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Does Unintelligible Research Mean High Prestige?

J. Scott Armstrong
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While writing Long-Range Forecasting (Armstrong, 1978), I spent much time trying to improve its readability. This, I was informed, was of little value to my career. In fact, some academics suggested that it might be detrimental. Can that really be true?

Scientific communications have at least two functions: "to communicate knowledge" and "to impress others." These are not necessarily complementary goals. Judging from the Dr. Fox study, they seem to conflict with one another.

Dr. Fox was an actor who gave a meaningless one hour talk about a subject on which he knew nothing (Naftulin, et. al. 1973). The talk, "Mathematical Game Theory as Applied to Physician Education," was delivered on three occasions to a total of 55 people. The audiences consisted of social workers, psychologists, psychiatrists, educators, and administrators. Judging from a questionnaire administered after the talk, the audience found Dr. Fox's lecture to be clear and stimulating. None of the subjects realized that the lecture was designed as pure nonsense.

If an unintelligible communication is received from a legitimate source and if this communication claims to be in the recipient's area of expertise, recipients might assume that they are wasting their time because they receive no useful knowledge. In terms of knowledge, they would be wasting their time. But their involvement in this activity may lead them to try to justify the time spent. Furthermore, the greater the unintelligibility, the greater the need to rationalize about the time spent (e.g. If you cannot understand a paper, it must be a very high level paper.). This might be called the Dr. Fox hypothesis:

An unintelligible communication from a legitimate source in the recipient's area of expertise will increase the recipient's rating of the author's competence.

If the Dr. Fox hypothesis is valid, researchers who want to impress their colleagues should write less intelligible papers. Journals seeking respectability should publish less intelligible papers. Academic meetings should feature speakers who make little sense. This strategy would be beneficial for advancement by an individual researcher or by a journal. Its major drawback is that it does not promote the advancement of knowledge.

A survey of the literature yielded only anecdotal evidence. To gain information on the relative importance of the communication-for-knowledge vs. the Dr. Fox hypothesis, written communications were studied.

An examination was made of 10 management journals. Readability ratings, using the Flesch test, were obtained from Loveland, et.al. (1973). Prestige ratings were obtained from a convenience sample of 20 faculty members from five universities. The results favored Dr. Fox: Journals that were more difficult to read were rated higher in prestige ($r=.7$).

Attempts to test these hypotheses with journals from economics, psychology, and sociology yielded little information due to unreliable measurement and to a lack of variation in the measures of prestige and readability.

In another test, four conclusions sections from journal articles in management were rewritten to provide easy and difficult versions. The content of these passages was held constant. Thirty-two faculty members were given one version of each of the four passages and were asked to rate the competency of the research. The easy-to-read versions were rated lower ($p < .05$) than the more difficult versions. Again, Dr. Fox seemed more important than communication-for-knowledge.

The evidence to date is consistent with a common suspicion: clear communication of one's research is not appreciated.

It is quite likely that I have overlooked research on this issue. I would be interested in other studies that contrast the communication-for-knowledge and Dr. Fox hypotheses. A more complete description of my work to date can be obtained from Armstrong (1979).

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Physical Scientists and Ethics

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I. Introduction

Physical scientists experience considerable tension when thinking about the ethics of their scientific work and about the social responsibility that they have for the consequences of their work. They recognize the potential conflict between undirected science and its social application. They tend to resolve this tension in one of two extreme ways. Most physical scientists adopt the view that the most responsible act is to continue doing the best possible science without worrying about the potential consequences. This view is supported by the argument that the applications of pure science are not predictable, that any given resulting technology can be turned to good or evil uses depending on the society that makes the decision to use it. Some physical scientists adopt an extreme opposite viewpoint by wholeheartedly accepting a social responsibility. They feel the need for social control outweighs all other considerations. These scientists will be activists, often to such an extent that they will become inactive as researchers.

One source of tension in the scientific community lies in the fact that it seems to be very difficult to be both active as a scientist and at the same time analytic about the social consequences of the science. Not only do these two activities compete for a scientist's time, but they further require two distinct kinds of thinking. I will argue that we should not be surprised at this bimodal way of thinking. And we should expect that most active physical scientists would take the position that independent progress of science would be the greatest contribution they could make to the good of mankind. Scientists in fact are trained to think in this way. As they are socialized into the scientific community they accept the norms of science. These norms make it difficult for them to be interested in and to control the social implications of their work.

II. The Norms of Science

As scientists undergo scientific training they are taught both a style of doing science and a way of interacting with other scientists. The style of doing science prescribes what problems are acceptable for investigation and how they are to be solved.¹ The interactions among scientists are guided by the norms of science described by Robert Merton.² This style and these norms affect how scientists view non-scientific issues as well.³

The style of science¹ demands that problems and solutions in science satisfy the demand for such parameters as empirical validity, logical clarity, generality, and logical consistency. These norms imply that only those scientific problems ought to be tackled where there is adequate experimental capability to promise a solution. In turn a scientific solution is acceptable only if it is clearly testable and is elegantly general. And internal consistency is demanded for any acceptable description of the scientific universe. This style discourages scientists from tackling problems that are unclear and have uncertain answers, it demands control over speculation, it encourages the general view over the practical view.

The institutional norms of science² require universalism, communality, disinterestedness, and organized skepticism. Universalism demands the recognition of a scientific contribution purely on the basis of its scientific worth, irrespective of the personality or social standing of its discoverer. Communality asks that the products of science be made publicly available to everyone in the field of research. Disinterestedness means that scientific work shall not be done for monetary gain, that the approval by the scientific peers be sufficient reward. Organized skepticism allows all beliefs to be challenged, particularly if they originate from outside the scientific community. But, on matters originating from inside the scientific community, the challenge should be made in a non-revolutionary way if possible.

These norms encourage some specific attitudes⁴ in scientists, attitudes that have policy implications. A peer orientation is established: the general public is seen as the "great unwashed" who have no contribution to make to decisions involving scientific aspects. Peers decide what problems and solutions are "good." Economic rewards for scientific progress are discouraged: there is then no way to encourage the development of goods for the broader public; there can be no scientific responsibility for any products that may come out of scientific research.

III. The Norms and Social Good

For scientists ethics and social responsibility mean anticipating and controlling the social consequences of scientific discoveries. This can be done for a given scientific development only if its technological implications are understood, if the economic and political feasibility of the technology can be estimated, and if the social costs and benefits can be evaluated. Scientists' desires and abilities to carry out such analyses are all strongly influenced by the style and norms of science.

A. Technological Implications -- To understand the technological implications of a scientific development the scientist would have to think like an engineer. Some of this thinking is contrary to the style of science. The scientist would have to apply the general and elegant science to very specific and possibly very dirty problems, violating generality. He would have to overlook any lack of specific knowledge and guess answers even if the science is incomplete; this is contrary to empirical adequacy and clarity. The antipathy of most physical scientists toward engineering is well-known.

