scholarship in the history of medicine so that the status and respectability of the subject as an academic discipline may be more widely appreciated and more firmly established."

The historiography of ideas, so much talked about in recent years, has been a part of the history of medicine since ancient days, as Owsei Temkin shows in the first chapter. In times of rapid scientific advance in medicine most physicians prefer to look ahead rather than back; but it is just in such times that farseeing men realize the need for history. And at all times, as Temkin summarizes, "asking why others thought as they did challenges us to ask why we think as we do."

While "new ways" in the history of medicine may now indeed be stirring, the publication of this book being one indication, Charles Rosenberg in his chapter charges that much of medical history has consisted of studies of medical men in medical institutions, with an emphasis on the anecdotal, at the expense of a systematic consideration of such subjects as patient care. Rosenberg is correct, I believe, in pointing to studies of the provision of medical care and to the profession as an institution as topics that need to be explored. Yet neither he nor any of the other contributors saw fit to call the attention of readers to an increasingly important body of medical-sociological literature dealing extensively with the "role" of physicians and other medical personnel. What is more, such sociologists as David Mechanic and Eliot Freidson have used the historical approach in their analyses.

In one of the most provocative chapters, R. S. Roberts deals with the use of evidence by medical historians. It is true, as Roberts claims, that much of the evidence assembled in the past tends to "fossilize" much medical history as written today. Particularly appropriate is his calling our attention to the importance of philosophical assumptions of previous writers. Charles Creighton, who continues to serve as an authority on epidemic diseases in Great Britain, wrote in the 1890's and was an implacable foe of the germ theory. Roberts's stricture is an important one: "Many who use Creighton today proceed upon the assumption that his erroneous theories on the causation of disease can simply be separated out from his work. . . . What is not realized is that the facts themselves have in the first place emerged from a process of selection, whether conscious or not, designed to prove Creighton's theories."

The field of paleopathology, experiencing a resurgence in recent years, is well handled in two chapters by Don Brothwell and E. R. Kerley. New techniques and new approaches to the study of disease in the past, as applied by paleopathologists and paleoepidemiologists, have done much to revive and extend the work of Moodie, Hrdlička, and Horton earlier in this century.

Another new trend in historical studies, the demographic approach, receives only one chapter. Thomas McKeown ably summarizes recent studies and work that remains to be done. Here is an area in which much has been written by our historical colleagues, an area, furthermore, where medical historians can play an important role. Further development of the subject would have been welcome.

The relationship between the history of medicine and the history of science is brought up in several chapters, most specifically by Marie Boas Hall. The history of science has in recent years experienced a remarkable increase in vigor, especially measured in terms of university positions and numbers of graduate students. Much of what once was in the domain of medical history, such as anatomy and physiology, is now being very ably pursued by historians of science. These subjects were formerly in the province of the history of medicine, partly no doubt because the history of science had not yet begun to flourish and because most physiologists and anatomists interested in the history of their field had received medical training, hence considered themselves "medical" men. It is of interest that of the 20 contributors to this volume, only eight have medical degrees.

To define the boundaries of medical history is at once important and treacherous. Edwin Clarke, in one of the four chapters he wrote or coauthored, addresses himself to that problem. His answer is broad enough that it should find fairly wide agreement: "Medical history proper should be compounded of all the scientific and social aspects of human health and disease. It can be thought of as fundamentally the history of the medical sciences and of the history of medicine in society." What about the behavioral sciences? I suppose the recent appearance of an entire volume devoted to methods in the history of psychiatry justifies its omission from this book.

Saul Benison, an expert in oral history, contributes an interesting chapter describing the way he goes about using this age-old method with modern electronic equipment. Painstaking research is as necessary for the oral historian as for his colleague using other methods of data gathering. Benison allows between 20 and 30 hours of research for each hour of interview, and recommends that the oral historian generally should collect no more than 125 hours of interview in any year.

There are other interesting chapters in this book, and because I believe it is a useful one I am sorry to end the review on a negative note. This is not an overly large book. It contains some tables, maps, and diagrams, all of which are necessary to the text, and four pages of photomicrographs, which are not. The price in English bookstores is in the vicinity of $13.20, high for students, but in view of today's book prices within reason, I suppose. I believe the price set by the American distributor is outrageously high and goes counter to the aims and labors of Clarke and his contributors. The references, the subject matter, the discussions, all should be made readily available to students with an interest in the history of the life sciences; but we will be forced to buy the book abroad.

GERT H. BRIEGER
Duke University Medical Center, Durham, North Carolina

A Chapter in Medical History

A History of Poliomyelitis. JOHN R. PAUL. Yale University Press, New Haven, Conn., 1971. xx, 486 pp., illus. $15. Yale Studies in the History of Science and Medicine.

Poliomyelitis is probably as old as man himself, yet it may be considered a "recent" disease since it was a rare medical curiosity until a mere century and a half ago. No substantial epidemics occurred before the end of the 19th century, and most of its known history is confined to the 20th. Seldom has it been possible for an individual to write the complete story of an important episode in the medical history of man most of which took place during his lifetime and in which he played an active role and knew personally most of the other principal actors. John R. Paul was able to do this, and he has produced an authoritative, intensely personal, and highly readable account. Shortly after the publication of this book Paul died, at the age of 77, but he had lived to

see "polio" almost completely eliminated from the United States and most other developed nations, and a vaccine made available which would permit its worldwide eradication.

