and "Scientists and Engineers in the Postwar Democracy." Topics covered include the destruction of cyclotrons, the Ishii Unit (Unit 731), scientist movements, and the establishment of the Science Council of Japan. Of particular interest to American readers will be topics such as the development of U.S.-inspired quality control in Japan, the role of U.S. advisory missions, and censorship of discussion and writing on the atomic bomb and its harmful effects.

While these topics have been discussed by others elsewhere—most notably by Keiichi Tsuneishi (a contributor to the volume and an expert on Ishii and his biological warfare unit), Bowen Dees (who worked in Japan during the Occupation), William Tsutsui (who has written on quality control), and Monica Braw (who has discussed censorship)—this volume will be very much welcomed by historians of science seeking a glimpse of recent Japanese scholarship in the field.

Although (like the Japanese original) this is more of a reference book to dip into than a sustained treatment calling for cover-to-cover reading, it is an indispensable guide for those who are interested in how Japan rebuilt its economy after the war and in the role of science, technology, and the Allied Occupation in helping to make a new Japan. The growth in the number of popular science magazines during this period, the establishment of scientist organizations, and attempts to implement a birth control program are all developments that have parallels elsewhere. This book offers scholars a chance to make useful comparisons that will, I hope, lead to a more cross-cultural history of science in the future.

MORRIS LOW

■ Sociology and Philosophy of Science

Gordon Graham. *Genes: A Philosophical Inquiry*. xii + 196 pp., bibl., index. London/New York: Routledge, 2002. $12.95 (paper).

The aim of this short treatment of genetic engineering is to bridge science, religion, ethics, and reflection on the social role of genetic science and technology: "My question is whether there is reason to think that the genetic revolution in science and technology is all that it is made out to be" (p. 20). More generally, Gordon Graham sets out to question the popular Janus-faced understanding of science and technology expressed in the contrasting icons of benevolent Einstein and evil Frankenstein. This is a worthwhile enterprise because the legal, ethical, and social implications of biotechnology cannot be assessed independently of assessing the actual scope and power of molecular biology. Unfortunately, as the author admits at the outset, his scientific understanding is limited, and the book ultimately only leads its readership from ignorance to misinformation.

Strangely, the chapter promised as an introduction to the basics of "genetic explanation" turns out to be an introduction to evolutionary biology—or, at least, to what the author takes evolutionary biology to be. Graham mistakes gene-centered versions of neo-Darwinism popularized by Richard Dawkins and Daniel Dennett for all there is to neo-Darwinism and, even worse, for all there is to evolutionary biology. Further, and more important for the aim of the book, he mistakes this extreme version of neo-Darwinism for all there is to "genetic biology." Graham either does not know about or chooses to ignore classical and molecular genetics, genomics, post-genomics, proteomics, and transcriptomics. Even within the limited range of "genetic explanations" he considers, he appears unaware of the important difference between explanatory agendas such as development, heredity, and evolution. At the end of this chapter we have learned nothing about what genes are and what they can or cannot do. Instead, we are told what neo-preformationist popular scientists such as Stephen Pinker wish genes to be, without any explanation of how actual molecules might perform the inflated functions assigned to them.

Among the glaring omissions in this picture of the current state of genetic and evolutionary biology are molecular developmental genetics and evolutionary developmental biology. These are the fields that are currently leading the way in understanding the relationship between genetics and evolution, and several excellent popular expositions of this work are available. Graham seems to believe that the only alternatives to the gene-centered neo-Darwinism he describes are creationism and the "theory of intelligent design." His discussion of the latter reveals that he does not know that irreducible complexity is likely to exist at many levels, not only the biochemical, and that this phenomenon can be tackled scientifically, via theories of complexity and self-organization. A similar problem afflicts Graham's account of naturalistic explanations of mental phenomena. Evolutionary psychology's view of naturalistic explanations of mental phenomena is only one among many—and one that has been widely and severely criticized in its attempt to reduce "nature" to genetic variation and natural selection. These and many

other things omitted in the book have been extensively discussed in Graham's home discipline, but the emergence and proliferation of a scientifically informed philosophy of biology in the past three decades seems to have passed unnoticed by our author.

