relate well with changes in the distribution of equipment purchases. Schmookler has attempted to extend his cross-section analysis to earlier years (for which capital-investment data by industry are not available) by using value added as a proxy for investment. His results are consistent with those above, but of course the fit is far less good. Thus cross-section data, like time-series data, reveal the powerful influence of the size of the market on the allocation of inventive effort.

To complement statistical evidence, studies were undertaken by Schmookler and his graduate students of 900 specific inventions in the petroleum refining, paper, railroading, and farming industries in order to try to identify whether demand factors or supply factors played an important role. Often it proved impossible to identify the conditions that led to the inventive effort. However, while in many cases Schmookler and his fellow researchers did find clear-cut evidence that changes in demand or new awareness of demand triggered an inventive effort, no clear-cut case was found of a scientific advance that triggered an effort to exploit it. Schmookler acknowledges that there may be cases in other fields of invention in which increased capability was the dominant initiating factor, but suggests that these must be in a minority relative to demand-induced inventive efforts.

Schmookler's conclusion is that the vast changes in the allocation of inventive effort that have occurred over the long run, and the changes that are occurring in the shorter run, are quite well explained by changes in the pattern of demand for goods and services. As demand patterns have shifted, so has the pattern of inventive effort. In comparison with the great explanatory power of demand shifts, changes in the relative costs and capabilities of inventing in different product fields appear to have had only a minor influence.

Schmookler has some sensible and interesting things to say regarding the reasons for this. He suggests that the nature of scientific advance has had its major influence in determining the magnitude and precise character of the technical advances we have achieved, not the *product* fields. Over the years a growing percentage of patents have been taken out on electrical as compared with mechanical devices; this clearly is the result of the improved capability of inventors to make these kinds of inventions. However, electrical devices have been relevant to the products, processes, or equipment of almost every industry. To a first approximation it would appear that inventors (and those that hire them) pick the product field and problems on which they work largely on the basis of considerations relating to demand, with the stock of knowledge (like knowledge of electricity and the technology of electrical apparatus) influencing the technical nature of the design solutions tried and achieved. Thus, as the United States spread out geographically, the returns to significant improvements in long-range communications systems sharply increased, and as a reflection of this many inventors were attracted to the field. The early systems were principally mechanical. The advance in knowledge of electricity opened up a variety of new approaches and permitted the achievement of a system representing orders-of-magnitude improvement over mechanical systems. But inventors had begun flocking to work on both systems long before the advances in scientific knowledge occurred which permitted major advances to be achieved.

Schmookler also has some interesting data and things to say about individual versus corporate inventors, the reasons for the decline in the patent rate per scientist or engineer in the postwar era, patent performance of big companies versus that of small companies, and issues relating to the "mining out" of a field. But the major thrust of this book is to present and develop the impressive evidence for the demand theory of the direction of invention. The book is a major intellectual and scholarly accomplishment.

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Broad-Scale Psychiatry

The Group for the Advancement of Psychiatry (GAP) was founded in 1946 by a group of outstanding physicians in response to their frustrations as military psychiatrists during World War II. More than 2,500,000 men had been either rejected or discharged from the armed forces because of emotional disorders. The traditional patterns of selection of men for military duty as well as the techniques for prevention and treatment of mental illness seemed lamentably inadequate to the psychiatric needs of the nation. GAP was started accordingly with the express purpose of seeking to improve the quality of psychiatrists' contributions to national mental health planning as considered in the broadest possible social frame of reference. It has developed as a loose federation of specialized committees, 21 in number, each functioning as an investigative team. Membership is by invitation, and every member is a collaborator in a selected project. The assembled committees meet twice a year to discuss work in progress.

When the members of a committee have completed a study they formulate a draft of their findings for consideration by other GAP members. The final published report represents the total group consensus. GAP committees also arrange symposiums in which members and invited nonmember experts participate. If the quality of the proceedings is particularly high they are published. In this way GAP has published 58 reports and the proceedings of ten symposiums since its inception. **Psychiatry and Public Affairs** (Aldine, Chicago, 1966. 479 pp., illus. $8.95) consists of a selection of these reports and symposiums which provide the reader with an opportunity to sample the work of GAP and to acquaint himself with its general mission, and which may perhaps stimulate him to study its work *in extenso*.

The book opens with a statement entitled "The social responsibility of psychiatry." Originally published as report No. 13, in July 1950, it calls for a redefinition of the concept of mental illness so that the main focus of psychiatrists will be on the zone of contact between the individual and his society. The report recommends a study of the social factors which contribute to the causation of mental illness and which influence its course and outcome. "Specifically, we favor the most intensive study of the psychosocial factors influencing human welfare. We favor the application of psychiatric principles to all those problems which have to do with family welfare, child rearing, child and adult education, social and economic factors which influence the community status of individuals and families, inter-group tensions, civil rights and personal liberty. . . . This, in a true sense, carries psychiatry out of the hospitals and clinics and into the community." The only exception one might take to this admirable statement of principle is its too exclusive emphasis on mental illness. The noxious psychosocial setting which breeds mental ill-

ness breeds other illness, too. Tuberculosis, premature births with excessively high perinatal morbidity and mortality rates, high accident rates, high incidence of venereal disease, violent behavior, impaired capacity to learn in school—to cite only some of the many aspects of a large complex of disorders associated with social and family disorganization—indicate that mental illness is but one troubling outcome of environmental stresses.

