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AUTHOR Arner, Paul; Gullard, Pamela
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ABSTRACT

The Program on Science, Technology and Society (POSTS), directed toward understanding a technologically dependent civilizations, aims to illuminate the interrelation of technology and culture by means of more effective communication between specialists in the natural, behavioral, and policy studies. This report contains short, substantive descriptions of research projects undertaken by fellows of the program between September 1973 and August 1974 as well as a list of their recent publications and presentations. (Authors)

Second General Report

POSTS

PROGRAM ON SCIENCE, TECHNOLOGY & SOCIETY

Center for Advanced Study in the Behavioral Sciences

September 1, 1973 through August 31, 1974

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Prepared by Paul Armer
and Pamela Gullard
5/1/75

202 Junipero Serra Boulevard, Stanford, California 94305
Telephone (415) 321-2052

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IV. CENTER FOR ADVANCED STUDY IN THE BEHAVIORAL SCIENCES

The Center is a non-profit organization established by the Ford Foundation in 1954. It is located on a secluded hilltop near Stanford University in California. It conducts a fellowship program for distinguished scholars in fields that illuminate the question of how men and societies behave, or who are in disciplines which are enough allied to the behavioral sciences that the presence of the scholar adds to the environment for all the Fellows. Each year about fifty scholars participate, working at the Center for the academic year.

The intent of the Center is to improve the quality of scholarship. To accomplish this, it provides the participating scholar with the time and facilities to intensely pursue and develop his* intellectual interests without interruption, to reevaluate himself in relation to his field, and to closely interact with peers from various fields. For the year he is freed from the teaching and administrative chores he carries at his home institution. The Center focuses on maintaining an environment which allows for reflective study yet promotes conversation and interaction among the scholars. In this atmosphere, the scholar not only can increase his knowledge, but can also bring to his work different perspectives gained from the other Fellows. Many Fellows have found that this freshening experience continues to influence their work, and consequently that of their colleagues, years after the fellowship has ended. The accumulated writings and the changed perspective of the approximately 1000 scholars who have spent a year at the Center are the fruit of the original idea for the Center.

Because the Center's major interest is in the scholar, selection of a Fellow is based on his past performance and on his promise as a productive scholar. His demonstrated or potential leadership abilities are more important than the nature of his particular interests. Nevertheless, each Fellow is chosen for his possible contribution to the year's particular scholar group. The Center's selection process is geared to create each year a synergistic scholarly community.

Though founded by the Ford Foundation and the recipient of an endowment fund and operating grants from the Ford Foundation, the Center depends on numerous sources of funds to meet its operational expenditures. Grants are made directly to the Center and some scholars arrive with outside grants or partial support through sabbatical leave arrangements with their home institutions.

V. PROGRAM ON SCIENCE, TECHNOLOGY AND SOCIETY (POSTS)

The Program on Science, Technology and Society (POSTS), directed toward understanding a technology-dependent civilization, aims to illuminate the interrelation of technology and culture by

*Although masculine forms are used to refer to Fellows, they are intended, of course, to refer to both men and women.

means of more effective communication between specialists in the natural and the behavioral and policy sciences. The focus of the program is not so much to produce problem-solving books and articles as to improve the quality of scholars concerned with the problems of today's society and to increase the awareness of these problems in scholars not now directly involved.

Problems at the interface between science, technology and society are almost always multi-disciplinary in nature. Yet our educational institutions, with very few exceptions, produce only specialists. So, to be effective in dealing with problems in the science, technology and society area, scholars often have to devote considerable effort toward educating themselves in disciplines other than their original specialty. Some Fellows have utilized their year at the Center to move into these multi-disciplinary problem areas. Thus, the purpose of POSTS is in concert with the intent of the entire Center. The reflective nature which dominates most of the rest of life at the Center also dominates the POSTS program. Fellows are free to move in and out of the program as their intellectual pursuits dictate.

The products of the POSTS program include research and writing on the ramifications of today's technology (many of them are described in Section VII). But more importantly, by promoting discussions at the Center on the socio-scientific problems of our time, the program alters the perceptions and even the research interests not only of scholars directly involved in the program but also of their associates at the Center. The most important follow-on result of the POSTS program is its continuing influence on the scholar's viewpoint and, subsequently, on that of his colleagues at his home institution and in his profession. POSTS scholars frequently speak about their work before audiences ranging from their fellow professionals to the public at large, thus increasing the general knowledge and awareness of the problems of a technology-dependent society. (See Section IX for a list of presentations of 1973/1974.)

The scope of the POSTS program covers a wide number of complex topics, usually involving specific technologies and policies. Consequently, the POSTS program has built small groups of Fellows each year around several core topics as well as having provided fellowships for individual projects. Cohorts of Fellows in a given year are assembled with an eye to maximizing interaction among them through common interests or through interdisciplinary cooperation.

The content of POSTS is determined by an Advisory Council (members listed earlier) which provides definition and review of the program and nominates and helps recruit appropriate Fellows. Paul Armer became Coordinator of POSTS in March, 1972, dividing his time between that function and that of being a Fellow. The Board of Trustees of the Center has also maintained a close interest in the program and has final authority in approving fellowships for specific individuals.

Although the awarding of the grant by N.S.F. to the Center was

the specific action which brought POSTS into being, financial support for the program is diverse. Since the grant does not provide for an indirect cost allowance, Center funds (either from endowment income or other grants) are required for all Fellows participating in the program. Further, some participating Fellows have been partially supported by their home institutions and/or grants from various agencies and foundations. For example, the program's core project of 1971/1972 on race, development and performance received major support from the Office of Child Development of the Department of Health, Education and Welfare through the Social Science Research Council.

Many Fellows work on several topics while at the Center. For some of the Fellows listed in Section VI as having been associated with POSTS, only a fraction of their activities was POSTS-related. In such cases, their support from the Center was charged to POSTS on a corresponding basis.

VI. FELLOWS ASSOCIATED WITH POSTS*

1971/1972

Charles O. Jones
University of Pittsburgh, Maurice Falk Professor of Politics

Joshua Lederberg
Stanford University School of Medicine, Professor of Genetics and Scientist in Residence at the Center for Advanced Study in the Behavioral Sciences, POSTS program

Gardner Lindzey
University of Texas, Vice President and Dean of Graduate Studies

James C. Loehlin
University of Texas, Professor of Psychology

Edwin Mansfield
Wharton School, University of Pennsylvania, Professor of Economics

James N. Spuhler
University of New Mexico, Leslie Spier Professor of Anthropology

1972/1973

Paul Armer
Center for Advanced Study in the Behavioral Sciences, Coordinator of the POSTS program and Fellow

William F. Baxter
Stanford University, Professor of Law

John S. Chipman
University of Minnesota, Professor of Economics

Victor R. Fuchs
City University of New York, Professor of Economics and National Bureau of Economic Research, Inc., Vice President — Research

*The affiliations of some POSTS Fellows may have changed since their stay at the Center.