Graham concludes that no new moral problems confront us with the advances of genetics and that the negative public image of genetic engineering as Frankenstein cannot be justified. His argument, like his arguments against the positive Einstein image of science and against a world devoid of theological thinking, is largely philosophical and free of actual evidence about contemporary science. In the end the author has not delivered the goods he promised, and it is hard to see who would benefit from reading this book.

KAROLA STOTZ

Russell W. Howell; W. James Bradley (Editors). *Mathematics in a Postmodern Age: A Christian Perspective*. viii + 399 pp., figs., bibl., index. Grand Rapids, Mich./Cambridge: William B. Eerdmans Publishing Company, 2001. $28, £17.99 (paper).

The authors represented in *Mathematics in a Postmodern Age,* all of whom refer to themselves as Christian teachers, have argued that the philosophy of mathematics is in the midst of a Kuhnian revolution and that for more than two thousand years mathematics has been dominated by an absolutist paradigm that views mathematics as infallible and objective truth. Postmodernist mathematicians are arguing instead that mathematics is fallible, changing, and the product of human inventiveness. Central to the ideas in the book are two mathematicians who have been placed within a wider context of God, Plato, Euclid, and Descartes, among others: the Prussian logician Gottlob Frege (1848–1925), described as the founder of modern mathematical logic; and the British philosopher of mathematics Paul Ernest (1944–), known for his work in the philosophy of mathematics education.

In their response to postmodernism, the authors have developed a model that gives God the leading role in creating and sustaining all abstract objects. In this model God is rational and the source of all possible well-formed thought and constructs: the authors assume that his ideas correspond naturally to mathematical properties, relations, and propositions. Their overriding concern is to discern whether any ideas that might spring from a Christian faith commitment can enrich their understanding of mathematics. Such an outlook poses a conundrum for the historian of science who does not subscribe to such a fundamentalist and literal view of Christianity.

While this book purports to address the historical development of mathematics over a period of a thousand years or so, the authors have made no attempt to contextualize any of their ideas or arguments and thus have not used any primary source material; moreover, they do not engage in any dialogue with other historians or address any historiographical issues whatsoever. Their work is littered with such present-minded comments as "Strange as it may seem to us today, the Greeks considered mathematics truly scientific because of its deductive methodology" (p. 138) and "It seems quite obvious and natural to those of us nurtured on Western culture that mathematics provided the ideas and tools that made real progress in science and technology" (p. 158).

Using their model, one wonders why—if God is omniscient when it comes to mathematics—he did not intervene with the clerics who placed Galileo under house arrest and banned his sun-centered theory of the universe. They also argue that mathematics is not a purely human mental construction, as "mathematics is a good gift of God" (p. 5). If this is the case, how does one explain the work of the Victorian mathematician Karl Pearson, who not only rejected all forms of religion and happily regarded himself as an agnostic at best but went on to create the foundations of the modern theory of mathematical statistics?

For historians of science or mathematics, it would have been far more interesting to explore the relationship various mathematicians had with God or some religious being and to determine whether their belief in God influenced their work. For example, someone like Florence Nightingale, who has often been described as a passionate statistician, regarded statistics "as the most important science in the world" because she maintained that "to understand God's thoughts, we must study statistics for these are the measure of His purpose." She shared with the Victorian scientist Francis Galton the idea that the statistical study of natural phenomena was the "religious duty of man" (Karl Pearson, *The Life, Letters, and Labours of Francis Galton,* Vol. 2 [Cambridge, 1924] p. 250). The issues of more interest to historians of science, such as a scholarly assessment of how religious ideas influenced the history of mathematics, are not addressed in this book, which seems best suited as an undergraduate textbook for students at a Christian college.

EILEEN MAGNELLO