplinary inquiry into value dilemmas in other areas of health sciences practice.

Those interested in these programs should contact:

Dr. Bernard Schoenberg
Associate Dean for Academic Programs
Columbia University
College of Physicians & Surgeons
630 West 168th Street
New York, New York 10032
(212) 694-4194

Recent Meeting

WORKSHOP ON SCIENTOMETRICS (University of Montreal)

Program

1. "Primitive Indicators of Science and Technology in Canada and the USA"
ALEX C. MICHALOS, Director
Social Indicators Research Programme
University of Guelph, Guelph, Ontario
2. "Citation Visibility of Third World Science: the Case of Two African Universities"
YAKOV M. RABKIN, professeur agrege
Institut d'histoire et de sociopolitique des sciences
Universite de Montreal, Montreal, Quebec
3. "Trends and Perspectives in Scientometrics Research"
DEREK JOHN DE SOLLA PRICE
Avalon Professor of the History of Science
Yale University, New Haven, Connecticut
4. "Information Theoretic Approach to Science Indicators"
JAMES MACAULAY, Project Officer
Standing Committee on Research
Science Council of Canada, Ottawa, Ontario
5. "Output Measures of Cooperative Research: the Case of Pulp and Paper Research Institute of Canada"
GEORGE H. BINDON, Assistant Professor
Science & Human Affairs Programme
Concordia University, Montreal, Quebec
6. RAPPORTEUR:
HERBERT INHABER, Science Advisor
Atomic Energy Control Board
Ottawa, Ontario

For further information write to:

YAKOV M. RABKIN, IHSPS
Universite de Montreal
C.P. 6128, Succursale A
Montreal (Quebec) H3C 3J7

Proceedings of the Workshop are to appear in SCIENTOMETRICS.

Forthcoming Meetings

FIRST CIRCULAR

**SYMPOSIUM ON STUDIES IN HISTORY AND
PHILOSOPHY OF SCIENCE:
THEIR EDUCATIONAL ROLE AND
BEARING ON CONTEMPORARY PROBLEMS
UNIVERSITY OF MELBOURNE**

23-25 AUGUST 1979

SPONSORSHIP

The symposium is being sponsored by the Australian Academy of Science, through its National Committee for History and Philosophy of Science.

OBJECTIVES

Studies in 'H.P.S.', that is the history, philosophy, and social relations of science, form an area of increasing interest and concern for scientists and members of the general public, as well as for those professionally engaged in the field. The broad aim of the Symposium is to bring together all those who are concerned with the study of science from a general point of view as a social and intellectual phenomenon, and to provide a national forum in which matters of common interest may be discussed. It is intended that the papers presented at the Symposium will help stimulate a specifically Australian contribution to the contemporary debate on the nature of science and its role in society, and will lead to a discussion of the best ways of presenting these issues to students and to members of the general public.

One of the main objectives of the Symposium is to promote worthwhile discussion of the function of H.P.S.-style studies in the general educational framework, whether at secondary or tertiary level. The final day will be given over to workshop discussions in which specific proposals will be taken up.

PROGRAMME

The first two days of the Symposium will be devoted to papers from the following invited speakers:

Mr R. Harré. University Lecturer in Philosophy of Science and Fellow of Linacre College, Oxford. Author of *The Anticipation of Nature* (1965), *Causal Powers* (1975), *The Explanation of Social Behaviour* (1976), etc.

Professor E. Mendelsohn. Professor of History of Science, Harvard University. Author of *Heat and Life* (1964), founder-editor of *Journal of the History of Biology* (1968-), and joint editor of "Sociology of the Sciences Yearbook" (1977-).

Professor A. Musgrave. Professor of Philosophy, University of Otago. Editor (with I. Lakatos) of *Criticism and the Growth of Knowledge* (1970).

Professor B. Gandeia. Associate Professor of Thoracic Medicine, University of New South Wales. Author of *An Annotated Bibliography of the History of Medicine in Australia* (1957), *Occupation and Disease in Australia since 1788* (1971), *Tears Often Shed* (1978), etc.

Professor J.A. Passmore. Professor of Philosophy, Australian National University. Author of *Hume's Intentions* (1952), *The Perfectibility of Man* (1970), *Man's Responsibility for Nature* (1974), etc.

Professor J. Ronayne. Professor of History and Philosophy of Science, University of New South Wales, and formerly Director of the Science Policy Research Centre, Griffith University.

Mr Hugh Stretton. Reader in History, University of Adelaide. Author of *The Political Sciences* (1969), *Ideas for Australian Cities* (1970), *Capitalism, Socialism and the Environment* (1976), etc.

The final session on the second day will be a panel discussion under the chairmanship of Professor F.R. Jevons, Vice-Chancellor of Deakin University and formerly Professor of Liberal Studies in Science, University of Manchester.

The third day of the Symposium will be devoted to workshop sessions. In these teachers of science who are thinking about including an element of history, philosophy or social relations of science in their courses can consider issues arising from the conference which are central to their work.

