feet and exited in the feces; thus control depended as much on preventive measures—the wearing of shoes and the use of well-constructed privies—as on curative therapy, an inexpensive form of which had become available in the 1880's.

In 1909 John D. Rockefeller and his advisers created a Sanitary Commission for the Eradication of Hookworm Disease and endowed it with one million dollars. During its five-year history the Commission failed to eliminate hookworm infection in the South, but it nevertheless succeeded in alerting the region to the hookworm problem, in treating nearly 700,000 infected persons, and in infusing vitality into the public-health movement in the South. By the 1930's, thanks in large part to the efforts of the Commission, the incidence of hookworm in the South had declined by two-thirds.

In this splendidly written book, which has already won the Allan Nevins Prize of the Society of American Historians, John Ettling draws on the rich (and recently opened) records of the Rockefeller Sanitary Commission to tell the story of the war against the hookworm. The first half of his book sets the stage for the Commission by focusing on the careers of two men: Charles Wardell Stiles, a government parasitologist, described as "the John the Baptist of the hookworm work" (p. 111), who labored for years to convince skeptical southerners of the dangers of hookworm infection; and Frederick T. Gates, a former Baptist minister who climbed to the top of the Rockefeller philanthropic empire and who played a pivotal role in its anti-hookworm campaign. The second half of the book is devoted to the medical and educational activities of the Sanitary Commission, headed by Wickliffe Rose, dean of George Peabody College in Nashville. Although administered and staffed by southerners, the Commission initially encountered stiff opposition, in part because of Rockefeller's unsavory reputation. According to one of the Commission's investigators, some southerners thought that "Mr. Rockefeller was preparing to go into the shoe business and had financed the hookworm campaign as a preliminary move to scare the people of the South into wearing shoes at all times and not in the winter season alone" (p. 130). By the end of its brief life, however, the Commission had won over all but its most jaundiced critics.

In a much-discussed book entitled *Rockefeller Medicine Men* E. Richard Brown has recently argued that the Rockefellers and Gates sponsored the anti-hookworm crusade primarily because of their interest in increasing the productivity of southern workers (even though they owned no southern mills). Without denying the possible influence of economic motives, Ettling stresses instead the religious roots of the Sanitary Commission. He not only likens the county hookworm dispensaries to southern tent revivals and describes hookworm as the medical equivalent of sin but maintains that Gates and his associates tried to exterminate the hookworm for basically religious reasons. "One of the important things that a study of the Sanitary Commission demonstrates," he says, "is that their instincts were overwhelmingly religious—specifically evangelical" (p. 223). Although I find Ettling's interpretation far more persuasive and better documented than Brown's, it is only fair to note that his case for the evangelical origins of the Sanitary Commission rests disproportionately on the testimony of one person, Gates, and that his evidence, drawn "from the oftentimes unconscious attitudes and assumptions expressed in the memoirs and correspondence of the Foundation's architects" (p. 223), may be less coercive than he implies.

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Nineteenth-Century Shifts

Epistemological and Social Problems of the Sciences in the Early Nineteenth Century. Papers from a conference, Bielefeld, Germany, Nov. 1979. H. N. JAHNKE and M. OTTE, Eds. Reidel, Boston, 1981 (distributor, Kluwer Boston, Hingham, Mass.). xii, 430 pp. $31.50.

This volume contains papers presented at a workshop held under the auspices of the University of Bielefeld's Institut für Didaktik der Mathematik. The title is both narrower and wider than the content: most of the book is about Prussian institutions or about mathematics, and a few contributions have no redeeming social (or epistemological) value.