Donald Kennedy
Stanford University, Professor of Biology
Joshua Lederberg
Stanford University School of Medicine, Professor of Genetics and Scientist in Residence at the Center for Advanced Study in the Behavioral Sciences, POSTS program
John R. Platt
Mental Health Research Institute, Associate Director, and University of Michigan Professor of Physics
Fredrick C. Redlich
Yale University, Professor of Psychiatry
Terrance Sandalow
University of Michigan, Professor of Law
Israel Scheffler
Harvard University, Professor of Philosophy
Vernon L. Smith
University of Massachusetts, Amherst, Professor of Economics
Lefton S. Stavrianos
Northwestern University, Professor of History
Joseph Weizenbaum
Massachusetts Institute of Technology, Professor of Computer Science

1973/1974

Graham Allison
Harvard University, Kennedy School of Government, Professor of Politics
Paul Armer
Center for Advanced Study in the Behavioral Sciences, Coordinator of the POSTS program and Fellow
John P. Crecine
University of Michigan, Institute of Public Policy Studies, Professor of Political Science
Michel Crozier
Centre de Sociologie de Organizations, Paris, France, Director of Research
Yehuda Elkana
Van Leer Jerusalem Foundation, Jerusalem, Israel, Director; and Hebrew University, Professor of History and Philosophy of Science
Martin Krieger
University of Minnesota, School of Public Affairs
Joshua Lederberg
Stanford University School of Medicine, Professor of Genetics and Scientist in Residence at the Center for Advanced Study in the Behavioral Sciences, POSTS program
James March
Stanford University, School of Education, David Jacks Professor of Education

Robert K. Merton
Columbia University, University Professor

Eugen Pusić
Zagreb University, Zagreb, Yugoslavia, Professor of Administrative Science

Daniel Shimshoni
Tel Aviv University, Tel Aviv, Israel, Professor of Public Administration

Judith Tendler
Center for Latin American Studies, University of California, Berkeley

Arnold Thackray
University of Pennsylvania, Professor of the History of the Sociology of Science

Harriet Zuckerman
Columbia University, Professor of Sociology

VII. POSTS PROJECTS

The following is a review of the written materials and other products which have resulted from POSTS. Most of the material produced during the years 1971/1972 and 1972/1973 was described in the First General Report. However, because the length of time between origination of an idea and publication varies considerably depending on the scholar and the subject, some of the early POSTS work is just now appearing. It is described briefly in the first two sections below.

There were two "core" projects in 1973/1974. In the section delineating the year's work, the collaborative material is described first, followed by descriptions of work accomplished by the individual member scholars.

1971/1972

Gardner Lindzey, John C. Loehlin, J. N. Spuhler—"*Race, Development and Performance: A Re-analysis.*"

As reported in the First General Report, during their fellowships at the Center, Lindzey, Loehlin and Spuhler studied the questions: *Could* some or all of the genes that affect general intelligence be differently distributed in different U.S. racial ethnic groups? If so, *are* they? Their conclusions have now been published in a book, *Race Differences in Intelligence* (20).

Loehlin, Lindzey and Spuhler state, "There is no issue in the history of the social sciences that has proved to be quite so persistently intrusive as the question of assessing *the relative importance of biological and environmental determinants of behavior.*" After reviewing considerable empirical data, the study group concludes, among other things, that individual variations within U.S. racial-ethnic groups exceed average between-group differences. Observed average differences in the scores of members of different U.S. racial-ic groups on intellectual-ability tests probably reflect in part

inadequacies and biases in the test themselves, in part differences in environmental conditions among the groups and in part genetic differences among the groups. The researchers emphasize that these three factors are not necessarily independent, that reasonable differences of opinion exist concerning their relative importance, and that a variety of research possibilities exist for resolving these differences.

They also emphasize that public policy "flows from facts *and values*." Future empirical findings about this issue, whatever they may be, need not change the fundamental values of this country. Even if there *are* some genetic differences between groups, all individual Americans can and should have the satisfaction of being full participants in a democratic and productive society.

1972/1973

Joseph Weizenbaum, Israel Scheffler, Paul Armer, Terrance Sandalow, Donald Kennedy, John R. Platt, Herbert Weiner and others— *"The idea of* understanding *and its implications on the scope and limits of computer intelligence."*

The POSTS "core" group of 1972/1973, initially organized by Weizenbaum and Scheffler, began its discussions on the general theme of the role played by *metaphor* in man's intellectual reconstruction of his world. Scheffler's concern with metaphor arose out of his long-range preoccupation with the idea of *objectivity*, and Weizenbaum's from the questions he was asking about the limits of machine (formalized) intelligence. These discussions soon led to more general questions having to do with (among other things) brain and behavior (Kennedy, Weiner, Platt) natural and artificial languages and their semantics (Weizenbaum, Armer, Scheffler), and reason and ambiguity in law and psychiatry (Weiner, Sandalow).

Weizenbaum has since completed a book that draws heavily on those discussions (*Computer Power and Human Reason*, Freeman and Co., San Francisco, in press). The book carefully develops the idea of the modern computer as a "universal" machine from the fundamental ideas of "effective procedure" and "language." An effective procedure is a set of rules that tell a player of an abstract game precisely how to behave from one moment to the next. A language is itself a game whose rules determine what strings of symbols on its alphabet constitute legally admissible sentences (correct grammatical sentences). Limits on the expressibility of artificial (computer) languages derive from the fact that 1) the coupling of languages to the real world — hence the realization of "intelligence" — destroys their abstract character, and 2) the theoretical terms fundamental to all models (of intelligence or any other real world phenomena) must always be ultimately grounded in metaphor. From this basis, the book derives the concept of intelligences that are *alien* with respect to certain domains of thought and action. And from that an argument is made that computers *ought* not to be put certain tasks even if they, in a certain sense, can perform them.

The book also discusses the computer as a metaphor in its own right. It demonstrates a confluence of the work of artificial intelligence researchers, systems dynamicists (Forrester), and behaviorists (Skinner) and generally points to the simplisticity of the world views engendered by their common epistemological assumptions.

John Chipman

John Chipman continues his work on the close examination of certain widely accepted quantitative indices used as indicators of a community's economic welfare. In a recently published article (8), he examines the conditions under which one can characterize the welfare of a population with a given income distribution, in terms of two indicators: per capita income and the "Gini coefficient" — the latter being a measure of inequality in the distribution of income. Chipman proves that this can be done under certain limited conditions, namely, when the income distribution pattern belongs to the Pareto family (which is considered to correspond to empirical data), and when the formula for aggregating individual preferences for enjoying income (the "social welfare function") are independent of one another and can be added directly. When these conditions are met, the author shows mathematically that aggregate social welfare increases as per capita income rises and decreases as inequality, as measured by the Gini coefficient, rises.

1973/1974

Yehuda Elkana, Joshua Lederberg, Robert K. Merton, Arnold Thackray and Harriet Zuckerman—"*Historical Sociology of Scientific Knowledge.*"

As members of a POSTS "core" project, Elkana, Lederberg, Merton, Thackray and Zuckerman spent the greater part of the year focused on aspects of the historical sociology of scientific knowledge and on methods for assessing the condition of science.

It is, of course, difficult to assess the current state of the scientific enterprise. Efforts to do so are still in their early stages. In the early 1970's, the National Science Board instituted a project designed to attempt to answer such questions as these. What has been accomplished in science as gauged in terms of what could have been accomplished? To what extent is scientific activity being directed? What are the strengths and comparative weaknesses in contemporary American science? Are scientific personnel being trained in the fields where they will be most needed? A first step in answering questions such as these is the development of sets of indices which will indicate the strengths and weaknesses of U.S. science and technology in terms of the capacity and performance of the enterprise for contributing to national objectives (including international peace). The first results of a study in the use of such indices of the condition of science was published by the National Science Board as its Fifth Annual Report, *Science Indicators 1972.*

Under the joint auspices of POSTS and the Social Science Re-

search Council, the members of the POSTS "core" group arranged for a three-day conference held at the Center in mid-June. The conference of scholars at work in the history, politics, economics, philosophy, and sociology of science was attended by several members of the National Science Board and by staff members of the National Science Foundation as well as by several additional Fellows at the Center. The members of the POSTS group in the Historical Sociology of Scientific Knowledge are editing a book which grew out of that conference. The book, based on papers presented at the meeting and supplemented by others generated by the discussion, sets out the problems and prospects for developing measures of cognitive and institutional developments in science. The title of the book is *Toward a Metric of Science* and its publication is expected next year.

