ture on the history and philosophy of mathematics that focuses on the crucial years around the invention of calculus and the publication in 1687 of Isaac Newton's *Principia*. A few decades ago, historians of mathematics were more concerned with results, such as the integration of a given expression; now they pay greater attention to methods and conceptual foundations. Blay has published extensively in this area and is one of the leading scholars on the birth of analytical mechanics and especially on Pierre Varignon, the French mathematician who "translated" Newton's geometric language into the algebraic forms of differential equations.

Blay deals with several crucial episodes of the history of mathematical physics. His book's subtitle is clearly modeled on Alexandre Koyré's *From the Closed World to the Infinite Universe* (Johns Hopkins U. P., 1957), which puts the geometrization of space at stage center of the intellectual revolution of the 17th century. By contrast, Blay detects a dichotomy between, on the one hand, geometrization and its failure to deal with the infinite and, on the other hand, mathematization, namely a more abstract enterprise no longer concerned with the reality of things but only with methods, techniques, and auxiliaries of investigation. (Readers interested in the related problem of the foundations of mathematics in the years between Galileo and Leibniz will find Paolo Mancosu's, *Philosophy of Mathematics and Mathematical Practice in the Seventeenth Century* (Oxford U. P., 1996) extremely valuable.)

One of the virtues of Blay's book is its extensive quotations and careful exegeses of primary sources, such as Galileo, Descartes, Huygens, and Newton. At times, however, the author does not deal with the material in a strictly chronological fashion, and this may confuse some readers.

Historians and philosophers of mathematics, as well as physicists with an interest in the history of science, will find this book interesting and thought-provoking, but historians and scientists will probably prefer different portions of it: Scientists will enjoy the detailed analyses of the main figures of the Scientific Revolution; historians will appreciate the careful conceptual explanations and especially the novel investigations of a neglected source, namely the work by Bernard le Bovier de Fontenelle, the secretary of the French Royal Academy of Sciences. Fontenelle's *Élemens de la géométrie de l'infini* (1727) is a very important text in Blay's story, because of its attempt to deal geometrically with the infinite. Blay goes as far as to claim that "Fontenelle's work (despite certain mathematical weaknesses . . . resulting for the most part from the lack of a clear distinction between ordinal and cardinal numbers) incontestably prefigured that of Georg Cantor and his successors."

Although this conclusion seems to require further qualifications, Blay has provided an interesting and novel perspective on the history of mathematical physics.

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Introduction to Bioanalytical Sensors

Alice J. Cunningham
Wiley, New York, 1998. 418 pp. $64.95 hc ISBN 0-471-11861-3

As those of us in the baby boomer generation age and the consequences of the second law of thermodynamics make their unwelcome inroads on our bodies, we become introduced to the world of bioanalytical sensors of various sorts. Over 5% of us, for example, will at some point develop diabetes, a condition that arises when the pancreas fails to produce enough insulin to break down glucose in the bloodstream. Although insulin injections can control this condition, it is critical to regulate the amount of insulin in the body on a semidaily basis, since the body responds to insulin in a complex way. Biosensors of quite high sophistication can now perform automated analysis of a sample drop of blood, allowing patients to monitor and regulate their insulin levels and greatly improve their quality of life.

Biotechnology has also, lately, been the darling of Wall Street, and a great deal of interest has been aroused by such concepts as a lab-on-a-chip being engendered by an array of high-technology start-up companies. The hope is to both shrink the present bioanalytical lab down to a wafer-sized object and to take advantage of the new physics and chemistry that arise in these micron-sized worlds. The drop-of-blood glucose monitors are merely the tip of the iceberg in a burgeoning field of advanced biotechnology that has the potential to transform medicine in the coming years. As the physics community seeks to broaden its horizons and find applications of physics among some not-so-usual suspects, this area offers many possibilities.

Alice J. Cunningham's compact *Introduction to Bioanalytical Sensors* offers a welcome entrée to this field. Although it is concerned more with conventional biosensors than with the new micromachined devices, it covers the basic physics, chemistry, and molecular biology of the processes that must be understood by the researcher entering the field. Cunningham, an emeritus professor of chemistry at Agnes Scott College in Atlanta, has read an astonishing amount of literature on the subject and, in her book, offers compact summaries of the basic ways these devices work. She also provides an extensive bibliography to a very diverse body of literature on the subject—including journals and books with which your average physicist is probably unfamiliar.

I would hasten to add that this is not a book you would read while taking a nice long bath. It is definitely not written by a physicist, and many concepts are presented too glibly. You suspect that there is a better way to understand selective membrane filtration, for example, from a statistical-mechanics point of view, but the book's discussion is so compact that you just know you will have to get up from the tub and do some searching among the books on your study shelves. The book presents a very broad introduction to many technologies and points the reader toward the literature; the rest is up to you.

During the time I was reading this book, I was on several study committees whose members included presidents of bioanalytic sensor companies, and I asked their opinion of it. They were very pleased to see that such a comprehensive and useful survey book had been written on the subject. As I work in biotechnology, this will be a very useful reference work for me.

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Princeton University
Princeton, New Jersey

New Books

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