nial science appears to have rested, in the long run, upon scientific organizations rather than upon the specific achievements of any particular colonial scientist."

Another opportunity for some kind of sociological relevance came in discussing the shift of leadership in science from the West Indies to the mainland colonies about 1750. Stearns notes that the West Indian scientists tended to be "birds of passage" who were ill-fitted socially to promote the new science among the more settled residents of the colonies. Once again, this suggests that some analysis of the society might be most enlightening—giving us valuable insights into the relation between social structure and the advancement of science—but here, too, the discussion is entirely in terms of individual scientists and their work.

There are other examples, but to cite them would be to belabor the obvious and, perhaps, to lose sight of the genuine merit of the work when taken on its own terms. And on its own terms, it is difficult to find fault with the book. There are a few errors, but they are not substantial. As a survey of the subject, and as a beginning point for further research, *Science in the British Colonies of America* is admirable.

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New Legal Arena

Law and the Environment. A conference, Warrenton, Va., Sept. 1968. MALCOLM F. BALDWIN and JAMES K. PAGE, JR., Eds. Walker, New York, 1970. xviii, 432 pp. $15. A Conservation Foundation Publication.

No science-based issue in modern times has been more underestimated and misunderstood than what Max Nicholson has called the "environmental revolution." The subversive potential of ecology had been unperceived even by ecologists, this nascent science having been focused largely upon manageable micro problems from which the human animal was usually excluded. The rapid maturing of ecological science, the advent of computers capable of coping with its extraordinary complexities, and the emergence of a public demand upon science to lessen the obviously worsening condition of the environment have reinforced the already changing relationship of science to society. Not only were scientists among the first to perceive the specific problems that man was creating for himself in relation to his environment; they also took the lead in identifying, defining, and interpreting the macro problem of the expansion of human populations and technologies in a finite world. The "environmental revolution" was not intentionally perpetrated by scientists, nor have all scientists been a part of it; there can still be found dissenting voices questioning the reality of an environmental crisis. Nevertheless, a Pandora's box of public issues has been opened not only for North America and Western Europe but, through international action, for the world as a whole.

It rapidly becomes obvious to anyone who examines the evidence that science-based policies governing man's behavior in relation to his environment imply far-reaching changes in social, economic, and political thought; and these changes further imply equally drastic changes in social, economic, and political institutions. But institutional structure and behavior are legitimatized and in various ways constrained and guided through law. For example, the effects of biomedical knowledge and technique upon legal prescriptions and procedures are widely recognized The impact of the environmental quality movement and of environmental science and technology upon law is now a matter of common knowledge. Newly developing public-interest law firms have had a strongly environmentalist orientation. Environmental law groups have organized in a large number of law schools around the country, a National Environmental Law Society has been established, two environmental law reporter services are now being provided, a large number of articles and several major symposiums have appeared in law journals, and environmental law is becoming a standard course offering in law school curricula.

The Conference on Law and the Environment, which resulted in the book under review, marked the initiation of an active role for law in the environmental quality movement. Recognizing the novel implications of the emerging politics of the environment, the conference undertook to analyze the legal problems that this movement would produce, such problems, for example, as citizen-initiated environmental law suits and the concept of environmental rights, and such basic changes in the law as were subsequently embodied in the National Environmental Policy Act of 1969. Ancillary to this purpose, the conference was intended to alert lawyers to the implications of the environmental movement, to explore theories that might be helpful in connection with environmental litigation, and to identify the kind of help needed to prepare lawyers for greater effectiveness in this field.

The resulting volume has three major divisions, dealing respectively with problems of litigation, needed developments in the law, and opportunities and mechanisms to meet the needs. A bibliography of reference works, government documents, and law review articles is appended, and it has the very great advantage of being accompanied by a finding index organized by topic. For the person not professionally concerned with law school curricula or with litigation, the articles of greatest interest would, in most cases, be those dealing with broader matters of public policy. Among these is the opening article by Malcolm F. Baldwin, a comprehensive case study of the Santa Barbara oil spill, with emphasis upon the political and legal aspects of that ecocatastrophe. Three other contributions of broad public interest are "Standing to sue in conservation suits" by Louis L. Jaffe, "The right to a decent environment: Progress along a constitutional avenue" by E. F. Roberts, and "The role of government in environmental conflict," by Harold P. Green.

An innovative consequence of the environment movement may well be a hybridization of scientific and legal training, comparable in the environmental field to what forensic medicine has been in the area of law and the biomedical sciences. In recent years a slowdown in the growth of opportunities for research, development, and teaching in the physical sciences together with an "urge to relevance" has led numbers of physical science graduates to seek outlets for their skills in environmental research and planning. Environmental law may well offer a valuable collateral field of competence. For a person whose interests may move in this direction, section 3 of the book would be especially useful. A. Dan Tarlock surveys "Current trends in the development of an environmental curriculum," James N. Corbridge, Jr.,

describes "An interdisciplinary program for law students in the environmental field" offered at the University of Colorado, in which law students were exposed to a variety of problems and programs of science-based state and federal governmental agencies, and Charles H. W. Foster outlines in "Counsel for the concerned" some of the specific possibilities and opportunities open to persons who wish to enter the field of environmental law.