"Psychiatric aspects of school desegregation," which first appeared in May 1957 as report No. 37, is, sad to say, still relevant to the acute problems of today. The report provides a valuable theoretical frame of reference for collecting data and for planning programs. It would have been helpful if the annotated reading list which follows the report had been brought up-to-date for the 1966 publication.

In a section entitled "Psychiatry and international relations," the editors trace the historical origins of GAP's interest in this field. They are frank enough to contrast the soaring enthusiasm and optimism of GAP's first report (No. 11, January 1950), which described plans for cooperative efforts with leaders at the highest echelons of government on the international scene, with more realistic and more circumscribed projects, such as those concerning the selection and preparation of civilian workers for overseas duty. Again, updating of the appended reference list would have increased the value of the material.

The section on "Forceful indoctrination" still makes for fascinating reading, even though the findings do not get too far beyond those arrived at speculatively by George Orwell when he wrote *1984* so long ago. Studies of REM-deprived sleep, which are probably relevant to this topic, had not yet come into being at the time of this GAP symposium. It is regrettable that the original contributors to the symposium were not invited to bring their material up-to-date.

"The threat of nuclear war" highlights perhaps more than any other section of the book the staggering complexity of the problems which GAP committees have been courageous enough to tackle. Since their speculations concerning the dangers of nuclear war by accident, a hydrogen bomb has been lost and found off the coast of Spain. The dark Russian shadow which concerned the GAP committee in this report has been replaced by the shadow of Red China in 1966, not even mentioned in this section. Needless to say, neither does Vietnam appear in the text.

This book is a record of serious study. The frustrations which gave birth to GAP have been replaced by more formidable ones. In a symposium dealing with psychological aspects of nuclear war, M. Stanley Livingston remarked: "I believe that we have failed completely in trying to persuade people to act intelligently on the basis of fear of unpleasant consequences. We sense a closing off; a withdrawal from facts. People do not want to hear." And yet it is in the face of precisely such resistance that psychiatrists and other specialists in the behavioral sciences must intensify their resolve and their efforts. We in psychiatry are no strangers to the fact of man's irrationality. Our caseload consists essentially of patients who have lost contact with common sense in the conduct of their daily lives. Man's irrationality is our challenge and our daily work. Are psychiatrists qualified to participate in areas of broad public policy? Can they contribute professionally and objectively to the search for alternatives to war? The members of GAP will be the first to express their doubts. Yet their efforts in the face of these doubts and considerable difficulty must be applauded and encouraged. It is in this sense most of all that this record of their work is outstanding.

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Treatise on Diatoms

Diatom taxonomy, particularly that part dealing with bilaterally symmetrical taxa, is one of the most difficult areas of systematic phycology. Ruth Patrick and Charles W. Reimer have treated many of these confusing species in **The Diatoms of the United States Exclusive of Alaska and Hawaii**, vol. 1, *Fragilariaceae, Eunotiaceae, Achnanthaceae, Naviculaceae* (Academy of Natural Sciences, Philadelphia, Monograph No. 13, 1966. 702 pp., illus. $18.50), the first of two volumes on freshwater diatoms in the continental United States. This book has been eagerly awaited by phycologists as an authoritative account of American diatoms; no reference on this flora has been written since Boyer's publication in 1927. Presenting their material in the style of classic works on cryptogamic plant taxonomy, the authors have furnished keys covering most species, descriptions of species (including known distribution in the United States), and well-executed illustrations of all species.

The introductory part of the book, some 100 pages, is devoted to various aspects of diatom biology; it includes sections on morphology, physiology, reproduction, distribution, diatom communities, classification, and techniques for collecting and preparing diatoms for study. The systematic part of the book covers over 500 pages. I have tested the keys in this section and in most cases was able to identify the species according to the authors' interpretations without great difficulty. The keys seem to be relatively free of errors. The inclusion of keys to smaller groups (three taxa and fewer) would have made determinations easier, however. The figures are well drawn and beautifully reproduced in most cases, although insufficiently erased artist's errors appear on some of the plates. A glossary would have been a most useful addition, and one hopes that it is to be included in the second volume. The systematic section makes the book well worth the price.

The introductory part of the book, on the other hand, is disappointing. The morphological section is scantily illustrated; electron micrographs of diatoms would have been very helpful, particularly in interpretations of valve structure. Omissions of important references in the literature, unfortunately, are common in the introductory section of the book. Okuno, Helmke, and Krieger and other publications on electron microscopy of diatom structure are not cited. It hardly seems possible to discuss diatom morphology without reference to some of these. Some omissions have very serious consequences. For example, Patrick and Reimer infer that haploidy is commonly known within the centric diatoms without considering that enough species have been studied to convince most phycologists that diploidy is characteristic. Male gametes in many centric diatoms are small motile cells that are usually referred to as spermatozoid cells in recent literature. Before their role as gametes was convincingly demonstrated, they were called microspores, a term that Patrick and Reimer often use. In other places, however, Patrick and Reimer refer to these structures as sperm, spermia, or spermatozoids.