In addition to their work on "Science Indicators," Elkana, Merton, Thackray and Zuckerman compiled an annotated collection of 60 volumes, to be reprinted from works in and about science over a span of the past four centuries (12). The collection includes writings by and about scientists, such as Galileo, John Ray, Euler, W. R. Hamilton, Henry Cavendish and A. R. Wallace. The group undertook this project in the thought that the natural sciences have become of increasing public concern and, in some quarters, are no longer taken for granted as possessing self-evident worth. A renewed awareness of the diverse heritage of the modern natural sciences should help provide adequate perspectives on the newly-problematical status of science.

In choosing the material for this collection, the selectors embraced the historian's belief that to glimpse where we are headed we must know where we have been. This does not involve simple extrapolation from the past. Rather, guided by perspectives drawn from the related disciplines of the history, philosophy, and sociology of science, and heading toward an historical sociology of scientific knowledge, the selectors have searched out forgotten gems and occasionally, since they were significant in the development of science, influential mediocrities of past times. The collection is composed of biographies and autobiographies of scientists, historical and sociological accounts of scientific societies and other institutional science, interpretations of the interaction between science and society, Festschriften devoted to pioneers in the analytical study of the scientific enterprise, philosophical orientations to science, and accounts of the comparative development of science in differing social and political contexts, in times of war and of peace. The collection, titled *History, Philosophy and Sociology of Science: Classics, Staples and Precursors* will be published in June, 1975.

Members of this POSTS group focused another part of their work on the cognitive and social processes in the development of scientific knowledge. Having decided to work toward the goal of developing an analytical and interpretative framework through the study of cases in point, they elected to focus on the case of Joshua Lederberg's discovery in 1947 of sexual recombination in bacteria and his sub-

analysis of the metabolism of a new agent, although this would in many cases be more efficacious and efficient than only using large numbers of routine tests.

Robert K. Merton

The transformations taking place in the world today confront sociologists with the immense task f investigating them effectively and of arriving at recommendations for coping with them. One of the several interest which Merton pursued last year was the place of structural analysis in sociological investigation. He describes structural analysis as a theory which was derived from several historical lines of thought, which explains social change on the micro-level as the choice between socially structured alternatives, and on the macro-level as the accumulation of advantage or disadvantage among various components of society, and which considers social conflict as an important and inevitable result of the fact that social structures are differentiated into interlocking parts which have conflicting as well as common interests. Although structural analysis is intellectually compelling and useful in understanding many practical problems, Merton shows that, no more than any other theoretical orientation, can it claim to be capable of accounting exhaustively for social and cultural phenomena. Instead, he describes structural analysis as one of several complementary paradigms which help provide understanding of problems in today's complex society. This plurality of paradigms presents a variety of problems for investigation rather than prematurely confining inquiry to the problematics of a single theory, and directs the attention of research workers to differing kinds of social phenomena. The paper on this subject appears in the new volume, *Approaches to the Study of Social Structure*, edited by Peter Blau (26).

A major theme in Merton's work last year was an examination of the behavior of scientists and of science as an institution in terms of a jointly historical and sociological orientation. In one paper, he focuses on Gerald Holton's work to explicate aspects of this hybrid orientation. Holton, an historian of science, uses thematic analysis, which assumes that there are underlying elements in the concepts, methods, presuppositions and hypotheses advanced in science. These elements function as themes that constrain or motivate the individual scientist and consolidate or polarize the given community of scientists. Themes in science involve the *tacit* imageries, preferences and commitments to certain kinds of ideas, methods, evidence, and problems, and to certain forms of solutions. Merton suggests that the sense of agreement or disagreement among scientists may be partly accounted for by their having simil r or differing themata. Holton identifies themata inductively, carefully studying case after case to obtain a working list of thematic concepts, methods and hypotheses. Sociologists and political scientists have long used thematic analysis as a phase in the content-analysis of documents. Holton has adapted tool for the interpretation of styles of scientific work. In addition

to their sharing of tools, Merton indicates numerous parallels and intersections which do or could occur between the history and the sociology of science. In particular, the two fields could share the investigation of many common problems, including the thematic basis of problem-finding and problem-selection in science. The paper reporting this work has recently appeared in *Science* (28).

Turning his attention to sociology as practiced outside the academic community, Merton took part in an American Sociological Association conference on the interaction of sociological knowledge and public policy as seen in Presidential Commissions. In a paper now in press, one of Merton's major points centered on the use, non-use and abuse of social knowledge by Presidential Commissioners. First, Merton remarks that studies of Presidential Commissions show that there is a scarcity of policy-oriented social research which could be used for their work. Employing the available data, the Commissioners tend to approach problems with sociological orientations that reflect theoretical and methodological pluralism as variously effective for dealing with different kinds of social problems. The Commissions focus on the consequences of alternative policies for a variety of social units. Merton proposes that conflicts in the Commissions result principally from differences in ethical, ideological and interest commitments which affect the weight to be assigned to the various kinds of functional and dysfunctional consequences. The question thus becomes, Which consequences for which groups and social systems should be taken into account? Merton suggests that sociologists need to cope with the implications of the impossibility theorem regarding a calculus for assessing the net balance of the aggregate of humanly relevant consequences of governmental action. The paper reporting this work appears under the title, "Social Knowledge and Public Policy," Mirra Komarovsky, ed., in *Sociology and Social Policy* (27).

The noted Spanish philosopher, Julian Marias, recently published a book, *The Structure of Society*, for which Merton wrote the introduction (25). In his book, Marias draws on philosophical, historical and sociological perspectives to discuss the structure, workings and changes of human society. Merton analyzes what he describes as disciplined eclecticism, particularly as handled through Marias' idea that systems of evaluation are central to social structure. Merton joined with Marias to discuss this and other concepts dealing with the structure of society on a television program series produced by *ENCUENTRO*, an educational program of the Mexican and South American television network, *Televisa*.

Arnold Thackray

Thackray is concerned with tying the cognitive development of science to its cultural context. He explains that before the late 1960's most scientists and laymen believed that scientific ideas, scientific procedures and scientific debate, free of social gravity, led inevitably to truth and progress. Since Thomas Kuhn's *Structure of Scientific*

Progress, and similar works, this belief has begun to erode. It is now understood that scientific ideas evolve from a social base, a scientific "community," and from the culture's prevailing view of scientific activity. Another common error until recently was to view the history of science from a presentist stance, presupposing that history as a process was interesting only insofar as it explained science in its form today. For example, modern categories of thought were often misapplied to eras which did not use those categories (e.g., before about 1870, "science" was not thought of as a distinct profession). In an article for *Science* (34), Thackray shows that social scientists are now beginning to better understand the interconnections between the social environment of scientific activity and the cognitive structure of it.

He also looks at the social forces shaping science during the historical period of the British Industrial Revolution of the late 18th and early 19th Centuries (32). Many historians believe that the "second" scientific revolution which took place in England at this time was prompted by the need for technological innovations to further the Industrial Revolution. Thackray argues, on the other hand, that this rise in scientific interests resulted from the sociological situation. In the city of Manchester, for example, the "nouveau riche" merchants, manufacturers and tradesmen were cut off from the acceptance and prestige rewards of English landed society. This also rendered them politically impotent. In order to challenge the traditional cultural modes which excluded Manchester residents from status they turned not only toward dissenting religions, but also toward progressive science. The Literary and Philosophical Society was founded in Manchester and men joined it to establish themselves socially (indeed, their technical productivity, as measured by the number of patents obtained by members, was extremely low). Their "scientific" endeavors were the pursuit not so much of intellectual and technological goals as social ones.

Thackray proposes the technique of "prosopography," or the study of the collective biographies of actors in scientific endeavors, as a method for understanding the social ramifications of scientific development (33). For example, prosopography confirms that during the Industrial Revolution in England, particular groups of scientists pursued science and fostered institutions for such pursuit in order to gain an "entree" into higher social classes.