The editors have arranged the papers under three heads: Science around 1800: Cognitive and Social Change; Science and Education; and Mathematics in the Early 19th Century. Many of the papers in the first part, and the editors' introduction, either have too much jargon and abstraction to be easily interpretable, or, like the essays by S. R. Mikulinsky and B. M. Kedrov on Russian and European science, are too general to relate directly to the declared theme of the workshop. An exception is Steven Turner's brief statement of a thesis he has worked out elsewhere: in Prussia the basis of learning and reputation for learning shifted from professional training (of doctors, lawyers, and ministers) in the late 18th century to the Wissenschaften of the arts faculty and the passing of required examinations in the middle of the 19th. The shift brought an emphasis on professorial research and the modern conception of the privileges and duties of a university instructor. Another exception is M. Heidelberger's claim that in practice little but rhetoric separated Naturphilosophen from straighter physicists around 1820 and that both were confounded and superseded by the methods of French mathematical physics, as represented in Germany by G. S. Ohm. Heidelberger's observation is a useful corrective to the usual exaggeration of the distance between the two sets of physicists.

There are several valuable papers on the social circumstances of mathematics and allied studies: D. K. Müller on effects of Prussian school reforms around 1800; B. Rang-Dudzik on curricular changes in Prussian grammar schools; W. Langsheimer on the organization of mathematics at the University of Halle-Wittenberg; G. Schubring on the frustrated plans for a polytechnic in Berlin, 1817–1850; and H. Mehrtens on the backgrounds of German mathematicians in the Napoleonic era. All, and Langsheimer and Rang-Dudzik especially, stress slips between theory and practice, between reform measures and their effects, between perceptions of innovators and of conservatives. The delusion of one reformer, that every human being "who is not completely demoralized by nature" likes mathematics, does not appear to exist in our enlightened age. Several matters are treated quantitatively, for example, the slow move from the 18th-century secondary school, which gave students considerable latitude in determining their programs, to the mid-19th-century gymnasium, which offered a fixed curriculum (Rang-Dudzik); and the changing emphasis on mathematics in the latter dispensation, from one hour to every four of classical languages between 1825 and 1840, to 1:2.3 in the '40's and 1:4.9 in the '50's (Schubring).

A favorite theme in the mathematics papers is the cause of concern with mathematical rigor around 1800. J. Grabiner thinks that increased teaching obligations forced mathematicians to worry about logical coherence; W. Schorlau argues that perception of previously unobserved connections between different

branches of mathematics aroused interest in their fundamental interconnections and principles; and Mehrtens believes that mathematicians had to secure their foundations in order to legitimize their subject for its part in *Allgemeinbildung*. We have a choice among, or a synthesis of, institutional, intellectual, and social explanations.

The contributors were not well served by their editors and publisher. The press reproduced the papers from typescript with little or no editorial intervention. The English of some German contributors is poor, and pompous claptrap abounds. An American professor writes: "The University of Berlin, founded in 1810, was relatively new when compared with older German universities, which traced their origins back to the Middle Ages."

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Inland Fishes

Fishes in North American Deserts. Papers from a symposium, Fort Worth, Texas, June 1980. ROBERT J. NAIMAN and DAVID L. SOLTZ, Eds. Wiley-Interscience, New York, 1981. xii, 552 pp., illus. $42.50.

"Desert fishes" may sound incongruous, but lying within the vast stretches of arid lands in the American Southwest are small, often ephemeral bodies of water, islands in a sea of sand and rock. The vertebrate inhabitants of these waters are primarily teleost fishes, the few remnants of a diverse Neogene-Pleistocene ichthyofauna. Interest in these fishes from an evolutionary perspective and the realization that the entire fauna is threatened with extinction have resulted in a great increase in attention from many quarters. In 1980, in concert with the American Society of Ichthyologists and Herpetologists, the editors organized a symposium to summarize the state of knowledge of American desert fishes. The chapters in the book fall into four major conceptual areas: the history of the geological areas and their faunas, ecology, desert fishes as models for the study of evolution, and conservation. The reader comes away from the book with increased conviction of the worth not just of the fishes but of the ecosystems, in economic, scientific, and aesthetic terms.

