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and approaching its definitive links with genetic studies, especially through studies of bacteriophage. The famous "green paper" by Timoféeff-Ressovsky, Zimmer and Delbrück was published in 1933; Schlesinger pointed to the resemblance in chemical composition of phage and of chromosomes, carriers of genetic information, three years later; the Wollmans in Paris made pioneering contributions to the study of lysogeny on the eve of their obliteration in the holocaust. On home ground, Bawden and Pirie, with Bernal and Fankuchen, published their paper on the liquid-crystalline nucleoproteins of tobacco mosaic virus in 1936. Phage work itself, which was to lead to the linking of studies on viruses with work on the genetic code and the tremendous advances of molecular biology after Twort's death, was getting under way during the war, even as the bombs fell on the Brown.

Thus it seems that Twort's early and obstinate decision to work alone, not to join in "team work" of any kind, gave him an exaggeratedly blinkered outlook. He doggedly adhered to a research style which had become moribund, and refused to move beyond its turn-of-century origins with conventional microscopes and conventional culture media in Petri dishes and test tubes. Not for him electron microscopes, ultra-centrifuges, or cultures on chorio-allantoic egg membranes; and perhaps no attempts to integrate the important results of others into his own thought processes and plans for future research. Perhaps, as his son suggests, his obstinate exclusivity, his insistence on being a scientific loner, was to some extent a result of his early life and upbringing as the eldest son in a family of eleven children of a Freemason general practitioner with rigid and uncompromising views on child rearing and education. We shall never know; but the story of F. W. Twort's early promise, with notable achievements withering into a catalogue of public controversies and thwarted hopes is ultimately a sad one. His son tells it objectively, warts and all.

Among a preponderance of family photographs in the illustrations, there are glimpses of the early bacteriology laboratory at the London, with Twort and his then chief, William Bulloch; and also the laboratories at the Brown, with Twort at the microscope, and he and his assistant, later wife, busily at work at the Bunsen burner. The sad photographs of the ruined Brown in 1944, and of Twort in final retirement at home, all show him with a cigarette clamped in his mouth. The first, preliminary, report by Bradford Hill and Doll on smoking and lung cancer was published in the same year Twort died of the disease, in March 1950.

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NAOMI PFEFFER, *The stork and the syringe: a political history of reproductive medicine*, Feminist Perspectives series, Cambridge, Polity Press in association with Blackwell Publishers, 1993, pp. vii, 235, £45 (hardback 0-7456-9821-3), £12.95 (paperback 0-7456-1187-7).

Today the newspapers and the media are frequently being hit with headlines of new scientific discoveries in reproductive technology, whether it be the birth of the latest test tube baby, the manipulation of embryos, or the miracle of hormone replacement therapy in curing the ills of menopausal women. Much of this reporting is tinged with a fascination for the wonders of science and casts a vision that such discoveries, appearing out of thin air, have no history. None the less, as Naomi Pfeffer demonstrates, many of these reproductive technologies have long histories and must be seen as the culmination of particular political, economic and cultural policies, and professional interests.

Much of this book focuses on the treatment of infertility, a subject which has hitherto received very little historical attention. Indeed, the issue has been largely ignored by politicians and the medical profession as a whole. Part of this Pfeffer attributes to the wider political and economic climate throughout the century. She shows that infertility was continually accorded a minor role in state and medical policies, whether they were directed towards pronatalism, as they were in the early twentieth century, or as has been the more recent trend, towards antinatalism. Only between the mid-1930s and the end of the Second World War did infertile women receive any political and medical recognition, but this was brief and quickly extinguished when the world increasingly began to direct its attention towards the population explosion crisis and the need to curb rather than enhance fertility.

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None the less, as Pfeffer has argued, while statesmen and medical experts have continually diminished the issue of infertility, it is a problem for thousands of women and men, who have not borne their plight in silence. Throughout the century doctors' surgeries and hospitals have been filled with people desperate for a cure. In her fascinating and detailed account of the different techniques for treating infertile women and men, Pfeffer unravels a disturbing story of the ways in which these were determined by particular notions of women's and men's bodies. Treatments for women tended to be much more invasive and interventionist than those for men. Not only were there gender biases in the remedies carried out, but particular notions of the nuclear family unit and the need to preserve it at all costs also determined the types of people provided with treatment. Unmarried mothers and lesbians, for instance, were seen as undeserving of such help. Similarly, the continual lack of state sponsorship of medical services for infertile men and women, has confined such treatments to the private sector making it a service which is available only to those who can afford to pay. Even those fortunate to get such help, Pfeffer warns, were never guaranteed treatment that was effective and free of hazards.

Pfeffer's book is not only timely and invaluable for the current debates on the morality and efficacy of reproductive technology, but also provides a stimulating and provocative account for anyone interested in the wider history of the interaction between medicine, economics, politics and gender.

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ROBERT BUD, *The uses of life: a history of biotechnology*, Cambridge University Press, 1993, pp. xiii, 299, illus., £30.00, \$49.95 (0-521-38240-8).

Biotechnology is not a discipline, field, or set of practices. Rather it is a way to describe relationships between bodies and machines, between biology and engineering, and between nature and the state. In this clearly written, accessible text, Robert Bud presents the first serious historical survey of this large, complicated phenomenon. He sets forth a mildly eccentric challenge to the biotech mainstream, in which the history of biotechnology begins with Asilomar and occurs mostly in the United States and Western Europe, and proposes instead that biotechnology begins early in human history and includes efficient pig farming and lactic acid fermentation. While he is not always successful in this omnivorous reconstruction of biotechnology and its past, I admire his intent. The book is ambitious, quixotic and much needed in a field overflowing with political, economic and moral analyses of something called "biotechnology" that is usually defined as manipulating DNA. As Bud shows, the story is much larger.

He begins with seventeenth-century zymotechnology—G. E. Stahl's term for practical fermentation—and its ramifications in the development of organic chemistry, agriculture, brewing, and the biological sciences. Bud is very interested in the origins of words—particularly the origins of the word "biotechnology"—and there is a theme running through the earlier chapters about its coining (in 1919 by Hungarian agricultural engineer and pig farmer Karl Ereky) and its varied uses in different contexts. He explores the American chemurgic ("chemistry at work") movement, the rise of industrial fermentation processes in the American chemical industry, scientific and industrial microbiology, chemical engineering (penicillin); the green revolution, and so on.

Bud must expend a great deal of energy to establish that all these things going on all over the world count as a history of some single thing and it is not until his later chapters that he begins to convince. Ironically his thesis begins to make sense just at the point at which his book takes on the character of a more traditional history of biotechnology. When he begins to deal with Asilomar, recombinant DNA, the public controversy over genetic manipulation, and the commercialization of biotech in the 1980s, his pig farms fall into place and much of his eclecticism seems justified.

This is an excellent book to use in courses on the history of biotechnology, molecular biology, chemical engineering or scientific agriculture. It is not fine-grained, but grand and sometimes superficial. It does, however, tell a rousing story and raise some wonderful questions.

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