Poliomyelitis as a mass disease phenomenon in large populations appears to pass through three—or perhaps four—major phases, with the inevitability of a biological law. Polio is first found as a rare and sporadic endemic disease in any premodern society where the virus is present; it remains such for as long as the level of sanitation and personal hygiene is low enough to assure intense and continuous fecal contamination of the environment, requiring only a population large enough to permit uninterrupted transmission. In the second phase of its evolution, epidemics of infantile paralysis make their appearance, becoming more extensive as environmental improvement continues and as the disease gradually enters its next stage. In the third phase, intermittent epidemics continue, but progressively greater proportions of older children and adults are involved, and the more severe "bulbar" and encephalitic cases become more frequent. The fourth phase was never quite attained naturally but suggested itself as a possibility; poliomyelitis would have disappeared as an endemic disease in highly sanitated societies. Scientific understanding and technical skill preceded such a level of cultural development, however, and polio was eliminated instead by prophylactic immunization.

The explanation of this evolution, and of the apparent exceptions to it, required a knowledge of the virology, immunology, pathogenesis, and epidemiology of this disease, and this knowledge, the gathering of which is the subject of Paul's book, was prerequisite to its control.

Poliomyelitis is an infrequent result of infection with one of the three poliovirus types. After ingestion by a person not immune to the serotype, the virus establishes asymptomatic infection in the intestinal tract that may last many weeks, with fecal excretion in high titer. Most strains are nonpathogenic, however, and infection usually terminates spontaneously with the development of solid, long-lasting immunity. In a small proportion of infections, the virus enters the bloodstream and secondary foci of multiplication may be established in certain lymphatic and neuronal tissues, accompanied by general constitutional symptoms. Depending upon the number and location of motor neurons that are affected and destroyed, transient or permanent paralyses result, and death may occur if vital respiratory or circulatory centers are severely damaged. Permanent paralysis results, generally, from no more than one in a hundred infections, and is even less likely following infection with strains of lesser pathogenicity. All three poliovirus types have the same epidemiologic characteristics and similar paralytogenic potential; the proportion of pathogenic strains is greatest within type 1, however, explaining the greater frequency of its isolation from clinical cases. Man alone plays natural host to these comparatively resistant viruses, and person-to-person transmission is the most frequent mechanism of dissemination, although flies may be passive carriers and common-source outbreaks have been traced to food and water contamination.

With little more than these facts, the evolutionary stages of poliomyelitis become understandable. In the endemic phase, intense fecal contamination assures infection at a very early age, often under cover of transplacentally acquired maternal antibodies—which are virtually assured because all mothers have been repeatedly exposed. Babies so infected are at little risk of disease but become immune for life. Only rarely does unusually delayed infection combine with unusual viral pathogenicity and unusual individual sensitivity to produce the sporadic case of paralysis. The endemic man-virus balance is disturbed when, with modest improvements in environmental sanitation, the intensity of fecal contamination is relieved and transmission is delayed. Gradually, the number of susceptible children increases and an epidemic potential is established. Waves of infection pass through communities. Most often these go unnoticed, because nonpathogenic virus strains are involved. Occasionally, however, a pathogenic strain is introduced, an epidemic of infantile paralysis occurs, and phase 2 is upon us. Phase 3 is ushered in gradually, as infection is delayed longer and longer with further environmental cleanup. Older age groups are affected, and cases are often more severe because of the as-yet-unexplained localization of secondary virus multiplication in more vital neuronal centers among older people. Phase 4 has never happened, but the prevalence of nonimmune older individuals in some social groups in otherwise endemic areas suggests that the disease might have disappeared spontaneously in a thoroughly scrubbed civilization.

Exceptions to general rules often provide critical clues for epidemiological understanding. In small, isolated communities, as of Eskimos and on some Pacific islands, transmission cannot be sustained indefinitely because there are too few susceptibles available. When infection is introduced into such unimmunized societies, explosive outbreaks affecting all age groups occur. Sometimes, cruelly fascinating incidence patterns appear, with numerous cases among all ages up to some sharp limit, which defines the years elapsed since the last introduction of the same poliovirus type.

In this book, the author carries us through the long and often painful story of the accumulation of this knowledge, and of much more, and introduces us to the men and women who labored to acquire it. Although it ends on a justifiably triumphant note, this is no simple, maudlin history of success. The false trails, the mistakes of interpretation and judgment, the sometimes bitter competition, the exploitation of science by publicity seekers, the tragedies resulting from error or haste—they are all here, told in frank, intimate, occasionally almost gossipy style. But all does end well, effective vaccines were developed despite nature's and man's obstacles, and poliomyelitis has all but disappeared from many countries of the world. The job is not finished, however, for in others infantile paralysis is just emerging.

HENRY M. GELFAND
6911 Strata Street,
McLean, Virginia

Aromatic Amine Oxides

Chemistry of the Heterocyclic N-Oxides. A. R. KATRITZKY and J. M. LAGOWSKI. Academic Press, New York, 1971. xii, 488 pp., illus. $28.50. Organic Chemistry series.

Although the first heterocyclic *N*-oxides were prepared a century ago, relatively little interest developed in these compounds, with the exception of the work of Meisenheimer and Bobranski, until the classic studies of Eiji Ochiai and his students in Japan in the early 1940's. Owing to the lack of communication and inadequate abstracting during the years of World War II and for some time thereafter,