B. Economic and Political Feasibility -- In order to judge whether one ought to be concerned about the social consequences of some potential technological spinoff, the likelihood of its adoption must be estimated. If the technology will not interest the marketplace because of its economics, or if the required public policy is not adopted because of political infeasibility, then the social implications of the technology need not be worried about. Anticipation of the economics is inconsistent both with universalism as it weighs the needs of all people irrespective of their ability to contribute, as well as with disinterestedness, as monetary rewards are considered. The very idea of technological exploitation, which proceeds by establishing patents, violates communality. Political feasibility is increased by persuading the general public, this runs counter to scientific universalism and disinterestedness. Estimates of these feasibilities are best obtained via the social sciences. The antipathy of physical scientists toward the social sciences is well-known.

C. Social Costs and Benefits -- If scientists are to decide what lines of scientific research are ethical to pursue, they may want to evaluate the social costs and benefits of the potential technological spinoffs. Such analyses are completely at odds with the norms of science. Value judgments averaged over the general population are hardly universal in the scientific sense of being based on an individual's abilities. The costs and benefits of technologies and social policies are not shared communally, as some members of society will obtain the benefits and most probably a completely different group will bear the costs. Costs and benefits imply the exact opposite of disinterest. And organized skepticism will make it difficult to focus on the appropriate social questions. That scientists have difficulty in dealing with social cost-benefit analyses on behalf of the general public should not be surprising. The antipathy of physical scientists toward the general public is well-known.

IV. The Ethical Tension in Scientists

I have outlined here the argument that the training of scientists ill-prepares them to be socially ethical. The typical physical scientists who subscribe to the style and norms of science will find it both difficult and uncomfortable to try to anticipate the social consequences of their research. Hence it is most easy for them to fall back on the faith that an "invisible hand" will inevitably turn their work into socially desirable goods. The alternative would be to reduce their discomfort and expand their analytic capabilities by breaking away from the style and the norms of science. The usual outcome of such a break is the complete loss of the rebelling scientist to science. Social activism and science do not seem to mix well.

It is tempting to reduce these tensions in the scientific community by pointing out to the scientists why they are uncomfortable, why they have difficulty exercising social responsibility. It is a fact that scientists are generally unaware how much they have absorbed this style and these norms. When confronted by such a description of themselves, scientists tend to become very indignant; they see themselves as highly sensitive and moral individuals. They do not believe they follow these norms. Perhaps that is for the best. Steven Brush asks whether the history of science should be rated X⁵ in order to allow scientists to be socialized. By analogy it might be best to hide the fact of their socialization from the scientists so that they will continue to obey the norms of science. Maybe this ethical tension in science is a necessary evil if scientific productivity is to be high.

V. References

1. Talcott Parsons, THE SOCIAL SYSTEM, Glencoe, IL: Free Press, 1951, p. 335.
2. Robert K. Merton, SOCIAL THEORY AND SOCIAL STRUCTURE, Glencoe, IL: Free Press, 1949, pp. 307-316.
3. See Ina Spiegel-Rosing and Derek de Solla Price, Eds., SCIENCE, TECHNOLOGY AND SOCIETY, Beverly Hills, CA: SAGE Publications, 1977, particularly the essay "Sociology and the Scientific Research Community," by M.J. Mulkay, pp. 93-148.
4. Warren O. Hagstrom, THE SCIENTIFIC COMMUNITY, Carbondale, IL: Southern Illinois University Press, 1975 (1965).
5. Steven G. Brush, "Should the History of Science be Rated X?", Science 183, 1164-1172 (1974).

FOURTH ANNUAL MEETING: PROGRAM NOTES

TIME: 8 PM Friday, 2 November to 3:30 PM Sunday, 4 November 1979

PLACE: L'Enfant Plaza Hotel, 480 L'Enfant Plaza East, S.W., Washington, D.C. 20024

The fourth annual meeting of the 4S will be held at the L'Enfant Plaza Hotel in Washington, D.C., on November 2-4, 1979. The program will begin on Friday evening at 8:00 p.m. and will end on Sunday afternoon at 3:30 p.m.

Conference organizers are planning a special luncheon and a dinner banquet for the 4S on Saturday. The speaker at the luncheon will be Derek de Solla Price. (The cost of the luncheon is included in the pre-registration fee of \$25.) The Saturday banquet dinner will cost \$20. Dorothy Nelkin will make her Presidential Address at the banquet. Those planning to attend the conference are strongly urged to pre-register and to pay for the dinner in advance; eating facilities near the hotel are virtually non-existent on the weekends.

Please send your payments for pre-registration and the banquet by September 30, 1979 to the 4S, c/o Professor Lowell Hargens (4S Secretariat), Department of Sociology, Indiana University, Bloomington, Indiana 47401. (Registration at the conference will cost \$30.)

The L'Enfant Plaza Hotel is reserving a block of rooms at a special rate for those attending the 4S Conference. Single rooms will cost \$45 per day; double rooms will cost \$50 per day. In order to be assured of getting this rate, you should return the hotel reservation form by September 30, 1979.

The L'Enfant Plaza Hotel is located in the center of the L'Enfant Plaza complex that runs from 9th to 12th streets, S.W., south of Independence Avenue. Registration and program information for the 4S Conference will be in the Caucus Room near the hotel lobby.

Transportation from National Airport: (1) Regular taxi service (approximately \$5.25) directly to the hotel. (2) Metro subway to the L'Enfant Plaza station (50¢); after inside the L'Enfant Plaza shopping promenade, turn right for doors to hotel lobby. The Metro operates from 6:00 am to 12:00 midnight, Monday - Friday, and from 8:00 am to 12:00 midnight on Saturdays. Closed on Sundays.

Transportation from Dulles Airport: The hotel shuttle bus (\$2.00) stops at the L'Enfant Plaza Hotel.

Transportation from Union Station (Amtrak): (1) Metro subway to the L'Enfant Plaza station. Transfer at Metro Center station; see note above. (2) Regular taxi is approximately \$1.50 directly to the hotel.

Parking in the L'Enfant Plaza garage is \$1.00 after 6 pm on Friday, and \$1.00 per day on Saturdays and Sundays.

PLEASE NOTE: You are urged to make your reservations early. The L'Enfant Plaza Hotel will hold our bloc of rooms at the reduced rate until October 12, after which they may revert to the regular rate of \$90 (single) and \$105 (double).

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NEW PROBLEMS IN THE PHILOSOPHY OF TECHNOLOGY*

Philosophers and sociologists have traditionally adopted philosophies of technology which consign a very minor role to philosophical problems of technology. Philosophers have viewed the problems of technology as simple extensions of philosophies of science; sociologists have viewed the study of technology as the study of the impact of the use of these theories. This collection of essays has been presented because it is recognized that this attitude has lead to neglect of important problems. This is not to say that there is any consensus as to what these problems are. The common view is that the social problems of technology are so great we must do better in our thinking about it, regardless of what the specific problems may be.

This collection attempts the laudable task of initiating the discussion. This is a difficult task. There are few philosophers or sociologists who have thought seriously about the problems; those that have done so follow disparate approaches whose relations are unclear. The editor has included essays from various points of view. These essays reflect both the diversity and limitations of these various approaches. The primary virtue of this volume is that it collects and articulates to a degree existing alternatives. This is no small merit. Nevertheless the book is somewhat disappointing. This is not the fault of the editor but the simple lack of good discussions of technology and any developed sense of what problems are important. In spite of the widely varied quality, the collection deserves some attention and appraisal: as in any endeavor, it is useful if not necessary to know where one stands if one intends to improve.