Harriet Zuckerman

Zuckerman examines the growth and development of scientific specialties from a sociological orientation. In an article for *The Idea of Social Structure* (Lewis A. Coser, editor), (36), she examines the sociology of science as an emerging specialty with its own system of stratification, its own arrangement for informal and formal communication, its own politics and its own conflicts. Zuckerman observes that the development of scientific specialties is apt to be highly predictable and not uniform as other authors have suggested. In par-

ticular, cognitive and social structural attributes of specialties will jointly affect their rates of growth, their institutionalization and resistance to their establishment. New specialties which challenge prevailing theoretical stances are likely to encounter greater difficulty in attaining legitimacy than those which apply established theoretical orientations to phenomena not previously studied. The sociology of science as a field is cognitively confirming and located firmly within the established disciplinary structure of sociology. Thus, its growth should be comparatively untraumatic, uncontested and more rapid than specialties which are cognitively or structurally radical.

Indeed, citation analysis and other methods of tracing the development of a field show that the sociology of science has grown steadily and has encountered little resistance from sociologists. However, it did get off to a slow start. Although Robert Merton, generally thought to be the founder of the specialty, began work on the value system of science in the 1930's, his studies in the late 1950's and early 1960's of the reward-system in science were far more influential. They laid out a set of problems for research which has provided the basis for much subsequent investigation. At the same time, a small number of historians and philosophers of science turned their attention to the social contexts of scientific growth and drew attention to the linkages between aspects of the social organization of science and its cognitive growth. These developments coincided with marked increases in the number of recruits to the field, in the number of dissertations and papers published, in the number of departments offering courses of study in the sociology of science and with an increasing proclivity on the part of researchers in the field to identify themselves specifically as sociologists of science. This study which brings together quantitative analysis of specialty development and qualitative analysis of changing foci of attention in the field suggests how cognitive and organizational elements interact in the emergence of special fields of inquiry.

In a systematic review of the evidence of the educational aspirations, attainments and career histories of women in American science (37), Zuckerman suggests that women encounter three barriers to becoming productive scientists. First, science is culturally defined as an inappropriate career for women. Second, those women who have surmounted the first barrier and have become scientists, continue to be hampered by the belief that women are less competent than men. Whatever the validity of this belief, it contributes to women's ambivalence toward their work and thereby reduces their motivation. And third, there is discrimination against women scientists such that they are not rewarded to the same extent as men with similar records of performance. Zuckerman calls the combination of these barriers, the "triple penalty." After examining the evidence for the existence of each of the penalties she turns to the probable costs of eliminating them. The current contraction of the market for Ph.D.'s is likely to increase the opposition to high attainment by women. Moreover, Zuckerman suggests that "if the sciences are pressed harder than other

occupations to recruit and to elevate women, their comparative prestige may decline" even if there are no changes in the quality of recruits. Finally, pressure for equality for women could reduce the performance of American science if the demand for women scientists outstrips the supply of those who are qualified.

Zuckerman also examines controversy in science in an essay review of the biography of Norman Lockyer, founding editor of *Nature* and one of the principal politicians and statesmen of Victorian English science (35). As an astronomer, Lockyer worked in a field that was still dominated by observation and was apparently more conflict prone than were the experimental sciences in the same period. His personal tendency to become embroiled in controversy was accentuated by cognitive features of his science and these, combined with the habit of eminent Victorian scientists to thrash out their differences in the pages of popular science publications, meant that Lockyer was almost continuously engaged in bitter public controversies bearing upon science and its politics throughout his life. Lockyer's career illustrates how attributes of scientific fields, individual researchers and communication patterns intersect to promote conflict or to constrain it.

Graham Allison, John P. Crecine, Michel Crozier, Martin Krieger, James March, Eugen Pusić, Daniel Shimshoni, Judith Tendler— *"Organizational Decision Making."*

James March has been interested for several years in how decision making occurs in organizations under ambiguous conditions. He therefore proposed to the POSTS Advisory Council a "core" project to pursue research concerning decision making problems in a modern technological society. He began outlining the substance of this project by pointing out the truism that some of the most conspicuous correlates of technological development and change are the organizational forms of modern society. Although bureaucratic structures of considerable power antedate sophisticated technology, the tremendous growth of technology in this century has been a major factor in the development of very large and powerful organizations. These organizations are considered necessary to cope with the complexities of combining human and technical resources. As bureaucracies and other large institutions have grown, modern man has developed the conviction that the nature of his life is heavily dependent on organizational decision making.

Consequently, many scholars have studied how organizations affect the lives of their more or less full-time participants, such as employees in business firms, and what problems arise for the individual involved in a bureaucracy. March suggests, however, that there is another field of investigation about organizations which has received little attention. He is interested in organizations as they operate as single entities, complex systems which allocate resources and solve problems and make decisions in a modern technological society. A complicating factor for such study is the fact that decision making often takes place in organizations when corporate goals are ambiguous and the means

available for attaining those goals are at least partially unknown.

The Organizational Decision Making "core" group conducted a series of seminars at the Center to discuss how choices are, and should be, made in organizations. These seminars were open to Fellows other than POSTS scholars, and were visited occasionally by Stanford faculty and other professors. Although the meetings were loosely structured, they did revolve around one recurring theme. What are the decision consequences of lack of clarity about goals, and methods for accomplishing those goals (technology)? Most existing theories of organizational decisions are based on relatively strong assumptions about preference functions and technologies. Such assumptions often are not valid, particularly in regard to public institutions. The seminars were largely devoted to developing a behavorial and normative theory of organizational decision making under ambiguity (i.e., when goals and technology are unclear).

This focus led the group to consider at various times several alternative general ideas about why organizations make choices as they do, including the following:

1. *Limited rationality*. Models built on this idea are based on the assumption that persons within organizations calculate (as best they can) the consequences of actions and choose the most satisfactory alternative.

2 *Power* This general idea emphasizes the assumption that there is conflict of interest within an organization and that decisions are made by some process that weights the preferences of some factions over others.

3 *Bureaucracy*. The focus of this model is on the standard operating procedures of organizations. The assumption is that institutions operate most of the time on the basis of these procedures, and that, as the channel for incentives, they constitute the central "decision making" unit.

4 *Diffusion* Organizational actions are seen in this idea as spreading through the social structure of families or organizations in a way analogous to that in which diseases spread through society.

The Organizations group made no attempt to work toward producing a collaborative book or other concrete product, rather, the effort was directed to affecting the work of the individuals involved, and to providing them with a testing ground for their ideas on the subject. Serendipitously, the group's work was at least partially reported in a document written by James March for the National Institute of Education (NIE).

March was asked by NIE to organize a series of conferences to develop an agenda in basic organizational research. His report of these conferences (23) heavily reflects the influence of the Center seminars. In it he outlines areas of research on educational organizations which could clarify policy-making and implementation problems educational institutions are now having. He notes in this report that universities and other organizations for learning are the focus of considerable contemporary complaint. For example, charges are made

by some that educational administration is too strong, by others that it is too weak. The major reason for such complaints is the decline in growth currently being experienced throughout society, and especially in educational institutions. This decline results in an oversupply of qualified professionals, competition for scarce resources, declining morale and confusion over the best direction to take for coping with diminishing growth. March suggests the following areas for research.

1. *Administrative effectiveness.* (What is the contribution of administration to organization performance?)

2. *Organizational change.* (How do organizations develop over time and adapt to their environments?)

3. *Loose-coupling in organizations.* (How do loosely coupled roles, beliefs, activities and functions combine within organizations to affect decision outcomes?)

4. *Careers and organizational demography.* (What are the organizational consequences of the way individuals enter the organizations, have careers and leave?)

5. *Decision making under ambiguity.* (How are decisions made in organizations with ambiguous goals, unclear technologies, and variable participation?)

