Book Reviews

Concerned Scientists in Britain

Scientists, Society, and State. The Social Relations of Science Movement in Great Britain, 1931–1947. WILLIAM MCGUCKEN. Ohio State University Press, Columbus, 1984. xiv, 381 pp. $22.50.

The "social relations of science movement" has generally been identified with a small but influential group of left-wing British scientists. During the 1930's, J. B. S. Haldane, Joseph Needham, Lancelot Hogben, P. M. S. Blackett, N. W. Pirie, and J. D. Bernal, among others, advanced a radical critique of scientists' relations to the state, the mass public, the educational system, and the wider culture. Under the impetus of economic depression, long-standing resentment of the low status and impoverished condition of science had flared into wholesale opposition to the dominant (literary) culture and capitalist economic order. In the radicals' view, capitalism inevitably slighted science (and scientists), making at best inefficient, and at worst destructive, use of its energies. They wished scientifically to reconstruct society and to reconstruct science so that it no longer served the ends of profit-making and war. Some of these critics were Marxists, some Fabians, some rather unconventional socialists. All were impressed by the level of support for scientific research in the Soviet Union (which devoted approximately 1 percent of national income to science in the '30's, compared to about a tenth of a percent for Britain), by its science-based school curriculum, and by its commitment to planning. The radicals actively promoted their views in popular articles and books, of which the most influential was Bernal's *The Social Function of Science*, and through their organization, the Association of Scientific Workers. In the 1940's, this movement fell victim to disillusionment with the Soviet Union and to the Cold War, as some scientists lost faith in the Soviet model and others came to fear association with any group on the political left.

Or so runs the conventional account, which is challenged by the author of this volume. McGucken takes a much broader view of the social relations of science movement than those who have equated it with the activities of the scientific socialists. The group that for others constituted the movement is treated here merely as its radical fringe. Indeed, McGucken devotes only about 25 pages to the left-wing scientists—perhaps in part because their efforts have already been detailed by others, such as Neal Wood, Gary Werskey, Greta Jones, and Hilary and Steven Rose, but also because he considers the radicals to have ultimately played a lesser role than politically more moderate actors in altering relations between science and state. Where others have approached the movement either biographically or through a history of ideas, McGucken explores the history of institutions. Moreover, the institutions described reflect a very broad political spectrum, including for example the Royal Society, the British Association for the Advancement of Science, the British Science Guild, and the Parliamentary Science Committee, as well as the Association of Scientific Workers. And where others have generally associated the movement with the 1930's, McGucken believes the '40's to have been the period of most intense political activity and greatest achievement.

In this "revisionist" account, the social relations of science movement passed through five major (though overlapping) phases, each involving the activities of different organizations. The first was shaped by the Depression, lasted from approximately 1931 to 1934, and witnessed the British Association's first, faint stirrings of interest in the social impact of science. The Association eschewed any organizational involvement in politics, however, leaving a void that was at least partly filled when the British Science Guild and the Association of Scientific Workers managed in 1933 to create an independent Parliamentary Science Committee. This phase also included the activities of the radical scientists, who began to dominate the Association of Scientific Workers.

Phase 2 was marked by the rise of fascism. Persecution of scientists and the use of gas warfare produced a heightened concern with international affairs—reflected in the Association's creation, in 1938, of a Division for the Social and International Relations of Science. Phase 3 began with the Second World War and principally involved the Royal Society, now concerned that government make the fullest possible use of scientists in the war. The Scientific Advisory Committee to the War Cabinet was created, and three scientific advisers were appointed to the new Ministry of Production. The fourth phase began about 1940 and involved the formation of the Society for Freedom in Science, an organization opposed to planning, and in particular to the activities of the left-wing Association of Scientific Workers. During phase 5, which lasted from 1943 to 1947, the Royal Society and the Association of Scientific Workers independently lobbied the Labour government to create an Advisory Council on Scientific Policy. The author considers the creation of this council the most significant achievement of the social relations of science movement.

The activities of these and other organizations are meticulously detailed. Indeed, it appears as though no memo, directive, or report of any scientific association, society, council, or committee has escaped the author's attention (or notice in this book). Hence, while the volume will provide a useful reference for specialists, it tells others considerably more than they are likely to want to know about its subject and cannot, unfortunately, be characterized as a "good read."

Is its subject the social relations of science movement? The author asserts that others are wrong in equating that cause with the activities of a handful of radical scientists in the 1930's. But definitions are not right or wrong; they are more or less useful. What analytic purpose is served by including under the rubric of the social relations of science movement any individual or organization whose goal included increased state support for science or greater influence for scientists? If the social relations of science movement was as broad as this book suggests, it was not distinctively British. As the author notes, the AAAS moved in the same directions as its British counterpart in response to essentially the same stimuli. Indeed, given the extent of the changes wrought in and by American science during the Second World War, one might conclude that the movement in the United States was more successful. Yet surely there was something unique about the British experience. Only in Britain did a group of very

distinguished scientists advance a radical, comprehensive, and, for a time, influential critique of capitalist science. To the extent that they aimed to change as well as understand the world, their efforts—unlike those of the Royal Society or the British Association—were ultimately unsuccessful. Their goals, their means, and the outcome of their efforts were essentially different from those of politically moderate or conservative actors. Little is gained, and a good deal of analytic clarity lost, in viewing these various individuals and institutions as participants in a single cause. To group under the same heading all those who shared a concern that science "be used for the benefit of society," irrespective of how that benefit was defined, or who promoted "greater integration of science and government," whatever its ends, is to lose the capacity to make important distinctions. McGucken has produced a well-researched, comprehensive, and useful account of British scientific institutions between the Depression and the end of World War II. But he has not convinced this reviewer, at least, of the need to abandon the conventional definition of the social relations of science movement.