The problems discussed in these essays vary among social problems, philosophical problems of rationality, problems of how to study technology and problems of the relationship between these problems. It seems clear that the problems--as yet to be explicitly formulated--that interest the authors require both sociology and philosophy: social problems are used as stimuli for the philosophical discussions. The authors attempt this integration in various ways but for the most part the attempts are regrettably inadequate to realize the motivating aims of the volume. Even so the problem of integrating social and philosophical studies can be better appreciated by seeing where the essays in this collection succeed and where they fail.

Four approaches to the problems of technology are represented in this text. Each approach combines to a degree sociology and philosophy. These are, first, the proposal that the study of the rationality of technology be a sociological endeavor; secondly, the attempt to explain rationality--or explain it away--with sociology; thirdly, the attempt to study the structure of technological societies as a type of abstract framework for rationality; and finally, more modest attempts to pose problems which need to be solved if a cooperative integration of sociology and philosophy is to be achieved. This review essay will explain the limitations of each approach as a function of the failure to adequately integrate sociology and philosophy. The most significant philosophical need is for the study of rationality.

*Review of Paul T. Durbin's RESEARCH IN PHILOSOPHY AND TECHNOLOGY.

There are three examples of the first program, i.e., the program of reducing the study of the rationality of technology to sociology. These are the essay of the editor, Paul T. Durbin and the essays of Joseph Margolis and Albert Borgman. The similarity of the three essays may not be immediately apparent as they start from somewhat different points of view. Durbin seeks a new philosophy of technology which can unite philosophical studies of meaning with the (social) study of technology while avoiding traditional mistakes of Platonism, Marxism, and Behaviorism as well as the mistaken separation of the study of meaning from the study of society. His hope is to use the philosophy of George Herbert Mead to found such a philosophy. In contrast, Borgman wants to apply the analyses of Thomas Kuhn to technology. In order to do this, he proposes that we investigate the "paradigm" which is used by the society of technologists to solve their problems or puzzles. Finally, Margolis argues that any appraisal of technology is limited because technology lies at the intersection of ideology and practical problem solving. Since ideology is a function of persons--he here continues analyses presented elsewhere--we cannot rationally appraise it; it is a function of "emergent" persons. This latter phenomena is beyond reason. The study of technology is thus limited: we can only describe the implementation of the ideology.

Durbin, Margolis and Borgman each deal with a central problem for any philosophy of technology, i.e., how can we appraise and/or study the rationality of technology? And they come to a similar solution: we can study the rationality of technology by describing the methods used by technological societies. But they all come to an unfortunate conclusion: we cannot appraise these societies and their rationalities. This rather pessimistic theory is not a new alternative. It is adopted in various forms by Michael Polanyi and Ernest Gellner as well as by Kuhn and others. Unfortunately, it is not adequate to the motivation of the current collection; this motivation results precisely from the need to appraise technology so as to make rational technology controlled to a degree. The challenge for a new philosophy lies precisely in the need to transcend this narrow view of the limits of reason so that the social problems wrought by technology may be sensibly dealt with.

The essays of Willis H. Truitt and Kai Nielsen attempt to do precisely that. Unfortunately neither essay takes us very far. Truitt's essay explains the "rationality" of technology as a pernicious function of the capitalist system. I think this analysis will regrettably appear somewhat simple minded to all but those already committed to a Marxist analysis. It attempts to explain, I should say explain away, the "rationality" of technology with a historical analysis but this analysis is highly schematic and raises many problems.

Kai Nielsen adopts a point of view which is very close to Truitt's but takes it farther: he approaches a discussion of the problem of how rationality may be appraised. Regrettably he drops the discussion just where the problem becomes acute. I will discuss his attempt at greater length to elaborate the problem. Nielsen's attempt in "Technology as Ideology" approaches but then dismisses the problem of the rational evaluation of technological reason. Like Truitt, Nielsen begins from an assumption of the truth of the Marxist assertion that technology is (simply?) a product of ideology. We have two choices: A technology which serves profit and capital accumulation or one which serves unmanipulated human needs. This choice is set by conflict between classes. The key is that it is only "ideological" mystification that keeps these obvious truths from view. Since these truths are not in fact recognized, it is necessary or at

any rate useful, that we should explain why there is a general failure of consciousness. In this regard, Nielsen simply summarizes the views of Habermas, Adorno and Marcuse, though Habermas is the most important. Habermas follows the line already mentioned. The "rationality" found in contemporary society is technocratic rationality, and is incapable of the radical critique necessary to see through the ideology of contemporary technology. Existing ideology is protected through the pretense that "rationality" is non-ideological. This technique of deception was made necessary by state capitalism which needs to hide its true nature to acquire social acceptance. In order to bring about "emancipation" and "a genuinely critical theory of society" we need to expose scientism and make it clear that rationality is "persuasively" defined as instrumental rationality. We need another conception of rationality.

We now come to an interesting problem: how can we rationally appraise technocratic or any other form of rationality? Nielsen is puzzled as to whether this question is legitimate since it seems that to do so is to fall back into the scientific trap of using an improper form of rationality to appraise itself. We need an alternative to the dominant form of rationality in order to proceed. The alternative proposed by Nielsen is critical awareness. But, Nielsen asks, how do we identify such critical awareness? His theory is that a critically aware person will have a good self-understanding and understanding of others, have emotional maturity, autonomy, and identity. He will see through ideologies, understand human needs, human solidarity, freedom, scientific procedures and be undogmatic to boot. Unfortunately, this description means almost nothing without theories of what these traits amount to, or it simply means that a critically aware person is anyone who sees and applies the truths according to Habermas.

The circle is thus complete. Nielsen's starting point forces him to approach yet also to explain away one of the interesting problems about technological rationality, which his views might have lead him to discuss.

Four essays have a more limited ambition. They hope to describe the structure of technology or technological society. These analytic descriptions are preparatory for any discussion of rationality or social impact of technology. Sometimes this preparatory nature is overt. These essays are one by Carl Mitcham, one by Edmund Byrne and two by Robert McGinn. They all attempt to sharply separate their analytic or descriptive studies from appraisals or details to follow. They wish to lay foundations for further studies. The difficulty that they regrettably all succumb to is the following. They fail to integrate the quest for foundations with a theory of the problems we wish to use these foundations to solve. As a result, the descriptions of the nature of technology become arbitrary. We lose the ability to integrate the social analyses these efforts present with the normative and philosophical studies we need in order to realize our ambitions.

Mitcham's stated rationale is that the term "technology" is used in different ways. The initial need in order to improve the quality of our discussion of technology, according to Mitcham, is for clarification. He suggests that disputes often hinge on competing definitions. His program for resolution of such disagreements is "structural and/or phenomenological analysis of technology." This methodological proposal leads directly to his substantive proposal for an analysis of technology. Since this analysis ought to be phenomenological, it must concern human activity or "human making and using of material artifacts in

all forms and aspects." Using this idea, Mitcham hopes to present a "rough catalog, a kind of philosophical lexicon of distinctions which seem to be fundamental and in fact widely accepted--as a summary and restatement of the work and conclusions of others which points toward the synthetic resolution of some confusions." Mitcham eventually wants a concept of "pure technology" i.e., a concept of the essence of all technology. The test of a theory of essences would be its "exemplification" in all the various types.