ACCOMMODATION

Block bookings of accommodation have been arranged at the Melbourne Town House motel in Swanston Street, Carlton, adjacent to the University, and at Ormond College, in the University grounds.

Tariff details will follow in a later circular.

SOCIAL PROGRAMME

A Symposium Dinner has been planned.

ASSOCIATED MEETINGS

The 1979 Annual Conference of the Australasian Association for the History and Philosophy of Science will be held in Melbourne immediately following the Symposium, on 27-28 August.

ORGANISING COMMITTEE

Professor R.W. Home (University of Melbourne)
(Chairman)

Dr D.W. Chambers (Deakin University)

Dr L.A. Farrall (University of Melbourne)

Mr H.J. Kannegiesser (Swinburne College of Technology)

Dr H.E. Le Grand (University of Melbourne)

Professor A.K. McIntyre, F.A.A. (Monash University)

Correspondence relating to the scientific programme should be directed to:

Department of History and Philosophy of Science,
University of Melbourne,
Parkville, Vic. 3052

TRAVEL

Ansett Airlines of Australia are official carriers for the Symposium, and will be pleased to make all travel and accommodation arrangements for participants.

If you are interested in attending this symposium please complete this form and return it to:

CONFERENCE SECRETARY
AUSTRALIAN ACADEMY OF SCIENCE
PO BOX 783
CANBERRA CITY ACT 2601
AUSTRALIA

SYMPOSIUM ON STUDIES IN HISTORY AND PHILOSOPHY OF SCIENCE

UNIVERSITY OF MELBOURNE

23-25 AUGUST 1979

Name:

Title:

Address for Mail:

.....

Institution (if applicable):

.....

1. My attending the symposium is ☐ very likely
☐ likely ☐ possible but unlikely.

2. I am ☐ very likely ☐ likely ☐ unlikely to attend
the workshop sessions.

3. I am ☐ very likely ☐ likely ☐ unlikely to be able
to contribute a short paper at a workshop session.

4. I probably ^{will} not be needing ☐ single
☐ double accommodation.

I would prefer ☐ University College ☐ motel
accommodation.

THE SIXTH INTERNATIONAL CONFERENCE ON SOCIAL SCIENCE & MEDICINE will be held at THE LEEUWENHORST CONGRESS CENTER, AMSTERDAM, 5th-10th August 1979. The three main themes will be:

A. ORGANISATION OF HEALTH CARE IN THEIR SOCIAL & POLITICAL CONTEXTS.

Section 1. Primary Health Care in the Third World.

Section 2. Comparative Occupational Roles in Health Care.

Section 3. The Relationship between Systems and Goals in Health Care.

Section 4. Comparative Systems of Health Care.

B. DECISION MAKING IN HEALTH POLICY.

Section 5. The Role of the Public/Consumer in Health Policy.

Section 6. The Affects of Professional Dominance on Health Care Decisions.

Section 7. Issues in the Establishment of Priorities in Resource Allocation.

Section 8. Attempts to Control the Costs of Health Care.

Section 9. Relationships between Medical and Social Policy.

C. INTERVENTION STRATEGIES & HEALTH OUTCOME MEASURES.

Section 10. Intervention Strategies and Health Outcome Measures and Life Style Behaviour Patterns.

Section 11. Intervention Strategies and Health Outcome Measures:--the Case of Nutrition

Section 12. Intervention Strategies and Health Outcome Measures:-- Methodological Issues.

Section 13. Intervention Strategies and Health Outcome Measures:-- Family and Community Support Policies.

Section 14. Ethical Issues in Human Experimentation.

Section 15. The Ethnography of Lay and Medical Behaviour.

Preliminary Programmes and further information may be obtained from:
Dr. P.J.M. McEwan, Glengarden, Ballater, Aberdeenshire AB3 5UB, Scotland.

Training Opportunities

The Program in the History of Science and Technology at the University of Minnesota now offers opportunities for graduate study for the M.A. and Ph.D. degrees. The four full-time staff members and their fields of specialization are as follows: Professor Roger Stuewer, Coordinator of the program (history of 19th and 20th century physics); Professor Malcolm Kottler (history of biology); Professor Edwin Layton (history of technology); and Professor Alan Shapiro (ancient science, scientific revolution, and history of optics).

Position Available

UNIVERSITY OF EDINBURGH, SCIENCE STUDIES UNIT--Temporary Lectureship. Applications are invited for a Temporary Lectureship in the Science Studies Unit, from 1 October 1979 to 30 September 1980 (or an equivalent period spanning the British academic session). Qualifications in the history or social history of science, with an interest in the sociology of knowledge, preferred. Salary towards the lower end of the Lecturer scale, with a maximum of £4,505 p.a., unless an exceptional case can be made. Candidates need not hold British passports. Closing date for applications is 16 March 1979, although later applications can probably be considered.

For further details, contact the Secretary, Science Studies Unit, University of Edinburgh, 34 Buccleuch Place, Edinburgh EH8 9JT, Scotland, UK.

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