tention, as did corporate and urban management. Nor did the program proscribe the study of a subject that might have immediate news value—witness its concern for the ethical questions raised by the organ transplantation controversies.

Why then did the program, with all its money and talent, fail to respond to the most pressing contemporary problems arising from the interaction of technology and society? First, in the program's defense it should be understood that the theoretical framework for a study of the social implications of technology was virtually nonexistent. This is still an area where truisms and prejudices abound and where expert knowledge is often nothing more than a sophisticated elaboration of some commonsense propositions. But that is only a partial answer to the question posed. More pertinent is a survey of the research personnel subsidized by the program. Of the 109 researchers one-half were drawn, in equal numbers, from business and economics. From the other social sciences there were only 12 sociologists, eight political scientists, and a scattering of others, and there were only ten humanists. From technology not only were there no engineers, there were no representatives of labor. To complete the professional profile, the director had worked as a Rand Corporation economist for a decade. Therefore, the research group was dominated by people who if not technological optimists were those least likely to be sensitive to the criticisms leveled against technology by environmentalists, consumer advocates, and peace marchers.

The program's optimistic faith in technology was revealed in a 1969 front-page *New York Times* story entitled "Study Terms Technology a Boon to Individualism":

> Modern technology, far from crushing and dehumanizing the populace, has made Americans the most genuinely individual people in history, a Harvard-based corps of scholars is concluding after the first four years of a 10-year appraisal.
>
> The group holds that technology has created a society of such complex diversity and richness that most Americans have a greater range of personal choice, wider experience, and a more highly developed sense of self-worth than ever before.

Accompanying this utopian outlook was the all-too-ready acceptance of the need for a ruling technocratic elite. In the same news story Mesthene was quoted as stating, "In governing the nation . . . it may well be essential to rely heavily on an emerging group of 'technocrats': persons trained in computer-based analysis techniques needed to sort out the complexities and subtleties" of an industrial society. He admitted the drawbacks of a technocracy, but contrasted them with the "chaos" likely to ensue if the "hippie population" had its way, and finally put the burden of the preservation of democracy on the "ordinary citizen," who must work harder to understand what the technocrats were doing.

The utopian and technocratic ideals of the program were not shared by the critics of technology, who simultaneously were coming to their own conclusion about the meaning of the machine in American life. In an ironic turn of events, the scholars who retreated to academe to fashion a theoretical approach to technology and society offered fewer intellectual innovations than did the activists who scorned theory and extolled practical involvement. Consider the period 1964 to 1972 and compare the theoretical contributions of the program's personnel with those of the dissidents. In contrast to the often bland and sterile philosophizing and the state-of-the-literature surveys that characterized the Program on Technology and Society we find: the environmentalists, who brought, to a wide segment of the American population, a heightened sensitivity to the natural environment and a reevaluation of the place of material goods in our lives; Ralph Nader, who raised fundamental questions about the responsibilities of the producers of consumer goods in an industry-dominated society; the antiwar protesters, who brought to our attention the military uses of advanced technology and the interlocking relationship between the military and industry; the zero-population-growth advocates, who argued that the population of industrial nations must be limited as their living space and natural resources diminished; the young assembly-line workers at the Vega plant in Lordstown, Ohio, and elsewhere, who demonstrated that worker alienation was more than a concept in Marx's social philosophy. Finally, special attention should be called to one notable attempt to articulate in formal, theoretical terms the complaints of these social critics and activists: John McDermott's 1969 *New York Review of Books* article, "Technology: The Opiate of the Intellectuals."

These voices of dissent and criticism were often shrill, superficial, illogical, confused, and irresponsible. One might deplore their tactics, become exasperated with their rhetoric, and still learn much from them, for they were bringing us a new awareness of the social repercussions of technology. It is an indication of the extent of the failure of the Harvard Program on Technology and Society that it did not respond to the most exciting movements in technology and society of the 1960's. The program might have played an important role in taming, shaping, or challenging, on intellectual grounds, the ideas put forth by the dissidents. Its shortcomings were not the result of its commitment to thought over action but stemmed from its failure to see that the activists, in their own crude ways, were generating new ideas and concepts worthy of further study.