There is unfortunately a serious inadequacy in the rationale for this program which throws serious doubt on its usefulness as an aid to further discussion. This is a failure to explain how correct descriptions can be identified. If we want to avoid verbal disagreements, conventional specification of terms in some debate is sufficient. If, on the other hand, we insist on "correct" or "essential" definitions, then we need to argue about terms. Yet it is precisely such disagreements--as Mitcham points out--that lead to so much difficulty. They do so because, as Mitcham fails to see, we have no good method of discovering essences or types. All such classifications must be dependent on theory or arbitrary. This is so because the points of view which serve to select the essential properties are used only as tools. They are not easily made subject to debate because the desiderata for such tools are not spelled out. Ultimately theories of essences must appeal to intuition. The remedy for this is to connect our theories with problems which supply desiderata for success or failure. Mitcham fails to do this.

Robert McGinn's second essay, "The Problem of Scale in Human Life: A Framework for Analysis," does attempt to do this. Even so this essay regrettably fails to provide the needed desiderata. McGinn hopes that his framework will be useful for the purpose of evaluating the favorable and unfavorable consequence of scale not only theoretically but practically as well. The difficulty with his essay is that he separates the systematic analysis from its use. He thus appeals in broad terms for scalar analysis but the desiderata for an adequate theory of such analysis are vague. I explain this looseness by the failure to integrate the descriptive and normative studies.

Edmund Byrne in "Humanization of Technology: Slogan or Ethical Imperative," presents a plea for a systematic evaluation of the consequences of technological innovations in order to make it humane. He thus also relates his systematic analysis to an applied problem. His proposal is unfortunately of little use however because he fails to deal with the central and well known problem his proposal raises, i.e., how do we discover or predict the unintended consequences of innovations. He seems to think structural social analysis alone, independent of the epistemological or methodological problems will do.

There are three remaining even less ambitious essays which pose serious problems though they do not offer solutions. These essays are Stanley R. Carpenter's "The Cognitive Dimension of Social Change," and two essays by Joseph Agassi, "Shifting From Physical to Social Technology" and "Technology, Mass Movements, and Rapid Social Change: A Program for the Future of Philosophy of Technology." Carpenter argues that science has "rationalized" technology so as to make it subject to controlled planning. This may, ironically, make it maladaptive, even dangerous. The two common attitudes of "business as usual" common to engineers and the wholesale rejection found among critics are unacceptable. We need to appraise rationality in order to improve it. This calls for an integrated study of the social and rational aspects of technology.

This interesting problem is portrayed in more detail and in a broader context by Agassi. His two essays deal with a more detailed version of the same problem: How can technological change be democratically controlled for social good? Agassi has three points to make in each of his essays. These are that technological problems are social as well as physical, that participatory democracy is needed, and that we now have no theory to explain how this is possible. In the first essay, he argues that mass movements are needed for participation yet inadequate because they are simplistic. They need to be clear cut and well argued even though we can never prove a case. The nature of the defects of our theories is exemplified in the narrowness of the concerns of the ecology movement and the failure of the Peace Corps. We are left with a problem: can there be democratic mass movement for world planning and peace?

In the second essay, he argues that physical and social technology interact. We need explanations of the dominance of physical technology over social technology in order to break this dominance. In order to do this, we need new theories of social change. Agassi discusses three inadequate and dominant views of social change. According to Agassi, functionalism has no theory, Hegel only shows that revolutions have points of no return, and Weber attributes all change to charisma. Yet if we want change, we must have a new theory of social engineering.

CONCLUSION

As the editor of this collection of essays indicates, the philosophy of technology has suffered from neglect. This neglect has not been due to lack of production. There is an extensive literature on technology. Rather, the defect seems to lie in the inadequacy of the approaches taken. The failure to adequately analyze, appraise and appreciate these inadequacies by most of the contributors leads them to repeat their failures. They use frameworks to reinforce the traditional separation of sociology and the philosophical study of rationality. The motivation of this book has to be seen in the inadequacy of these traditional approaches to deal with the social and methodological problems created by technological social change. For the most part then the essays fail to meet the challenge of the most important problems.

Nevertheless some of these important problems come to the fore: how can technology be controlled?; how can we democratize our planning? how can we evaluate technological innovation? and even how can we think about these problems? The problems of technology are deeply interesting and challenging. New integrated views of technology, society, and politics are needed in order to solve them. These problems cannot be dealt with in traditional frameworks nor by simply taking greater care and effort. New programs which can unify our understanding of social phenomena and our critical appraisal of technological thinking are needed. Many of these essays come close to posing the serious problems which need to be solved to achieve this end. Yet regrettably most of these essays fail to even enter the discussion: they fall back into traditional dichotomies or fail to break them adequately.

Nevertheless, this attempt will no doubt be useful in furthering the needed effort for critical appraisal of existing efforts. The difficulty of this task is evident in the difficulties noted by Mitcham in discussing the bibliography compiled by himself and Jim Grote. Part of this bibliography--1973-74 only--is appended to

the text. As Mitcham notes, the organization of this literature is quite difficult. We seem to have no clear ideas of what counts. This is due, I believe to the inadequacies of existing frameworks. The discovery of the limits of these frameworks can, however, lead to new and improved alternatives.

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IN THE LITERATURE

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Its Theory and Application in Science, Technology, and Humanities

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PROGRAM

SOCIETY FOR SOCIAL STUDIES OF SCIENCE

FOURTH ANNUAL MEETING

2-4 November 1979

L'Enfant Plaza Hotel

Washington, D.C.

4S Society for Social Studies of Science

Former President: Warren O. Hagstrom

President-Elect:

President:

Dorothy Nelkin

Secretary-Treasurer:

Lowell Hargens

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Edwin Layton
Ian Mitroff
Eugene Skolnikoff
Arnold Thackray
Patricia Woolf
Dorothy Zinberg
Warren Hagstrom, ex officio

Editor of the 4S Newsletter:

Henry Small

Local Arrangements for the Fourth Annual Meeting:

Lidia Lubrano, American University

Albert Teich, George Washington University

SCHEDULE OF EVENTS

Friday, November 2

5:00 - 8:00 pm

REGISTRATION AND GENERAL INFORMATION-- Caucus Room

8:00 - 10:00 pm

PLENARY SESSION — Renoir I & II

Keynote Address: William D. Carey, Executive
Officer, American Association for the Advance-
ment of Science

Saturday, November 3

8:00 - 12:00, 1:30-6:00 pm -REGISTRATION AND GENERAL INFORMATION--Caucus Room

9:00 - 10:45 am PANEL SESSIONS (for meeting room, see panel descriptions)

1-A Contemporary Relations Between Science and
Literature (Arranged by John Woodcock, Indiana
University)

1-B The Sociology of Science in Developing Countries:
The Case of Latin America (Arranged by Diana
Crane, University of Pennsylvania and Edmundo
Fuenzalida, Stanford University)

10:45 - 12:00 noon ROUNDTABLE SESSIONS (*See important note at end of schedule.)