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Researches in the Kaiserreich

Paul Ehrlich. Scientist for Life. ERNST BÄUMLER. Holmes and Meier, New York, 1984. xvi, 288 pp. + plates. $39.50. Translated from the German edition (Frankfurt-am-Main, 1984) by Grant Edwards.

Among the most celebrated factors contributing to the rise of Imperial Germany to the first rank of industrial and military powers in the last decades of the 19th century was the active promotion by the German state, through a variety of financial and institutional arrangements, of a close cooperation between industrialists and university-based research scientists. This policy of fertilizing practice with theoretical knowledge bore immediate fruit in the chemical and electrotechnical industries. But these new science-based industries were also a frequent source of stimulus to major scientific advances and even the creation of entirely new fields of research. The career of Paul Ehrlich (1854–1915) was linked with the development of one of these new fields, immunology. In drawing upon the invaluable archival materials of the Hoechst Pharmaceutical Corporation, Bäumler's timely scientific biography provides tantalizing suggestions concerning the relations between science, industry, and the state in the Kaiserreich.

Bäumler effectively explores the connection between Ehrlich and the chemical industry to illuminate every stage of his career and the development of his science. Once describing himself as a scientist with "blinders" on, Ehrlich single-mindedly pursued several lines of research based on the exploitation of the chemistry of aniline dyes. As a medical student working on his dissertation, Ehrlich concentrated on mastering the new structural chemistry developed by Kekulé and being exploited in the dyestuffs industry. This led to the development of staining techniques for identifying cell structures and classifying the various types of leukocytes. Ehrlich quickly moved on from morphological studies to develop vital staining techniques for investigating the physiological action and distribution of substances in living cells. The basis for this new direction was his detailed knowledge of the structure of dyes. Thus, in developing the notion that the physiological effect of toxins depends upon their fixation to a cellular structure, that toxins and antibodies exhibit specific affinities for one another determined by atomic groupings enabling them to fit together like lock and key, Ehrlich exploited conceptions from dye chemistry, where, for instance, appendages to the benzene ring were known as "side chains." In explaining the creation of antibodies Ehrlich assumed that atom complexes capable of performing subordinate nutrient functions attach themselves to structures in the protoplasm as side chains. The side chains in turn have predetermined affinities for particular toxins, which they attract and bind. Overcompensation and production of side chains result in the shedding of these appendages as antibodies. Ehrlich's "side chain" theory not only was the basis for further development of his ideas in immunology, including the theory that cancer is due to changes in normal cells caused by chronic chemical or physical irritation, it also served as the basis for his groundbreaking work in chemotherapy, which culminated in the development of Salvarsan for the treatment of syphilis. Equally significant, the theory of side chains guided Ehrlich in developing precise quantitative methods for determining the antibody content of sera and standards for dosage measurement, particularly of antidiphtheria toxin, for which he was awarded the Nobel Prize in 1908.

Though Bäumler's study is a valuable contribution, it is regrettable that he devotes only superficial treatment to the scientific institutions headed by Ehrlich—the Institute for Serum Testing in Berlin and the Georg Speyer Haus in Frankfurt. In spite of the rich archival sources at his disposal Bäumler has missed important opportunities to explore, for example, the "for profit" research done at the Speyer Haus and the extent to which Ehrlich's own research interests were shaped by this environment. His fleeting treatment of Friedrich Althoff ("Ehrlich's old friend and patron"), the most powerful member of the Ministry of Culture, who shaped the careers of men like Ehrlich, Koch, and Behring while actively promoting the construction of research institutes jointly funded by private industrial firms and the government, leaves us longing for a more thorough study of the relationship between such pharmaceutical giants as the Hoechst Corporation and the state.

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Magnetic Oscillations

Magnetic Oscillations in Metals. D. SHOENBERG. Cambridge University Press, New York, 1984. xxiv, 570 pp., illus. $97.50. Cambridge Monographs on Physics.

Our present understanding of the electronic properties of solids has largely resulted from the interplay between measurements that give direct information about the electronic band structure of materials and the theoretical calculation of these electronic band states. An important and essential element in this process is the experimental determination of the energy bands at the Fermi energy. Shoenberg's book is a comprehensive review of the many experimental and theoretical considerations involved in the acquisition and interpretation of data that map out these band states. The book also reviews recent advances that permit the detailed determination of fundamental electronic parameters that characterize individual electron states at the Fermi energy.

The first important experiments in this field were performed by de Haas and van Alphen, who, in 1930, discovered that at low enough temperatures a bismuth sample exhibited oscillatory behavior as a function of an applied magnetic field.