Graham Allison

In early 1973, President Nixon abolished the Office of Science and Technology and the position of Special Assistant to the President for Science and Technology, thereby essentially dismantling the mechanism for providing the President with direct, ongoing advice on the scientific and technical aspects of major issues. In the fall of 1973, the National Academy of Sciences convened an *ad hoc* Committee on Science and Technology to look into the question of "advisory and coordinating functions previously carried out by the White House science advisory complex." Allison was appointed to that Committee, he and other members made the following major recommendation in a report (3) to the President and to the Congress:

> *A Council for Science and Technology should be established as a staff agency in the Office of the President.* This Council should consist of at least three full-time members, highly qualified by training and experience, and they should be appointed by the President with the advice and consent of the Senate. One member, designated by the President, should be chairman and should report to the President. The Council for Science and Technology should work closely with the Office of Management and Budget, the Domestic Council and the National Security Council, and it should also have a role in foreign policy. The purpose of this Council would be to assure a balanced national scientific effort, to promote awareness of unexploited opportunity, and to assure that the nation "will, tomorrow, have those resources and capabilities necessary to optimize the future contribution of science and technology to the national welfare."

The recommendations of the *ad hoc* Committee are currently being reviewed by the Congress and the Office of the President.

In addition to his work on general science policy, Allison has been deeply involved in arms control studies. During the summer of 1974, and continuing in part during the fall, he was director of Defense and Arms Control Studies (DACS) for the Commission on the Organization of the Government for the Conduct of Foreign Policy (the so-called "Murphy Commission"). Allison directed twenty-five case studies of United States relations with allied governments as they pertain to defense. Each is a study in alliance management and the problems that arise in organizing the American government for that task. The cases include episodes ranging from the German-American negotiations over the foreign exchange cost of stationing U.S. troops in Germany, to the 1962 Anglo-American snafu connected with the American pledge to develop and sell to Britain the nuclear missile, Skybolt. Basing their arguments on such cases, the DACS group concludes that the decentralization of the organization of the U.S. government can have adverse effects on the outcome of its actions.

The group made three major recommendations to begin correcting some of the problems in alliance management which result from this. First, some mechanism is needed to deal with the identification and management of situations in which decentralization is likely to cause serious trouble. This could be an informal working group of sub-Cabinet officials which would review issues and make recommendations, several fixed committees to study issues and frame alternatives, regular meetings with the President and his senior foreign policy advisors, or a combination of such mechanisms. Whatever structure is utilized, a fixed committee, at the sub-Cabinet level, should be established to provide early warning of issues which require coordinated management. Secondly, assessment of foreign matters by the State Department should be improved — more serious analysis is needed. This could be done through increased use of special information channels on given issues, special assessment assignments for State Department officials (to study issues in Washington and then abroad) and more outside consultants. Also, foreign officers could be better trained in assessment and reporting, reports could be signed by their originator rather than the ambassador, and the staff at the State Department in Washington could be enlarged. Third, the State Department could be strengthened in general through increased staff, allowing the Secretary to choose his principal advisors, and through reorganization of the State Department personnel system which would increase its credibility in Washington.

Allison also published a paper (4) about arms control in which he described a model of the arms race which differs with that of many arms race analysts. Many of them believe that U.S. actions trigger Soviet reactions aimed at offsetting whatever gain the U.S. achieved in the first move, and vice versa. Allison believes, however, that the nature of the interaction between U.S. and Soviet strategic forces is much more complex than this "action-reaction" hypothesis implies. This complexity stems from such factors as: (1) the lead times for development of strategic weapons are 7-15 years, thus, the "arms

race" must be complicated by assorted lags; and (2) development organizations compete among themselves for improvement of their weapons systems. Allison concludes that decisions regarding new weapons systems result from general international competition in which motivation for particular actions is predominantly internal.

The ramifications of internal politics in relation to international affairs is a major theme in Allison's article, "The Cold Dawn and the Mind of Kissinger" (1). Focusing on the SALT talks and basing his argument on books by John Newhouse and Stephen Graubard, Allison describes the intra-governmental negotiations which took place in the development of proposals for SALT. He also shows that the Kissinger philosophy of international policy-making presumes that the diplomat must act outside and beyond such intra-governmental considerations. By reading Kissinger's own works about the management of international affairs, one can find explanations for the independent initiative he has often taken in the international arena.

Allison is not concerned only with policy-making, but also with implementation of policies once they are developed. In a case study for the Research Seminar on Bureaucracy, Politics and Policy of the Kennedy School of Government at Harvard University, Allison and several co-authors described an implementation problem which occurred in the New York Police Department in the early 1970's (2). To improve efficiency in the deployment of the resources of the NYPD, Mayor Lindsay proposed the establishment of a "fourth platoon" of men which would work the 6:00 p.m. to 2:00 a.m. shift, the most "crime prone" time. After a lengthy and sometimes bitter battle with certain police officials, the policemen's union and many of the rank and file police, who were all against the "fourth platoon," Lindsay and the Department reached a compromise over the issue. The "fourth platoon" was to be deployed, and it was to be comprised of police people volunteering for the shift. During the implementation phase, however, Lindsay's time and attention were absorbed by his reelection campaign, and the Department's planning division attempted to implement the new plan very slowly and on a piecemeal basis. Supervision of the parts of the "fourth platoon" which were deployed was poor or nonexistent. By 1971 the new shift had deteriorated to the point where it was evident that it would soon be effectively dismantled.

To avoid such situations, Allison writes in a forthcoming article, implementation problems should be addressed *before* a policy decision is made, and the consideration of implementation obstacles should be a major factor in analyzing alternatives. Analysts should design plans for decision and action that increase the prospects of successful implementation. Studies of and teaching materials for such "implementation analysis" are being developed by Allison and the rest of the teaching staff of the Political Analysis Group in the Public Policy Program at Harvard University. They have constructed a list of questions which the planning analyst should consider when determining the feasibility of alternative policy plans. These questions help the

analyst to clarify the assumptions underlying any proposed policy, particularly those assumptions concerning implementation, and they help analysts predict possible implementation problems. They also point to potential pitfalls, such as misstatement of the problem or neglect of some important objective.

John P. Crecine

Crecine is interested in organizational behavior as it influences policy-making decisions, particularly at the federal level. A large portion of his time at the Center was spent studying the development of budgetary and fiscal policies within the U.S. Office of Management and Budget (OMB) from 1946-1970. Crecine obtained access to OMB's internal files, especially those related to the preparation of the President's annual budget, and he obtained internal memos from White House office files and the President's office files regarding budgetary matters. Collectively, these 50,000 documents represent one of the richest administrative protocols in existence on ongoing policy processes which is suitable for research. Crecine supervised the coding of these materials to generate a time series of the steps in each budget's development, and is now concentrating on the more formal interpretation of the research material. His aim is to show how the formal governmental structure, the bureaucratic decision rules employed, and the personal characteristics of administrative officers and elected officials affect fiscal and budgetary decisions. Published results of this work will not appear for one or two years due to the size and complexity of the data base.

Working along similar lines, Crecine prepared an analysis of the determination of the defense budget and the allocation of that budget among the various services and programs within the Department of Defense. This work was partially financed by and it was presented to the Commission on the Organization of the Government for the Conduct of Foreign Policy, with recommendations for changes in certain organizational arrangements (9). Over the past three decades, peacetime Defense budgets have been formulated in the context of two parallel budgeting and resource allocation processes: the defense budgetary process centered in the Office of the Secretary of Defense (OSD) and the non-defense budgetary process overseen by the Office of Management and Budget (OMB). Crecine states that the activities of these two agencies must be coordinated if the Federal government is to have a coherent fiscal policy. He shows how the coordination of budget planning for and in the defense and non-defense parts of the government can be improved, offering detailed improvement proposals for such a task. These proposals do not include overhauling the present system of national security resource allocation because it is unlikely that such drastic measures would be instituted; rather, he suggests modification of selected aspects of organizational structure and other changes which can readily be incorporated into the present system.