All Roundtable
Sessions in the

Degas Salon

- ** A Science Studies Course Development (Arranged by
Roy MacLeod, University of London and Jim
McCartney, University of Missouri, Columbia, and
David Edge, University of Edinburgh)
- B Relations Between Science Policy Studies and
Social Studies of Science (Arranged by Wouter
van Roussum, Erasmus University)
- C Scientific Style, Personality, and the Reaction
to Unusual Ideas (Arranged by John Wilkes,
Worcester Polytechnic Institute and Roger Krohn,
McGill University)
- D Autonomy of Scientists (Arranged by Simon Marcson,
Rutgers University)

12:00 - 1:30 pm

LUNCHEON — Monet I and II

Address: Derek J. deSolla Price, Professor of the
History of Science and Medicine, Yale University

**Presenters: Lyndsay A. Farrall, Deakin University (Australia)
Arie Rip, University of Leiden (The Netherlands)
Russell Moseley, University of Aston (UK)

1:45 - 3:30 pm

PANEL SESSIONS

- 2-A Historical and Philosophical Science Studies:
Implications for Science Policy (Arranged by
Sal Restivo, Rensselaer Polytechnic Institute)
- 2-B The Sociology of Applied Research (Arranged
by Daryl Chubin, Georgia Institute of Technology
and Albert H. Teich, George Washington University)

3:45 - 5:30 pm

PANEL SESSIONS

- 3-A Dollars and Scholars: The Future of Academic
Science (Arranged by James E. Katz, Clarkson
College)
- 3-B Social Processes of Scientific Investigation
(Arranged by Roger Krohn, McGill University
and John Wilkes, Worcester Polytechnic
Institute)

6:00 - 7:30 pm

COCKTAIL RECEPTION--Renoir II Room

Cash Bar

7:30 - 9:30 pm

BANQUET-- Monet I and II

Presidential Address: Dorothy Nelkin, Professor
in the Program on Science, Technology and Society,
Cornell University

Sunday, November 4

8:30 - 1:00 pm
8:45 - 10:30 am

REGISTRATION AND GENERAL INFORMATION--Caucus Room
PANEL SESSIONS

- 4-A Resolving Scientific Controversies (Arranged
by Robert F. Rich, Princeton University)
- 4-B Alternative Perspectives on Science and
Technology (Arranged by Henry Etzkowitz,
State University of New York College at Purchase)

10:45 - 12:30 pm PANEL SESSIONS

5-A Science Indicators for Research and Policy
(Arranged by Roberta Balstad Miller, Social
Science Research Council)

5-B Comparative Perspectives on the Formulation
and Implementation of Science Policies
(Arranged by Linda L. Lubrano, American
University)

12:30 - 2:00 pm LUNCH (Open)

2:00 - 3:30 pm BUSINESS MEETING

*Five ROUNDTABLES (seating 8 persons each) will be available for ad hoc meetings and discussion groups from 9:00 am to 5:00 pm on Saturday, November 3.

Roundtable space has already been reserved by four groups from 10:45 am to 12:00 noon. Remaining space is available on a first-come basis. Please contact Professor Linda Lubrano in advance (School of International Service, American University, Washington, D. C. 20016) or sign up at the conference.

PANEL DESCRIPTIONS

Panel 1-A

Saturday, November 3

9:00 - 10:45 am

Renoir I Room

Title: Contemporary Relations Between Science and Literature

Chairperson: John Woodcock
Indiana University

Papers: "Should We Be Serious About Science Fiction?"
Mark Adams, University of Pennsylvania

"The Fictional Mode and the History of Science"
June Goodfield, Rockefeller University

"The Gothic Quality of Science in Contemporary Fiction"
Martin Green, Tufts University

Discussant: George Basalla
University of Delaware

Panel 1-B

Saturday, November 3

9:00 - 10:45 am

Renoir II Room

Title: The Sociology of Science in Developing Countries: The Case of Latin America

Co-Chairpersons: Diana Crane, University of Pennsylvania and
Edmundo Fuenzalida, Stanford University

Papers: "Communication and Diffusion of Scientific Activity in Mexico"
Maria Luisa Rodriguez Sala-Gomezgil, Institute for Social Investigation (Coyoacan, Mexico)

"Foreigners in their Country: The Brazilian Scientific Elite"
Simon Schwartzman, University Research Institute of Rio de Janeiro (Brazil)

"Pharmaceutical Disciplines and the Pharmaceutical Industry in Argentina"
Francisco Suarez, Study of Latin American Science (Buenos Aires, Argentina)

"Science and Society in Venezuela"
Marcel Roche and Yajaira Freytes, IVIC (Caracas, Venezuela)

Discussants: Edmundo Fuenzalida, Stanford University
~~Larissa~~ Lomnitz, The National Autonomous University of Mexico

Panel 2-A

Saturday, November 3

1:45 - 3:30 pm

Renoir I Room

Title: Historical and Philosophical Science Studies: Implications
for Science Policy

Chairperson: Sal Restivo
Rensselaer Polytechnic Institute

Papers: "Policy in Science Education: A Philosophy of Science
Perspective"
Michael Zenzen, Rensselaer Polytechnic Institute

"Improving Mathematics Education: A Proposal from Comparative
Sociology"
Randall Collins, University of Virginia

"History and Current Technology Policy: A Case Study of Energy"
Eugene Frankel, Department of Energy

- "Philosophy of Science and Science Policy"
Andrew Bjerring and Clifford Hooker, University of Western
Ontario

Discussant: Ron Johnston, University of Wollongong (Australia)

Panel 2-B

Saturday, November 3

1:45 - 3:30 pm

Renoir II Room

Title: The Sociology of Applied Research

Chairpersons: Daryl Chubin, Georgia Institute of Technology
Albert H. Teich, George Washington University

Papers: "Bereaved Parents, NICHD, and SIDS Research -- 1945-1975"
Michael P. Johnson and Karl Hufbauer, University
of California at Irvine

"Interdisciplinary Research: Policy and Performance"
Frederick A. Rossini, Alan L. Porter, and Patrick
Kelly, Georgia Institute of Technology

"Technological Choice and Government Policy in the West
German Nuclear Program"
Otto Keck, University of Ulm (W. Germany)

"Cosmopolitanism in Basic versus Applied Science"
Susan E. Cozzens, Institute for Scientific Information

Discussant: Albert H. Teich, George Washington University

Panel 3-A

Saturday, November 3

3:45 - 5:30 pm

Renoir I Room

Title: Dollars and Scholars: The Future of Academic Science

Chairperson: James E. Katz, Clarkson College

Papers: "The State of Academic Science"
Bruce L.R. Smith, Columbia University and U.S.
Department of State

"Five Year Forecast for Science"
Charles V. Kidd, George Washington University

"Changes in the Scientific Community: Implications
for Scientific Knowledge"
Jonathan Cole, Columbia University

"The Academic Labor Market and Scientific Development"
Gary Meyer, State University of New York at Stony Brook

"Causes and Effects of Congressional Actions on Science
Policy"
Hon. George S. Brown, Jr., U.S. House of Representatives

Panel 3-B

Saturday, November 3

3:45 - 5:30 pm

Renois II Room

Title: Social Processes of Scientific Investigation

Chairpersons: Roger Krohn, McGill University
John Wilkes, Worcester Polytechnic Institute

Papers:

- "The Interaction Between Theory and Data in a Cognitive Approach to Science and Scientific Investigation"
Marc De Mey, University of Ghent (Belgium)
- "The Scientist's Cognitive Limitations: Descriptive and Prescriptive Implications"
David Faust, University of Minnesota
- "Networks of Enterprise in Scientific Work" (tentative title)
Howard E. Gruber, Rutgers University
- "The Other Side of the Coin: Occult Belief"
Barry Singer, California State University, Long Beach

Panel 4-A

Sunday, November 4

8:45 - 10:30 am
Renoir I Room

Title: Resolving Scientific Controversies

Chairperson: Robert F. Rich, Princeton University

Papers: (Titles not yet received)

Arthur Caplan, The Hastings Center

Dorothy Nelkin, Cornell University

Randy Rydell, Harvard University

Gerald Markle and James Peterson, Western Michigan
University

Robert F. Rich, Princeton University

Discussant: Ian Mitroff, University of Pittsburgh

Panel 4-B

Sunday, November 4

8:45 - 10:30 am
Renoir II Room

Title: Alternative Perspectives on Science and Technology

Chairperson: Henry Etzkowitz, State University of New York College
at Purchase

Papers: "A Radical Perspective on Technology Policy"
Colin Norman, Nature

(Title not yet received)
Langdon Winner, Massachusetts Institute of Technology

(Title not yet received)
Alan McGowan, Scientists' Institute for Public
Information

Discussant: Don Ihde, State University of New York at Stony Brook

Panel 5-A

Sunday, November 4

10:45 - 12:30 pm

Renoir I Room

Title: Science Indicators for Research and Policy

Chairperson: Roberta Balstad Miller
Social Science Research Council

Papers: "Indicators of Power and Structure: The American Chemical
Society as a Case Study"
Arnold Thackray, University of Pennsylvania

"The Demography of Problem Areas in Astronomy, 1950 - 1975"
Thomas F. Gieryn, Indiana University

"Bibliographic Indicators in the Analysis of the Structure
of Science"
Belver C. Griffith, Drexel University

Discussant: John Holmfeld, Science Policy Staff, Committee on Science
and Technology, U.S. House of Representatives

Panel 5-B

Sunday, November 4

10:45 - 12:30 pm

Renoir II Room

Title: Comparative Perspectives on the Formulation and
Implementation of Science Policies

Chairperson: Linda L. Lubrano
American University

Papers: "Policymaking for Science in China and Japan"
Richard P. Suttmeier, Hamilton College

"Policymaking for Science in Canada and the
Soviet Union"
Yakov Rabkin, University of Montreal

"Power and Influence in Australian Science Policy from
1968 to 1976: An International Comparison"
David Bennett and Peter Glasner, University of
Oxford and Polytechnic of North London

Discussant: Christopher Wright, Carnegie Institution of Washington

PROGRAM NOTES

B 8050

SCIENCE, TECHNOLOGY, AND ECONOMIC DEVELOPMENT

A Historical and Comparative Study

General Assembly of the International Council of Scientific Unions.
Washington, DC, October 10-16, 1976. Sponsors: Agcy Int Dev / ARS /
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THE DYNAMICS OF SCIENCE AND TECHNOLOGY Social Values, Technical Norms and Scientific Criteria in the Development of Knowledge

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Regulation of Scientific Inquiry: Societal Concerns with Research

edited by **Keith M. Wulff**, Concordia College

The increase in regulations affecting the conduct of scientific research, and the debate about their appropriateness and effectiveness, reflect societal concerns with fundamental questions raised by certain types of scientific inquiry. This book addresses issues of ethics, accountability, and conflict as they relate to the rights of inquiry, the rights of citizens, and the role of government in a research-oriented society.

Keith M. Wulff is assistant professor of sociology and codirector of the Tri-College Social Science Research Institute at Concordia College.

CONTENTS: Introduction—*K. M. Wulff*. PART 1. Regulation of Scientific Inquiry. The Ethical Dilemmas of Medical Research—*Andre E. Hellegers*. Value Conflicts in Restricting Scientific Inquiry—*Barry M. Casper*. Panel Discussion. Freedom of Scientific Inquiry and the Public Interest—*Hans Jonas*. Scientific Research: Determining the Limits—*Gerard Piel*. The Presumptions of Science—*Robert L. Sinsheimer*. Secrecy and the Individual in Sociological Research—*Kurt W. Back*. PART 2. Regulation of Scientific Inquiry in the Context of Recombinant DNA Research. Recombinant DNA Legislation—*Adlai Stevenson*. Regulation of Recombinant DNA Research: An edited

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AAAS Selected Symposium 37

March 1979

\$17

Federal Regulations: Ethical Issues and Social Research

edited by Murray L. Wax,
Washington University,
and Joan Cassell, Center for Policy Research

As the federal government elaborates its networks of control over social research, some investigators feel that federal regulations mean only increased costs and constricted research opportunities; others see the possibility of better research through the informed interaction between investigator and subjects that can be brought about by these same regulations. This book—in which responsible social research is defended as essential for intelligent social policy—presents the effects of federal regulations on various research methodologies, with particular attention to their differential impact on qualitative and quantitative studies. It also presents material on the formation and nature of the federal regulatory system, the effects of research on the different kinds of populations studies, and the conflicts among professional associations with regard to regulation.

Murray L. Wax is professor in the Department of Sociology and Anthropology at Washington University, St. Louis. Joan Cassell, research associate at the Center for Policy Research in New York, is currently executive director of a project investigating the ethical problems of fieldwork.

CONTENTS: PART 1. Background. Some Perspectives on Ethical/Political Issues in Social Science Research—*M. Brewster Smith*. Privacy and Social Research—*Edith F. Graber*. Human Subjects Review Committees and Social Research—*Bradford H. Gray*. The Reluctant Merlins of Camelot: Ethics and Politics of Overseas Research—*M. L. Wax*. PART 2. Qualitative Methodology. Introduction—*M. L. Wax and J. Cassell*. Federal Regulations. Institutional Review Boards, and Qualitative Social Science Research: Comments on a Problematic Era—*Virginia Olesen*. Protective Privacy in Action-Oriented Fieldwork—*Janet M. Filchen*. Regulating Fieldwork: Of Subjects, Subjection, and Intersubjectivity—*J. Cassell*. PART 3. Quantitative Methodology. Introduction—*M. L. Wax and J. Cassell*. Federal Regulation of Social Research: Survey Instrument—*Clark C. Abt*. On Solutions to Some Privacy Problems Engendered by Federal Regulation and Social Custom—*Robert F. Boruch and Joseph S. Cotel*. Informed Consent Procedures in Surveys: Some Reasons for Minimal Effects on Response—*Eleanor Singer*. PART 4. Epilogue. Case Study: An Undergraduate's Experience with Human Subjects Review Committees—*Lynne Kipnis*. Final Words—*M. L. Wax and J. Cassell*.

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February 1979

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NATURAL ORDER

Historical Studies of Scientific Culture

edited by
**Barry Barnes and
Steven Shapin**



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- CHAPTER SIX: PRODUCTS OF THE SCIENTIFIC PUBLICATION SYSTEM
- CHAPTER SEVEN: REFLECTIONS ON PUBLICATION REVIEW PROCEEDINGS AND RECOMMENDATIONS FOR REFORM
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*Vol. 1, No. 2 will be devoted to the August 1979 United Nations Conference on
Science and Technology for Development - UNCSTD

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The editors welcome the submission of appropriate manuscripts and Letters to the Editor. All manuscripts should be submitted in duplicate, typed double-spaced on bond paper with at least one-inch margins on all four sides. Papers should not exceed 6,000 words. Mail to: Editors, Technology in Society, Box 693, Polytechnic Institute of New York, 333 Jay Street, Brooklyn, New York 11201 USA.