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Reference

1. The titles of the Program on Technology and Society *Research Reviews* are as follows: No. 1, "Implications of Biomedical Technology"; No. 2, "Technology and Work"; No. 3, "Technology and Values"; No. 4, "Technology and the Polity"; No. 5, "Technology and the City"; No. 6, "Technology and the Individual"; No. 7, "Implications of Computer Technology"; No. 8, "Technology and Social History." Except for No. 4, which is now out of print, they are available (for $2 each) from the Harvard University Press.

A Tormented History

Genetics and American Society. A Historical Appraisal. KENNETH M. LUDMERER. Johns Hopkins University Press, Baltimore, 1972. xiv, 222 pp. $10.

Genetics is as old as this century; and in the course of its growth it has influenced and been influenced by events in the society in which it exists. Kenneth Ludmerer has explored this interaction provocatively.

In its early years genetics was used, primarily by nongeneticists, to justify a program of negative eugenics based on state sterilization laws aimed at the unfit. Even before Mendelism this eugenics movement looked upon the Jukes, the Kallikaks, and other "families" as social parasites corrupting the American stock. The labeling of pauperism, feeblemindedness, alcoholism, and habitual criminality as results of genetic defects stimulated the passage of sterilization laws. (By 1917 such laws had been adopted by 16 states.) Their application, especially to the feeble-

minded, resulted in over 30,000 sterilizations by 1935. The Eugenics Record Office through its staff of Harry Laughlin and Madison Grant, neither one active or competent as an experimental geneticist, served as a lobbying group for eugenic laws. As the Jukes and the Kallikaks lost their appeal as scapegoats, their place came to be occupied by the foreigner, especially the eastern and southern European. The coalition of Laughlin and Grant with Senator Albert Johnson resulted in the infamous Restrictive Immigration Act of 1924, the racist prejudices of which were backed up by lengthy testimony by supporters of the American eugenics movement which portrayed the immigrants as an inferior stock laden with potential disease, feeblemindedness, and erratic character. The fear of bringing more of these immigrants into the melting pot spread, particularly after the flood of polemical books and articles warning America of the biological destruction of its Anglo-Saxon heritage.

As Ludmerer points out, genetics was misused but geneticists did not speak out. Why? The aversion of scientists for publicity and popularization is a long-standing tradition in the United States. Such scientists as did go to the public were frequently suspected of charlatanism, weakness of character, and irresponsibility. The character of the spokesmen for the eugenics movement whom they observed presenting public addresses only served to strengthen the geneticists' aversion to such encounters. Most geneticists privately denounced Laughlin and Grant and disavowed membership in the American eugenics movement, but because of their silence there was no effective criticism in public testimony or in the popular press to dispel the prejudices being passed off as scientific fact.

The death of the eugenics movement is documented extensively by Ludmerer. There was the embarrassment of the U.S. Army Binet tests, which identified 47 percent of white inductees as feebleminded by eugenicists' standards. The population genetic studies of J. B. S. Haldane destroyed the myth of rapid elimination of feeblemindedness by sterilization. Even with a rigorous application of the laws a millennium of effort would be required for eradication of most of the defective "gene" from the population. L. Penrose's studies revealed that feeblemindedness was not a single Mendelian entity but a number of disorders, many of them non-Mendelian. Most significant to the public, however, were two social events—the great depression of the 1930's and the rise of Nazi Germany. The unemployment of millions could not be blamed on a genetic tendency to pauperism. The indiscriminate sterilizations and political persecutions in Germany under Hitler's Eugenic Sterilization Act of 1933 frightened the American people. Many of the leaders of the American eugenics movement had at first welcomed Hitler's decree and dismissed as paranoia the claims of American Jews and intellectuals that it was being used as an instrument of tyranny.

The pseudoscientific nature and the eventual death of American eugenics were so traumatic that they had a paralyzing effect on the development of human genetics as a legitimate field of research and kept physicians, for more than 40 years, from seriously considering medical genetics as a subject worthy of research or inclusion in the medical curriculum.

