Book Reviews

American Medicine

The Healers. The Rise of the Medical Establishment. JOHN DUFFY. McGraw-Hill, New York, 1976. x, 386 pp. $12.50.

If case history be indispensable to the diagnosis of a patient's condition, so should the history of a profession be essential to the evaluation of its status. John Duffy serves well the needs of our generation with his straightforward, factual, readable account of the healing profession in America, from the Indian shaman the European explorers encountered to today's highly trained physician specialist beset by ethical dilemmas.

Duffy, who teaches history at the University of Maryland, now holds the presidency of the American Association of the History of Medicine. His prolific scholarship includes a study of colonial epidemics and histories of medicine in Louisiana and of public health in New York City. His new summary relies on his own researches and on recent scholarship in what is a lively field, contributed to by social historians concerned with health (like Duffy himself) and by physicians concerned with history.

The adventures of the medical profession in America are set in a rich context of broader trends relating to disease and destiny, both American and European: epidemics; wars; attitudes toward class and race, toward sex and section; changes in education, urbanization, and philanthropy; innovations in theoretical and applied science. Duffy strives to explain causes for the major changes in the developments he chronicles, and he clarifies and enlivens his broad patterns with accounts of specific incidents, quotations, and biographical vignettes. While taking no doctrinaire stance, Duffy does not eschew judgment.

Probably believing that the more remote the events, the greater the emphasis needed to bring enlightenment to the reader, Duffy devotes more space to earlier than to recent times. Two-thirds of his pages go into describing events up to the end of the Civil War. Thus the degree of compression must be greater in telling of the significant developments, beginning in the 1890's, that ushered in modern medicine and of its flowering and its problems in the 20th century. Despite these space strictures, which Duffy acknowledges occasionally, the key patterns of our century emerge clearly.

And it is in the third of the book concerned with the last century that Duffy's most novel interpretations are to be found. From the pages of medical journals Duffy makes it clear that the elimination of the shoddy proprietary schools that had burgeoned in the late 19th century, even after the bacteriological revolution, and the tightening of licensure procedures owed as much to economic and class motivations as to advancing science: "Virtue and self-interest went hand in hand" (p. 299). Reducing competition as well as raising standards helped along the campaign that cut the 151 medical schools of 1900 to 66 in 1930. Physicians of the latter date were much better trained than was the average doctor at the turn of the century. They were also soon to be much wealthier—the M.D. affluence boom, Duffy says, began in the late '30's. Already physicians were more conservative, less willing to undertake the kind of innovative leadership roles in the interest of the public health that their 19th-century predecessors had played.

The medical profession, as of 1930, enhanced in prestige and shrunken in numbers, contained fewer women doctors than in earlier days. Reflecting recent societal concerns, Duffy places emphasis on the theme of minorities in medicine. "The United States has the distinction of giving the first medical degree to a woman, yet, far more than most countries, it has continually discriminated against females in medicine" (p. 270). In 1850 Harvard accepted a woman, who, confronted by a student protest riot, withdrew her application; the Harvard Medical School next opened its doors to women in 1945. Sectarian schools gave women their first opportunity to enter the profession. With the reduction of schools, women's chances declined, a trend significantly reversed only within the last decade.

Duffy also provides a sobering account of discrimination against Jews and blacks. The account of black physicians meshes with Duffy's consideration of Southern medicine as a special and different historical case within the national picture.

Another major theme in the last part of the book is the rising presence of the federal government in health research, education, and care, a trend supported in some ways but bitterly fought in others by the organized medical profession. This and many other complexities of the current health scene are illumined by the historical perspective provided in Duffy's commendable account.

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Last Years at Cambridge

The Mathematical Papers of Isaac Newton. Vol. 7, 1691–1695. D. T. WHITESIDE, Ed. Cambridge University Press, New York, 1976. xlviii, 706 pp., illus. $95.

The seventh and penultimate volume of Whiteside's magnificent edition—what more can one add to its praise?—covers Newton's last four years at Cambridge, ending with his appointment in April 1696 as Warden of the Mint. The papers presented, together with Whiteside's enlightening introductions to them, reveal a man casting about in the shadow of his incomparable *Principia* (1687) for a worthy sequel but unable to bring any of his mathematical efforts to fruition, or at least to what he considered fruition. Neither the imagination nor the stimulus was lacking. Although much of the material is elaboration of fundamental results achieved earlier, here and there brilliant originality flashes forth and testifies to Newton's continued creativity. Moreover, Newton knew of investigations along similar lines going on in Europe; what he did not read himself of Leibniz, the Bernoullis, and others he heard about from friends. Closer to home, David Gregory had already published as his own a method of quadrature taken from Newton via John Craige. Recognition and priority were slipping away, and only resolute steps toward publication might save them.