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ANNOUNCEMENTS

INVITATION TO AUTHORS: For a reader on the sociology of technology, which I am currently preparing, I am seeking unpublished manuscripts or reprints of published articles on the production of technologies, policies for technologies and social impacts of technologies. Please send materials (with stamped, self-addressed envelope for their return) to Professor Diana Crane, Department of Sociology, 3718 Locust Walk CR, University of Pennsylvania, Philadelphia, PA 19104.

PROJECT ANNOUNCEMENT: The office of the Committee on Scientific Freedom and Responsibility of the American Association for the Advancement of Science plans to initiate a major research project on ethical principles and practices within the scientific and engineering societies affiliated with the Association. The project, jointly funded by the Ethics and Values in Science and Technology program in the National Science Foundation and the Science, Technology and Human Values program in the National Endowment for the Humanities, will include a survey and workshop to collect information on the professional ethics activities in the societies and to develop criteria by which these activities can be evaluated.

Committee Staff Officer Rosemary Chalk and Mark Frankel, Assistant Professor of Political Science at Wayne State University, are co-principal investigators for the project. Survey data will be collected from the AAAS affiliates during the summer months and a two-day workshop will be held in the fall of 1979. The workshop participants will review and respond to the survey findings and will discuss appropriate roles for the societies in the area of professional ethics.

NEW JOURNAL--SOCIAL ANALYSIS. This new series aims to publish articles of a combined theoretical and substantive nature which will address critical issues and problems in the social sciences. The editorial policy will be directed to the publication of articles which are primarily anthropological or sociological in content. This does not exclude contributions from scholars who work in cognate disciplines (e.g., geography, economics, history, politics, psychology) or the humanities, provided these contributions are directed to deepening the understanding of human behaviour in the political, cultural and social world of ideas and action. As a rule, articles of a purely theoretical or review nature which do not develop their argument in relation to original substantive material, will not be published in the journal. However, if such articles are of demonstrated high quality, and clearly contribute to the understanding of human social action, they will be seriously considered for publication. Essays which are simply descriptive or ethnographic in content, with no clearly articulated analytical or theoretical position, will not be accepted.

A final objective of the journal is to provide a publishing outlet for articles of high standard which exceed the limitations on length set by many other scholarly journals in the social sciences. Articles which run up to 50 printed pages in published length will be considered. However, printing costs must limit the number of articles of this size published in any one issue.

Special features include: no limit to the length of articles except that long articles must be of outstanding value; speedy publication; and every encouragement will be given to essays and comments from honours and postgraduate students.

The production process will employ an IBM computer typesetting system and offset printing to produce a perfect bound soft covered journal measuring 160mm by 245mm. Each number will have around 100 pages, except the inaugural issue will be 192 pages.

Price for Single Copies: \$10 for No. 1 (Special Issue); \$6 for No. 2 et. seq.

Price for Subscribers: \$8 for No. 1 (Special Issue); \$4 each for No. 2 et. seq.

Method of Payment: Cheques or bank drafts made out to The University of Adelaide and addressed to The Managing Editor, Social Analysis, GPO Box 498, Adelaide, South Australia 5001.

Institutions and individuals who have placed standing orders will receive their copies automatically and will be invoiced with each issue. Casual subscribers will be sent copies on receipt of the requisite amount.

Special Offer: For those who accept the special offer or place a standing order, Nos. 1, 2 and 3 can be purchased for \$14. This offer stands till 30 September 1979.

For more information, please write:

The Managing Editor
Social Analysis
Department of Anthropology
The University of Adelaide
GPO Box 498
Adelaide, South Australia 5001

Recent Meeting

Legal Argument and Scientific Knowledge. UNIVERSITY OF WARWICK 9-12 April 1979.

Brian Wynne (School of Independent Studies, University of Lancaster) writes:

A recent meeting of the Sociology of Science study group of the British Sociological Association tentatively explored ground which would appear to be of great interest to Sociologists and historians of science. The title of the meeting was "legal argument and scientific knowledge," a topic occasioned by the BSA annual meeting's theme of Sociology of Law. The meeting was thinly attended, particularly by sociologists of science, which reflects perhaps the hitherto unrecognised rewards offered by exploring the common ground of the Sociology of Knowledge, from cases where scientific and legal systems of thought interact. Such cases have been far more visible in the United States, where the courts and other quasi-legal institutions such as licensing hearings have been tackling esoteric conflicts between experts head-on for many years. In Britain the impetus to look at such interactions has been much weaker, largely because the exposure of courts to expertise has been with relatively confined matters e.g., forensic medical or psychiatric questions, or economic and engineering matters in civil courts (e.g., on insurance claims).

Stimulated by his involvement in the Windscale Inquiry, and with a research background in Sociology of Science and technology assessment, this author sought in vain for a body of literature or an invisible college beaver away somewhere on the comparisons, contrasts and interactions between scientific and legal rationalities as "useful" cognitive frameworks in the kinds of institutional

setting, (e.g., courts and inquiries on policy questions) where they do interact. The Windscale Inquiry was especially interesting because it was the first significant convergence of the closed, expert consensus traditions of British decision making in relation to technology and science, with the opposite, open legal adversary system of the public inquiry. In issues such as this, and in many court cases, how the problem is defined as a knowledge-building exercise has important implications for the outcome, thus the competition and complementarities between science and law become of direct practical importance as well as being theoretically fascinating.

One useful approach is to treat science and law as problem solving institutions, often being delegated wider social problems to "solve." They boil down or simplify complex issues in their own characteristic ways, according to the procedural and cognitive traditions of each discipline. Lawyers appear to operate with a positivistic, empiricist mythology even more deeply ingrained than that of science, and important for similar reasons--the value of a self-image of objective impartiality. When lawyers control the resolution of expert conflicts, they appear to hold important misconceptions as to the nature of scientific knowledge and scientific conflicts. For example, expert conflict is often assumed to be the pathological result of the incompetence or dishonesty or ideological bias of one side or another, to be cross-questioned out into the open. The fact that adversary exchanges frequently result in greater conflict and confusion may be obscured by the judgement process, which in the end does have to rely upon what might be called social credibility indicators rather than objective universal rules of thought, but does not often recognise this. The intuitive element of judicial thought is concealed by a stringent rationalist rhetoric just as is the same element in science. There is much to interest the sociologist of science here, especially from a broadly interpretive point of view, and for those like myself who have been interested in extending sociology of scientific knowledge into contemporary political issues involving science. There is a sufficient number of case studies now nearing completion in Britain to suggest a preliminary collection of articles in the attempt to highlight the area for others. There are probably many such studies already under way in the U.S., and if so it would be rewarding to hear of them. It is intended to devote one of next Year's study group meetings to a more focussed examination of the theoretical and practical issues raised in the interaction of scientific and legal systems of thought.