All of these points are illustrated and documented with scholarly care by Ludmerer. His reading is extensive, and his personal interviews with many of the participants in this tormented history of genetics and public affairs add an eyewitness quality to the account. The only major defect in Ludmerer's analysis is the virtual absence of H. J. Muller's role. Almost all of Muller's correspondence is at the Lilly Library at Indiana University, and his death in 1967 prevented its organization into a reference source for Ludmerer. If he had read through this material Ludmerer would have altered, considerably, his analysis of the relation of genetics to society between 1930 and the present. He would have seen that Muller's first warnings of radiation danger, presented to physicians in Texas in 1928, were repudiated as irresponsible. He would have seen how effective was Muller's denunciation of the American eugenics movement at the 1932 International Congress of Eugenics in his paper "The Dominance of Economics over Eugenics." He would have appreciated the quality of Soviet studies in human genetics under the leadership of Solomon Levit in 1933–1936 before Levit was arrested and killed in the Stalin purge and his Institute of Medico-Genetics was dismantled. The rejection of eugenics in the U.S.S.R. and the triumph of Lysenko were episodes that shattered Muller's social philosophy. His return to eugenics is scarcely mentioned by Ludmerer, yet most of the last decade of Muller's life was devoted to positive eugenics, especially his proposal of germinal choice. It would have been valuable to have Ludmerer's analysis of Muller's development of positive eugenics and his inability to bring about a movement in support of it. The correspondence on the Lewis Strauss affair would have revealed a political connection between genetics and atomic energy—the banning of Muller as a delegate to the First Atoms for Peace Conference in 1956 and the AEC's evasions, misrepresentations, and fears of subversion which were associated with Muller's concern about radiation damage. Although Ludmerer mentions Muller's paper "Our Load of Mutations," he incorrectly attributes to him the view that "background radiation" from atomic weapons development was the major source for the genetic load. Muller feared that medical and industrial sources of radiation under the then-existing maximum permissible dose guidelines could result in an exposure of some 50 roentgens per individual per generation, an amount which could result in a 25- to 50-percent increase over the spontaneous mutation rate. It was the spontaneous rate, however, that gave Muller his greatest worry and that made him advocate a eugenics program as the only reasonable alternative to the accumulation of higher genetic loads in the absence of vigorous selection. Many of Muller's ideas were later challenged by Wallace, Dobzhansky, and other experimental and population geneticists who advocated a compensatory heterosis based on polymorphism as an alternative to genetic load from spontaneous or induced mutation. The controversy still exists.

Although his account of later events is seriously flawed by these omissions, Ludmerer's history of the relation between genetics and American society up to 1940 is sound and needs to be widely read. Ludmerer poses the unanswered questions of the scientist in our own time. When should the scientist speak out? When is group rather than individual scientific protest justified? Would abuses such as the state eugenic sterilization laws and the Johnson Act of 1924 have been prevented by a concerted action of American geneticists? The collective activism of some scientists, especially younger anti-establishment scientists, has not been

welcomed in the past few years at AAAS meetings. The polemics and emotionalism generated over scientific involvement in the Vietnam war (napalm, antipersonnel bombs, human sensing devices, electronic warfare, defoliation) cannot be ignored. Concerted scientific protest, whether against Hitler's persecutions of Jews, Lysenko's destruction of formal genetics with Communist Party support, or the inhumanity of man to his fellowman during wartime, has always been accompanied by such powerful emotionalism that the scientific issues become overwhelmed in the conflict of values. This is perhaps the most important lesson revealed by Ludmerer's analysis of genetics and American society: If we fail to relate science to values and allow science to be used or abused by society we keep our scientific objectivity in the eyes of society but we may lose our humanity; if we act as a group or as individuals to advocate or protest the applications of science, we lose our objectivity in the eyes of society but we may well preserve our humanity.