"It is desirable that in determining the appropriate "Defense Total,"

explicit trade-offs be made between defense and domestic program packages. These should reflect relative priorities of foreign policy/national security goals versus domestic goals, and the relative costs and effectiveness of programs in the two spheres. One of Crecine's major proposals is to establish a small White House analytic staff to perform this function and to advise a Cabinet-level committee and the President.

Martin Krieger

As a result of his year at the Center, Krieger has come to believe that we may be able to learn a great deal about models for planning and design and for evaluating public policies from a study of the referential character of works of literature and art, and how we evaluate them. The basic idea is that planning and policy analysis are attempts to say something *about* something, and those attempts are as a rule governed in the same way as is formal deduction. Storytelling and painting are quite regimented and rational activities.

Originally trained as an experimental particle physicist, Krieger taught in the College of Environmental Design at Berkeley before coming to the Center. During the year here, much of his reading was in philosophy in order to develop a foundation for his work on theory. The above-described programmatic change is in part a result of that reading and conversation with Fellows during the year. He brought the substance of these readings to bear on his concerns about models of relevance for elucidating the relationship of science to design. In his work, Krieger explores the trend toward more context-sensitive and particularistic theories in the field of design. In an article on planning theory (15), he explains that formal models conventionally used cannot "richly describe" the human beings who will participate in the planned situation, nor can they account for participation by the planner himself. Thus, genuine issues can easily be distorted or ignored. A formal planning model, derived from science, cannot incorporate political, social or sensual persons and so there is no means to include such concepts as democratic involvement and dissemination of power. Thus far, attempts to develop a reflexive, self-examining planning theory have seemed to sprawl intellectually, with no basis given for the aesthetic used. Krieger recommends orientations toward planning that encourage grounding in the full-bodied life at hand, and which do not fall into the pitfalls of inappropriate generality.

James March

March is deeply concerned with the organizational problems faced by educational institutions. In an article about education administration (22), he notes that many different criticisms are currently being leveled against educational organizations, including complaints that schools are too rigid or too casual, not innovative enough or too inclined to adopt every panacea. March says that the list of problems is important, it is long, and it is inconsistent.' How can education

administration meet these criticisms? First, one should be aware that even identifying (much less solving) the genuine causes of these problems is a dubious undertaking. The management of learning involves widely varying activities by many different individuals and groups in numerous social institutions. But even when the education administrator can pinpoint specific problems, he should recognize that the context of educational administration constrains the prospects for dramatic administrative success. At least three major factors, outside the control of the education administrator, limit improvements in modern education.

1) Education is a declining industry—a declining birth rate has reduced student populations, thereby decreasing the need for administrators. There are fewer chances for advancement, fewer resources, and in general a loss of managerial vitality.

2) Social expectations, with respect to education, have shifted. Until recently, many people expected educational institutions to almost singlehandedly solve problems of racial and sexual inequalities. Because it is a declining industry, and because one group of institutions cannot solve problems pervading the whole of society, educational systems have not been successful in meeting those expectations. The resulting disappointment may lead to indifference about education which will hamper education administrators.

3) Advancement in a career as an education administrator often depends more on personal contacts and reputation than on objective criteria, and the profession is not accorded as much prestige as many other similar professions, such as business administration.

Despite these obstacles, March believes that educational institutions *can* be modestly improved, chiefly through training of their managers. This training should be based on the belief that "educational institutions are organized anarchies." Their goals are problematic because they change across time, are different for different parts of the organization and for different persons involved. Also, technologies necessary to accomplish specific objectives are unclear, and participation in the organization is fluid. March explains that managers of organized anarchies need to be taught many critical administrative skills, including how to manage conflict and ambiguity, and how to allocate their attention and their time.

In a book about university presidents (24), March and his collaborator, Michael D. Cohen, further expand the description of the university as an organized anarchy. They state that university presidents "live in an ambiguous world." The first step toward becoming more effective in the decision making process is to acknowledge this ambiguity. With this in mind, March and Cohen offer seven tactical methods for the university president to improve his administration.

1) *Spend time*—Decision making energy is in short supply in the university. Thus, if the president is willing to spend time, he can expect more tolerant consideration of the problems he considers important. Also, by spending time on the homework for a decision, he becomes a major source of information in an information-poor world.

2) *Persist*—Because participation in an organization is fluid, and because other parts of the organizational structure change, he should not give up if a proposal is rejected for the first time. Nor should he expect rapid implementation if a proposal is accepted.

3) *Exchange status for substance*—Although esteem is important to a college president, he should find it possible to accomplish some of the things he wants by allowing others to savor the victories.

4) *Facilitate opposition participation*—Opponents of the administration of a university often do not participate directly in the decision making process. Thus, they often believe that greater changes can be made than are possible. By including opposing groups in the decision making process, these groups are likely to gain a more realistic idea of which improvements are possible, and which are not.

5) *Overload the system*—Strong commitment to one project (no matter how worthy) can be fruitless because of constraints outside the control of the president. By initiating and following through on several proposals, the president is not only able to accomplish at least some of his objectives even if one of the projects fails, but he is also able to maintain greater control over those that succeed.

6) *Provide garbage cans*—Many projects become bogged down in "rider" issues which are irrelevant to the substance of the matter (e.g., a proposal for curriculum reform can become an arena for a concern for social justice). To avoid such intertwining of issues, the president should provide garbage cans, i.e., projects which can be catch-alls for problem areas. For example, "overall organizational long term plans are classic first-quality cans."

7) *Manage unobtrusively*—The university president should attempt to affect many parts of the system slightly rather than a few parts in a major way. Moreover, he should attempt to promote decisions which, when activated, stay activated without further organizational attention.

Eugen Pusić

Pusić is interested in decision making in government, particularly the local government of Yugoslavia. In a forthcoming paper, he asks, How extensively are governmental institutions constrained by their historical development? How do other factors, such as economic resources, determine the course of governmental institutions? The distinguishing characteristic of Yugoslavia's government in the past was unusually great diversity relative to the size of the country. Before Yugoslavia became a separate, organized state in 1918, there were three distinct types of governmental systems and in all these systems, the urban and rural governments were only very loosely coordinated. Because of these historical influences, diversity seems still to be today the most obvious characteristic of Yugoslavia's government, and there is still an emphasis on local decision making. Moreover, the governments of cities and urban areas continue to be distinct. Urbanization tends to increase the real choices available to political leaders in the cities because there is enough money from

the long waiting period before there was State power, the pluralist mode which encouraged differing ways of belief and of living, and the traditional Jewish integration of religious belief and everyday behavior. The belief systems strongly influenced the development of political institutions and parties, such as the "Histadrut" and kibbutzim. However, due to limited resources and the initially low educational attainment of the hundreds of thousands of immigrants from the Arab countries, equal opportunity was not always possible. Shimshoni points out that the gap between ideals and reality has caused contradictions in the political, social and economic structure of the country. He says that despite the unifying stimulation of the outside threat to survival, the gaps between belief and reality are a source of malaise, and in the long run, a central question. He speculates that the country is now in a sense "between ideologies," and that in the future new belief systems and institutions will be needed to help resolve some of these conflicts. In this, Israel has much in common with th. problems of the human and social condition in western industrial countries.

To further pursue large-scale relations in Israeli society, Shimshoni has also undertaken a project to study the political structure of the scientists in that country. With a grant from the National Council for Research, in the Prime Minister's Office, Jerusalem, Shimshoni is studying the political culture through the beliefs, values and attitudes expressed in interviews (and compared with the results from closed-end questionnaires). Additionally, he is studying the political behavior of scientists as seen in their roles in the politics of science itself, and in the politics of more general issues. An understanding is sought of the relations of political culture, behavior, and the political system.