The history of these desert areas and of the fishes is summarized by M. L. Smith and R. R. Miller. The latter author presents a useful and detailed summary of the paleohydrology of southwestern deserts and of the history of the pupfishes, *Cyprinodon*. Aquatic ecology is dealt with by G. R. Smith, G. A. Cole, and R. J. Naiman. These papers describe many of the factors that make up the unique desert environment, including aquatic chemistry, thermal conditions, flow characteristics, and habitat size.

A large portion of the book is devoted to desert fishes as models for evolutionary study. Taken together these papers show that relatively little in the way of trenchant adaptation to the desert environment has occurred. The contributions of G. D. Constantz (life histories), A. Kodric-Brown (facultative changes in reproductive behavior), S. D. Gerking (stress responses in reproductive behavior), D. L. Soltz and M. F. Hirshfield (lack of differentiation in structural genes), C. R. Feldmeth (temperature tolerance), and S. D. Hillyard (energy metabolism and osmoregulation) show that the living fishes have survived by virtue of facultative behavioral and physiological adjustments. Fishes endowed by their ancestors with the appropriate tolerant constitution and the luck to be in permanent water have survived; fishes less well endowed or less lucky have failed.

Conservation is the dominant theme of authors E. P. Pister and J. D. Williams. Pister discusses the formation and role of the Desert Fishes Council, illustrating how concerned academics, government employees, and citizens can be effective in molding public policy and perceptions about conservation. Williams explains the ins and outs of the federal programs concerned with endangered species, although in the light of recent developments it remains to be seen how much of this protective structure will survive. A. A. Schoenherr discusses the effects of introduced exotic fishes on native desert fishes; he concludes that, contrary to popular opinion, exotics often eliminate native species not by competition for food resources but by predation and disruptive social interactions. R. J. Behnke's plea for the maintenance of genetic diversity is eloquent and should be read by fisheries biologists responsible for resource management.

This book has both the strengths and weaknesses of a symposium volume—experts discussing what they know best but with some unevenness in perception and writing ability. Some contributions are of highest quality, and a few could have been more tightly edited, shortened, or questioned with respect to fundamental assumptions. Nevertheless, as a summary of our immature but growing knowledge of desert fishes, the book deserves serious consideration.

Potential buyers should know that the book was apparently prepared on a word-processor and photo-offset and it does not have the look of a book this expensive. The book is available through the American Fisheries Society at a $7.50 discount.

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Chemical Senses

Biochemistry of Taste and Olfaction. Papers from a symposium, Philadelphia, Apr. 1980. ROBERT H. CAGAN and MORLEY R. KARE, Eds. Academic Press, New York, 1981. xxiv, 540 pp., illus. $38.50. Nutrition Foundation Monograph Series.

Despite the inherently chemical nature of gustation and olfaction, biochemists have avoided the study of these processes, preferring simpler systems where methods are well established and background literature is plentiful. However, with the development of modern analytical techniques, the mushrooming of literature in the neurosciences, and an increasing interest in nutrition and the palatability of foods, some biochemists and biochemically oriented investigators have begun serious research on taste and smell. In *Biochemistry of Taste and Olfaction*, a collection of papers from a symposium, investigators both present work from their own laboratories and review the relevant literature.

The first and second sections of the book deal with the receptor mechanisms of olfaction (six chapters) and taste (four chapters). Here, the term "receptor mechanisms" is somewhat confusing until one realizes that it is the receptor membrane, not the receptor cell, that is being discussed. The book begins with a well-developed paper by Gower, Hancock, and Bannister on the biochemistry of pig pheromones. The paper raises the possibility that androst-16-enes, or similar compounds, are involved in human social interactions. For example, it has been reported that the menstrual cycles of close female friends or of women living in residence halls become synchronized after a time, probably due to odor cues. In chapters 5 and 6, the major histocompatibility complex is treated with respect to its olfactory role. This is a special case of discrimination between