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Human Sexual Development

Man and Woman, Boy and Girl. The Differentiation and Dimorphism of Gender Identity from Conception to Maturity. JOHN MONEY and ANKE A. EHRHARDT. Johns Hopkins University Press, Baltimore, 1973. xvi, 312 pp., illus. Cloth, $12.50; paper, $3.50.

Man and Woman, Boy and Girl presents a general and unified account of human sexual development and differentiation. By necessity the book ranges from biochemical to anthropological levels of analysis in an attempt to blend the several disciplinary perspectives into a single comprehensive and comprehensible picture. A unique feature of the effort is the clinical experience with hermaphrodites that the authors bring to bear. Over the last 20 years, more than 900 cases of hermaphroditism and related reproductive and psychosexual disorders have been seen in the psychohormonal research unit at Johns Hopkins Hospital. Money has been associated with this unit from its beginning, and Ehrhardt did her doctoral research there.

The major organizational principle of the book is ontogenetic: discussions of genetic dimorphism and fetal hormones are placed at the beginning, and pubertal hormones and adult behavior are reserved for the end. The middle chapters contain examples of unusual gender problems and their resolution (for example, raising as a girl a genetic male whose penis was completely lost to clumsy circumcision at age 7 months), brief ethnographies of gender role differentiation in six preliterate or transitional societies, and case material from "matched pairs" of hermaphrodites who had very similar clinical problems at birth (all were genetic females with adrenogenital syndrome) but who had been assigned different sexes by their parents. Several chapters contain photographs of patients or their genitalia which exemplify the problems under consideration. Should the text possibly fail to bring home, the human significance of this research, the photographs will allow no one to remain unaware of it.

The conceptual framework within which Money and Ehrhardt work is an evolutionary advance on the views presented by Money and by John and Joan Hampson in their chapters in the 1961 edition of *Sex and Internal Secretions*. There are more data now than then, but these have not necessitated major revisions of primary concepts. An extension of the earlier concept of "gender role" is the concept of "gender identity." Money and Ehrhardt use the term gender identity to distinguish a "private," experiential sense of gender from its "public," behavioral manifestations, to which they continue to apply the term gender role. The reviewer did not find this distinction very helpful. One problem is that gender role, as defined in the book (p. 4), includes "everything that a person says and does, to indicate to others *or to the self* the degree that one is either male, female, or ambivalent" (italics supplied). Thus "the self" becomes split off to observe and define "the person," who then experiences gender identity. Of course one can have a theory in which a distinction is made between the self and the person; several philosophers and psychologists have built such theories. But in the context of this book, if such a theory is intended it should be made explicit.

The concepts of "gender feedback" and "complementation" are emphasized as important determinants of normal gender differentiation. Regarding gender feedback, the authors cite the work of Lewis and his colleagues to show that parental expectations of infantile gender-related behaviors are partially self-fulfilling; biological potentials and culture-based parental expectations become completely enmeshed. Regarding complementation, Money and Ehrhardt use the analogy of bilingualism to account for normal gender role acquisition (p. 163):

> In the same way that the bilingual child encounters two sets of language stimuli requiring two sets of responses, so the ordinary child receives and responds to two sets of gender stimuli, one the behavior of females, the other the behavior of males. The child's response to one set is to imitate or identify with, and to the other, to reciprocate in a complementary manner.

In addition to its major organizational principle, the book has several underlying themes. One of these is the nature-nurture relation in the differentiation of human gender identity/role. In their preface the authors emphasize that the traditional "either-or" approach to the nature-nurture issue is outdated. Nevertheless their own data and their descriptions of the work of others respond to the question of how important are the relatively automatic consequences of particular genotypes in the eventual realization of behavioral gender dimorphisms. For example, the child whose penis was accidentally amputated in infancy and who has been reared as a girl has an identical twin, reared of course as a boy. Continued careful observation of this tragic natural experiment will give us valuable insight into the limits of behavioral gender plasticity. Of course the phenomenon of transsexualism has already shown that gender identity can be at variance with all biological sex criteria, but we typically take this to be pathologic rather than an example of a phenotypic extreme within the genetic norm of reaction.