Judith Tendler

Beginning in 1967 Tendler spent three years working as an economist with the U.S. Agency for International Development (AID). Two of those years were spent in Brazil, and one in Washington, with field work in Latin America. Subsequently, she pursued her interests in foreign assistance and economic development through consultant work in Latin America for AID, the World Bank and the Inter-American Development Bank. During this time she conducted extensive research in two major problem areas — how the design of development assistance organizations affects the program outcomes, and agricultural development problems.

While at the Center, Tendler wrote part of a book (forthcoming) on the first of these topics. She begins the volume by noting that in the late 1960's various evaluations of the U.S. foreign assistance program (such as the Report to the President from the Task Force on International Development — "The Peterson Report") concluded that this program was wanting in many areas. Tendler agrees with many of the criticisms, but finds that the proposed remedies lack sense of the organizational setting in which foreign assistance

decisions took place." Whereas other evaluations of foreign aid have focussed on such factors as the constraining effect of policies imposed by the Legislature and the Executive, and the problem of insensitive technicians, Tendler focusses on the way in which the organization adapts to constraints, and on how the organizational environment itself attracts the more insensitive technician.

The Agency for International Development is the executor of the U.S. bilateral foreign aid program. This agency began with some characteristics unusual for a public sector bureaucracy (such as decentralization) which should have enabled innovations and in general a successful program. Why then was its performance so disappointing? The intent of Tendler's inquiry is twofold — to explore the unique character of AID as a public sector organization, and to analyze certain problems which, although most visible in AID, turn out to affect other types of foreign assistance organizations as well. For example, one of the major problems is adapting the proffered assistance to the beneficiary's needs. This requires innovation at the assistance site. The assistance technician there is usually lacking in administrative skill, and is accustomed to using standard solutions for standard problems. Moreover, he is far removed from home base, and so he may guess that there are political constraints on his behavior even though such constraints may have been removed. Also, the inducements to personnel to work in an outlying mission tend to promote application by people with "ugly American" characteristics. These inducements involve PX privileges, living quarters allowances, and other amenities to enable the assistance technician to live in the same way as at home. None of these allowances can be converted to cash even if the technician prefers to live in a style more like that of the host country. This tends to increase alienation between the foreign aid technician and the recipient. Thus, Tendler points out that the AID assistance technician and other foreign aid staff members are no less innovative individually than their counterparts in other organizations, rather, although the foreign assistance tasks require considerable ingenuity and adaptation to the recipient country's needs, the organizational structure constrains just such behavior.

During Tendler's participation in a World Bank mission to Brazil, she closely studied the economics of rural poverty. Her research, which was reported to the World Bank (31), showed that lack of credit is an important component in the structures of rural poverty in the area. Small farmers, 63% of the agricultural labor force, have little access to subsidized institutional credit. Rather than being able to obtain relatively low interest loans from banks, the small farmers are forced to borrow from their landlords and other monopolists, thereby incurring very high interest charges. Such charges are a major obstacle to the small farmer's growth out of poverty. A significant portion of the Northeast's agricultural output is produced by the poor (over 50%) and the marginal utility of credit for the small farmer is greater than for the large operators. Thus, making

more credit available to small farmers could significantly increase overall productivity.

Not only is more credit needed for the small farmer, but also changes must be made in the structure of the lending system. For example, landowners prohibit their sharecroppers from planting perennials in order to discourage long-term claims to the land. When banks *do* lend to small farmers, they also prohibit the planting of perennials because they do not want to make long-term commitments to precarious producers. Consequently, lending practices currently used in Brazil reinforce the small farmer's poor position in the economy. Tendler suggests that new institutions to provide small farmers with credit are needed.

Paul Armer

Armer is concerned with the implications for society of computer technology. In particular, he has focused on two problems: (1) maintaining privacy when most financial transactions are handled electronically rather than via pieces of paper like checks and credit card slips, (2) avoiding obsolescence of individuals' knowledge and skills in a rapidly changing world.

Armer is vice-chairman of the Committee on Computers and Public Policy of the Association for Computing Machinery. One of the major tasks of the group in the past year was the preparation of a list, with accompanying discussion, of the issues involved under the general rubric of the impact of computers on society (5).

VIII. PUBLICATIONS

Some scholars bring to the Center completed research and use their time here to write the results of it. Others begin to work in different areas or find new directions for their research. Consequently, the lead times between fellowships and their tangible results vary considerably. The following is a list of those books and articles which were published last year. It includes works by POSTS Fellows of the first two years of the program, as well as publications by last year's group. (For 1971-1973 POSTS publications, see First General Report.)

1. ALLISON, GRAHAM. "Cold Dawn and the Mind of Kissinger." *Washington Monthly*, March, 1974, 39-47.
2. _____, M. MOORE, T. BATES, J. DOWNING. "The Case of the Fourth Platoon." *Urban Analysis, Volume III*. Great Britain, Gordon and Breach Science Publishers, 1974, 207-258.
3. _____, and other members of the National Academy of Sciences *ad hoc* Committee on Science and Technology. "Science and Technology in Presidential Policymaking — A Proposal." A Report to the House Science and Astronautics Committee, June 26, 1974.
4. _____. "Questions About the Arms Race," in *Contrasting APProaches to Strategic Arms Control*, Robert Pfaltzgraff, Jr., Ed., Lexington, Massachusetts: Lexington Books, April, 1974, 31-72.
5. McCRACKEN, DANIEL, (Chairman), PAUL ARMER, JOSEPH WEIZENBAUM, and other members of the Committee on Computers and Public Policy of the Association for Computing Machinery. "A Problem List of Issues Concerning Computers and Public Policy." *Communications of the ACM*, Vol. 17, No. 9, September, 1974, 495-503.
6. ARMER, PAUL. Foreword to Milton R. Wessel's *The Edge of Freedom*. Reading, Massachusetts: Addison-Wesley, 1974, vii-ix.

7 CHIPMAN, JOHN. "Homothetic Preferences and Aggregation." *Journal of Economic Theory*. Vol. 8, No. 1, May, 1974, 26-38.

8. _____. "The Welfare Ranking of Pareto Distributions." *Journal of Economic Theory*. Vol. 8, No. 3, November, 1974. 275-282.

9 CRECINE, JOHN P. *National Security Resource Allocation Processes* (Prepared for the Commission on the Organization of the Government for the Conduct of Foreign Policy). 1974.

10. _____. "Organization Theoretic Approaches to Arms Race Phenomena." Proceedings of the Symposium on Analytical Methodology. L. Jordan, Ed., June, 1974. 154-158.

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14 _____. "Some Economic Aspects of Mortality in Developed Countries." *The Economics of Health and Medical Care*. London: The MacMillan Press, 1974

15. KRIEGER, MARTIN. "Some New Directions in Planning Theory," *Journal of the American Institute of Planners*. May, 1974. 156-163.

16 JONES, CHARLES O. "Doing Before Knowing." *American Journal of Political Science*. Vol. XVIII, No. 1, February, 1974. 215-228.

17 _____. "Federal Air Pollution Policy. Thoughts on Effects and Feedback." *Alternatives*. Winter, 1974. 18-24.

18 _____. "Federal-State-Local Sharing in Air Pollution Control." *Publius*, Vol. 4, No. 1, Winter, 1974, 69-85.

19 LEDERBERG, JOSHUA. "A System-Analytic Viewpoint." in *How Safe Is Safe?* Washington, D.C., National Academy of Sciences, 1974. 66-95.

20 LOEHLIN, JOHN C., GARDNER LINDZEY, J. N. SPUHLER. *Race Differences in Intelligence*. San Francisco. W. H. Freeman and Company, 1975.