Forthcoming Meeting

CONFERENCE ON INNOVATION AND CONTINUITY IN SCIENCE -- AMSTERDAM (THE NETHERLANDS) 12-14 DECEMBER 1979. This conference will explore the nature of innovation processes in the natural sciences, in relation to tradition and continuity. The conference will bring together scholars working on historical aspects of "science studies" (Wissenschaftsforschung) and those working on present-day aspects, in order to encourage the greater integration of the historical and present-day dimensions. The working language of the conference will be English.

The conference is being held to mark the first five years of the work of the Unit for the History and Social Aspects of Science, and it will take place shortly before the celebration of the first centenary of the Free University. All interested persons are warmly invited to attend the conference.

There will be five half-day sessions, each devoted to the theme of innovation and continuity on a specific "level," ranging from the individual to the broadest societal level. In each session there will be two main papers, one given by a historian of science, and the other by a scholar working on some social aspect of present-day science. The discussion of each paper will be introduced briefly by an invited discussant.

The provisional programme, with main speakers, is as follows:

1. INNOVATION AND ITS IMPACT THROUGH TECHNOLOGY

Dr. Hans J. Braun (Lehrstuhl Wirtschafts- und Technikgeschichte,
Ruhr Universität, Bochum)

Prof. Dr. Rainier Randolph (University Santos Dumont, Brasil;
Universität Erlangen-Nürnberg, Betriebs-
wirtschaftliches Institut)

2. INNOVATION AND THE SCIENTIFIC COMMUNITY

Dr. Steven A. Shapin (Science Studies Unit, Edinburgh University)

Mr. F. Henry Brookman (Unit for the History and Social Aspects of
Science, Free University, Amsterdam)

3. INNOVATION WITHIN THE SMALL GROUP ("school," research team)

Prof. Gerry L. Geison (Program in History and Philosophy of Science,
Princeton University)

Dr. Harry M. Collins (Department of Sociology, Bath University)

4. INNOVATION AND CREATIVITY ON THE INDIVIDUAL LEVEL

Prof. Frederick L. Holmes (Department of History of Medicine and Science,
University of Western Ontario; and History
of Medicine, Yale University)

Prof. Howard E. Gruber (Institute for Cognitive Studies, Rutgers
University; and Division for Study and
Research in Education, Massachusetts Institute
of Technology)

5. INNOVATION AND ITS IMPACT ON RELIGIOUS BELIEF

Prof. Martin J.S. Rudwick (Unit for the History and Social Aspects of
Science, Free University, Amsterdam)

Dr. Eileen Barker (Department of Sociology, London School of
Economics)

6. SCIENCE, TECHNOLOGY AND INDUSTRY IN THE NETHERLANDS DURING THE EARLY
INDUSTRIAL REVOLUTION

Dr. Ir. J. Mac Lean (Unit for the History and Social Aspects of Science,
Free University, Amsterdam)

A registration fee of Dfl. 40.- (about US \$20) will be payable. There will be a reduced fee of Dfl. 25.- for full-time students. For those who are only able to attend one day of the conference, a reduced fee of Dfl. 25.- (full-time students, Dfl. 10.-) will be payable. These fees will include abstracts of the papers, and coffee, light lunch and tea for the relevant period. Participants will be responsible for arranging their own accommodation in Amsterdam, though help can be given with this if requested.

Further details of the conference, including full titles of the papers and a provisional time-table, will be contained in the Second Circular. This will be distributed in September 1979 to all those who have returned the preliminary enquiry form.

Correspondence about the conference should be addressed as follows:

Conference on Innovation
Vakgroep G.M.A.N.
Vrije Universiteit
Postbus 7161
1007 MC Amsterdam
The Netherlands

Positions Available

UNIVERSITY OF PENNSYLVANIA. The Department of History and Sociology of Science seeks to encourage interdisciplinary research on modern science, technology and medicine. The Department's work is characterized by an emphasis on historical investigation informed by sociological awareness, and by a concern with current policy in historical perspective.

The Department now seeks to hire an additional assistant professor (tenure track) with special competence in either the development of technology or the social impact and organization of science. For the former, we seek a historian interested in technological change in modern Western culture; background in American, British or European history. For the latter, we seek a social scientist well-versed in the sociology of knowledge, and at ease with historical materials and techniques; background in social sciences applied to modern science, technology or medicine.

Deadline 15 December 1979. Write Dr. Rosemary Stevens, Search Committee, Department of History and Sociology of Science, University of Pennsylvania, E.F. Smith Hall/D6, Philadelphia, PA 19104. An Equal Opportunity/Affirmative Action Employer.

GEORGIA INSTITUTE OF TECHNOLOGY. The Department of Social Sciences of the Georgia Institute of Technology announces a staff opening, earliest starting date Fall 1979. This is a tenure track position, requiring a Ph.D. Rank and salary are open and dependent on qualifications. The 23-person department teaches in the disciplines of history, political science, philosophy, and sociology. The Department seeks individuals who will strengthen the Technology, Science and Policy (TSP) component of its teaching and research activities. Ideally, candidates should have (1) a record of research and publication in at least one of the following areas related to TSP, such as: history or philosophy of science and technology, sociology of science/knowledge, public policy, public administration, modernization; (2) work experience in public or private non-academic institutions such as federal or state government agencies, foundations, or corporations; (3) experience in and inclination toward interdisciplinary research, not only with departmental colleagues, but campus-wide, for example, on projects involving engineers, architects, and/or economists; and (4) background and willingness to teach both the introductory course in one of the Department's four disciplines as well as advanced courses in the candidate's areas of expertise. The Department has pending an M.S. Program in Technology, Science and Policy that, if

approved, will involve a team-taught core curriculum including problem focused courses. Georgia Tech is an equal opportunity, affirmative action employer M/F. Submit curriculum vitae only to Prof. Frederick A. Rossini, Department of Social Sciences, Georgia Institute of Technology, Atlanta, Georgia 30332.

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

DIRECTOR

of the CENTER for the STUDY of SCIENCE in SOCIETY

The Center has been established to promote research, teaching, and continuing education in, and to foster coherence among, the specialties concerned with science and technology as cultural phenomena: HISTORY, PHILOSOPHY, and SOCIOLOGY of SCIENCE and TECHNOLOGY; SCIENTOMETRICS; TECHNOLOGY ASSESSMENT; SCIENCE POLICY; et cetera. The Center was set up as a result of the efforts of some two dozen individuals in various Departments and has strong administrative support. Copies are available of the proposal which led to the establishment of the Center, with details of current activities and of proposed developments.

To serve as DIRECTOR, we seek a scholar of entrepreneurial and administrative bent, interested in social and policy aspects of science and technology, anxious to develop multidisciplinary research, sufficiently well established to qualify for a tenured faculty appointment. Rank is open and salary is competitive; high qualifications for this particular position will be the sole criterion, since we do not discriminate on the basis of such irrelevant attributes as gender, ethnic origin, and so forth. We offer an ambience of high morale, encouragement, and the ambition to build a first-rate and comprehensive program.

Please send applications and nominations to, and request further information from: Henry H. Bauer, Dean, College of Arts and Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061; (703)961-5421. Closing date for applications is November 16, 1979; preferred date for initial appointment is September 1, 1980.

4S *Society for Social Studies of Science*

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