This is a landmark volume and will be a much used contribution to the literature for some time to come. Because it has to do with novel and dynamic developments, the specific doctrines and propositions with which it deals are certain to be affected by social and legislative change, and users of the volume seeking information on the current state of environmental law will need to update its contents by reference to more recent sources, notably in the environmental law reporters and in the law journals. But the benchmark value of this volume will not be impaired, and it will be a long time before anyone seriously concerned with law and the environment can afford to be unacquainted with it.

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Mathematician

Carl Friedrich Gauss. A Biography. TORD HALL. Translated from the Swedish edition by Albert Froderberg. M.I.T. Press, Cambridge, Mass., 1970. xii, 176 pp., illus. $7.95.

Carl Friedrich Gauss is usually described in superlatives. He is "the prince of mathematicians," and is ranked with Archimedes and Newton as one of the greatest mathematicians of all time. His contributions to mathematics and physics range from number theory to telegraphy, from differential geometry to the calculation of planetary orbits. Yet though there are abundant materials—collected works, letters, notebooks containing unpublished discoveries, detailed scholarly studies of many aspects of his work—no mathematical biography of Gauss has ever been written.

Tord Hall's biography is a more modest undertaking. He answers two questions: "What sort of man was Gauss?" and "What sort of mathematics do we owe to Gauss?" The book can best be described as a modern popularization of some important topics in mathematics and physics that were greatly advanced by Gauss: prime numbers, congruences and quadratic reciprocity, construction of the regular 17-sided polygon, the method of least squares, the Gauss-Weber telegraph, triangulation, differential geometry and curvature, non-Euclidean geometry, complex numbers, and elliptic functions. The account is interwoven with biographical data, and the topics are presented in the order in which Gauss took them up. In the brief last chapter, "Personal facts about Gauss," Hall has given us a nice picture of Gauss the man, including his aversion to teaching, his conservatism in politics, his views on religion, his attitude toward his children, his loneliness, and above all his love for the beauty of mathematics. There is no ground-breaking historical research here, but Hall makes some interesting nontechnical generalizations about Gauss's work.

The popularization of the mathematics is generally good, especially on the geometrical topics. But sometimes, though the mathematical problem is easily stated, no quick popular explanation of the solution is possible. Hall may leave the nonmathematical reader wondering, among other things, Where does the logarithm come from in the number of primes less than a given number n? How could one possibly prove the fundamental theorem of algebra?

Though Hall spends much time explaining the mathematics, he has chosen not to explain in any detail how Gauss himself approached the problems. In particular, no Gaussian proofs are reproduced. For a detailed account of Gauss's mathematics, its influence on his contemporaries and successors, and its relationship to the mathematics of earlier periods, the reader must turn elsewhere: to histories of mathematics, to detailed studies of particular works, or to Gauss's works themselves. But Gauss's works are notoriously difficult; the *Disquisitiones Arithmeticae* has been called "that book with the seven seals."

There are some errors in the historical remarks Hall does make. For instance, he implies that "There is one and only one parallel to a given line through a given outside point" is the famous Fifth Postulate of Euclid's *Elements*; it is a later equivalent. He believes that Newton and Gauss mean Euclid, rather than Archimedes, when they speak of the "rigor of antiquity." Finally, there are no footnotes, and the bibliography is brief and unselective.

For a nonmathematician, whether student or scientist, who wants a modernized, elementary account of some major topics in classical mathematics, Hall's book is not a bad source. The reader will at the same time get a feeling for Gauss as a human being. But we still await a major mathematical biography of the prince of mathematicians.

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Population Genetics

An Introduction to Population Genetics Theory. JAMES F. CROW and MOTOO KIMURA. Harper and Row, New York, 1970. xvi, 592 pp., illus. $13.95.

The genetic state of a population is determined by the genotypes of its members, their relative frequencies, and their values. Accordingly, the central concerns of population genetics are with the forces responsible for change (or stability) of genotype frequencies, expected rates of change, and the concurrent effects on the average genotypic values and genetic variances of populations. These, and many relevant ramifications, are the things about which Crow and Kimura have written. Their book is, as its title indicates, devoted to theory, primarily theory tailored to diploid organisms and populations subject only to natural selection. It is modestly labeled an introduction. Far less would have qualified as an introduction; it is not exhaustive, but it is a very thorough introduction, and on several subjects (among them inbreeding, Fisher's fundamental theorem of natural selection, and gene frequency drift in finite populations) the treatment is far better described as sophisticated than as introductory.

Attention is directed first to genotype frequencies as functions of gene frequencies, mating system (random, assortative, and consanguineous), and interlocus correlations in gametic allele content (amount of linkage disequilibrium). This done, the focus is shifted to the joint effects of selection, mutation, drift, and migration on gene frequencies. Changes in genotype frequencies arising from changes in mating system or gene frequency are trans-