21 MANSFIELD, EDWIN. "Technology and Technological Changes," *Economic Analysis and the Multinational Enterprise*, J. Dunning, Ed., New York: George Allen and Unwin, 1974.

22 MARCH, JAMES. "Analytical Skills and the University Training of Educational Administrators." *Journal of Educational Administration*. Vol. 12, No. 1, May, 1974. 17-44.

23. _____. "Organizational Factors in Education. Outline for a Progeam of Basic Research." (A Report Submitted to the National Institute of Education.) August, 1974.

24. _____ and MICHAEL, D. COHEN. *Leadership and Ambiguity*. New York. McGraw-Hill Book Company, 1974.

25 MERTON, ROBERT K. "Introduction" to Julian Maris' *The Structure of Society* University, Alabama: University of Alabama Press, 1975.

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27 _____. "Social Knowledge and Public Policy. Sociological Perspectives on Four Presidential Commissions," in *Sociology and Public Policy. The Case of Presidential Commissions*, Mirra Komarovsky, Ed., New York: Elsevier Scientific Publishing Company, 1975.

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30. _____. "What is Medical Ethics?" *Connecticut Medicine*, Vol. 37, No. 11, November, 1973, 13-22.
31. TENDLER, JUDITH. *Peasants, Poverty and Banks, Report on a Mission to Northeast Brazil for the World Bank*, June, 1974.
32. THACKRAY, ARNOLD. "Natural Knowledge in the Cultural Context — The Manchester Model." *American Historical Review*, Vol. 79, No 3, June, 1974, 672-709.
33. _____. "Prosopogeaphy as a Research Tool in History of Science: The British Scientific Community, 1700-1900." *History of Science*, Vol. xii, January, 1974, 1-28.
34. _____. "Shifting Views of Science." *Science*, Vol. 186, No. 1516, October 25, 1974, 339-340.
35. ZUCKERMAN, HARRIET. "Cognitive and Social Conflict in Science. A Review Essay." *Minerva*, Vol. xii, No 1, January, 1974, 131-135.
36. COLE, JONATHAN and ZUCKERMAN, HARRIET. "The Emergence of a Scientific Specialty. A Self-Exemplifying Case of the Sociology of Science." in *The Idea of Social Structure. Essays in Honor of Robert K. Merton*. Lewis A. Coser, Ed., New York Harcourt Brace Jovanovich, 1975.
37. _____. "Women in American Science." *Minerva*, Vol. XIII, No. 1, January, 1975, 131-135.

IX. PRESENTATIONS

1973/1974

Graham Allison

"Implementation Analysis" at the Analytic Seminar of the Public Policy Program, Harvard University, January 23, 1974.

"Implementation Analysis" at the Organization Seminar, Center for Advanced Study in the Behavioral Sciences, February 25, 1974.

"Skybolt and MLF, Model III Mapping Applied" at Tulane, Ohio, March 7, 1974.

Presentation to the Foreign Affairs Task Force of the Democratic Advisory Committee, April 9, 1974.

"The Study of Public Policy" at the Rand Corporation, April 29, 1974.

Kissinger's Foreign Policy" at the University of Nevada, Reno, May 9, 1974.

"The Arms Race" at the University of California, San Diego, May 9, 1974

"The Arms Race" at the University of California, Davis, June 4, 1974

"The Cuban Missile Crisis" at the Naval Post Graduate School, Monterey, California, June 18, 1974.

"Weapons Acquisition" at the Arms Control Conference, Aspen, Utah, August 8, 1974.

Perception of the Military Balance" at the Rand Conference, Santa Monica, California, August 27, 1974.

"Ethical Problems in Public Policy" at Duke University, October 17, 1974

Paul Armer

"ComPuters and Education" at the International Federation for Information Processing Congress, Stockholm, Sweden, August 8, 1974.

John P. Crecine

"Federal Fiscal and Budgetary Policy Processes" presented to the following groups:

- Center for Advanced Study in the Behavioral Sciences
- Rand Corporation, Santa Monica, California
- Institute of Policy Sciences and Public Affairs, Duke University
- Commerce Faculty, University of British Columbia
- Science Department, University of California, Davis
- Organization Seminar, Stanford University

Michel Crozier

"The New Sociological Conditions for Action in the Western Societies," a series of ten lectures given at the Kyoto American Studies Program, July, 1974.

"The Dilemma of the Professional in Modern Society. Meritocracy vs. Self-Management," at the World Congress of the International Sociological Association (ISA) in Toronto, April, 1974.

Joshua Lederberg

"Do Scientists Understand Science?" Phi Beta Kappa address at the Annual American Association for the Advancement of Science Meeting in San Francisco, California, February 28, 1974.

James March

"Commitment and Competence in Educational Administration" at a Conference on Education Administration in a Steady State, Stanford University, January 25, 1974.

Robert Merton

"The History and Sociology of Science. Parallels and Intersections" at the Annual Meeting of the History of Science Society, 1974.

"Social Knowledge and Public Policy. Sociological Perspectives on Four Presidential Commissions" at the Annual Meeting of the American Sociological Association, 1973.

"Social Philosophy" (a series of three, 1½ hour programs with Julian Marias) on ENCUENTRO, an educational Program of the Mexican and South American television network *Teleriso*.

"Structural Analysis in Sociology. A Perspective from the Sociology of Science" at the Annual Meeting of the American Sociological Association, 1974.

"The Sociology of Science Developmental Patterns" at the Annual Meeting of the Southern Sociological Society, 1975.

Eugen Pusić

"Policy Coordination in Government" at the European Conference on Public Administration, Speyer, FR Germany, September 19-21, 1974.

"Differences Between Territorial and Functional Systems at the Local Level" at the 8th World Congress of Sociology, Toronto, Canada, August 19-23, 1974.

Daniel Shimshoni

"On Science Policy," at the Rand Corporation, Santa Monica, California, 1974.

"Environmental Policy and Planning," at the Center for Advanced Study in the Behavioral Sciences, Stanford, California, 1974.

"Ideology and Reality" at Stanford University, 1974.

"Scientific Advice and Public Policy" at the Wingspread Conference on Scientific Advice and Public Policy, University of Chicago, Illinois, 1974.

"1973 War," at the Council for Foreign Affairs, San Francisco, California,

Judith Tendler

"Why Third World Countries Subsidize Agriculture Through the Interest Rate," at the Food Research Institute, Stanford, California, 1974.

"Decision Making in an Urban Police Department," at the Center for Advanced Study in the Behavioral Sciences, Stanford, California, November, 1974.

Arnold Thackray

"Natural Knowledge in the Industrial Revolution," at the University of Montreal, February, 1974.

"Natural Knowledge in the Industrial Revolution," at the University of California, Berkeley, April, 1974.

"Prosopography as a Research Tool in the History of Science," at the California Institute of Technology, March, 1974.

"Prosopography as a Research Tool in the History of Science," at the West Coast Lazzarum (Sub-group of the History of Science Society) San Francisco, California, May, 1974

Harriet Zuckerman

Commentary on Steven Weinberg's "Reflections of a Working Scientist" at the Daedalus Symposium on Public Conceptions of the Legitimacy of Science, American Academy of Arts and Sciences, Boston, Massachusetts, October, 1973

Commentary on Edward Shils' "The Attack on Rationality and the Future of Science" at the Daedalus Symposium on Public Conceptions of the Legitimacy of Science, American Academy of Arts and Sciences, Boston, Massachusetts, October, 1973.

"The Emergence of a New Scientific Paradigm: Bacterial Genetics as a Prototypal Case" at the Annual Meeting of the American Sociological Association, 1974.

"The Social and Educational Origins of a Scientific Elite," at the Annual Meeting of the Southern Sociological Association, 1975.