Yet, although Newton wrote, indeed wrote extensively, he did not publish. Bold in thought, he remained hesitant in act. Even if still unexplained, the hesitation comes as no surprise to those who know from I. B. Cohen's *Introduction to Newton's 'Principia'* (Harvard Universi-

ty Press, 1972) the tortuous path to a second edition of the magnum opus.

Nor will it seem strange to the even greater number of people who know of Newton's mysterious "breakdown" in 1693. The papers in volume 7 shed no light on what happened in that "black year," but they do make clear that it had no lasting effect on his powers of thought. As Whiteside puts it,

> In Newton's scientific papers and correspondence of the early 1690's we may trace a slow but accelerating decrease in his elasticity to absorb fresh findings and his hitherto matchless capacity to attack novel problems and evolve new techniques of solution. . . . But this is the inevitable relentless attrition of old age, not the sudden and permanent debility of a mental storm or physical breakdown in health in the summer of that year [p. xxiii].

Three topics dominated Newton's mathematical work in the early 1690's. First, spurred by Gregory's plagiarism and by John Wallis's request for something on the subject to include in his *Algebra* (1693), Newton worked out a draft and final revision of his *De quadratura curvarum* (not published until 1704, as an appendix to the *Opticks*). To a limited theorem communicated to Leibniz in 1676 and to earlier work on the quadrature of curves given by trinomial equations, Newton now added general methods for moving from fluxional expressions to their fluents, both directly and via infinite series, and for applying fluxions to curvilinear motion and central forces. To the revise he also added for the first time his "pricked," or dot, notation for fluxions. During the later priority dispute with Leibniz, however, he ignored this notational evidence of the time at which his treatise had taken shape, placing in the mid-'70's what had seen light only in the early '90's.

As early as 1691 Newton had intended to make his *Quadrature of Curves* the second half of a bipartite treatise on the "Geometry of the Ancients and of Quadrature." Part 2 of the present volume contains the several versions of the first half. In them Newton attempted a reconstruction of the geometrical analysis of the Greeks, for which, following tradition, he took book VII of Pappus of Alexandria's *Mathematical Collection* as the starting point, dubbing it the "treasury of analysis" (*penus analytica*). The result is striking for two reasons: first, in his reconstruction of Euclid's *Porisms* Newton showed himself the equal of any of the creators of projective geometry in the 17th century; second, despite his talents and his professed preference for classical, "pure" geometry, his discussion begins with references to equations and ends with the algebraic quadrature of curves. In short, Newton wrestled briefly with past canons and then abandoned the struggle. One may question whether he had any feeling of defeat:

> As he slips into this accustomed role of modern innovator once more one can sense Newton's relief at relinquishing the frock of classical expositor and interpreter, relentlessly stressing—and overstressing—the superiority of the ancient polished syntheses over the cruder 'algebraic' resolutions of more recent Cartesian geometry [pp. 193–194].

Here, in particular, the original papers will surely help to undo misunderstanding occasioned by the myth-makers among Newton's followers who made of him the century's greatest analyst *malgré lui*.

Few works demonstrate Newton's powers as an algebraic analyst so forcefully as the *Enumeratio linearum tertii ordinis*, his all-but-complete classification of cubic curves that was also published as an appendix to the *Opticks* in 1704 and that here forms the core of part 3. In the *Enumeration*, the culmination of some 30 years' work, complete mastery of Cartesian methods combined with innovative use of projective techniques to produce the first modern analytical study of curves for their own sake. Yet the work was largely ignored by Newton's contemporaries, and no one until James Stirling in 1717 appears to have understood it. The reasons for its neglect make it a fitting conclusion to the works in this volume. For, as one considers them not for their mathematical content but for their place in history, they engender sadness and a sense of poignancy. Knowing what was being published at the time by Leibniz, the Bernoullis, l'Hôpital, Varignon, and others less luminous, one sees time and events overtaking Newton. A look back at volume 3 of the *Papers* proves revealing. The magisterial *Method of Series and Fluxions* (1671–73) placed its author alone at the edge of contemporary mathematical advance. Had it been published, it would have obviated almost all the research going on elsewhere and drawn most of the community into its ban. But it was not published, and others got along on their own. Having learned on their own, they missed the *Quadrature of Curves* even less. Whiteside writes of the latter,

> We will not pretend that the onward advance of mathematical discovery was more than temporarily slowed by this failure on Newton's part to communicate the totality of the notational and technical novelties of his treatise to his contemporaries. Within a few years (and sometimes in but months) all came to be independently rediscovered and quickly absorbed into the scientific mainstream [p. 17].

Thus, from the early 1690's on, the new methods bore the name "differential calculus," were expressed in Leibniz's symbols, and included Johann Bernoulli's techniques of integration, more powerful than Newton's. By the time Newton's *Quadrature* did appear in 1704, it was redundant rather than novel. As if in epitaph, Whiteside says of it,

> What is not communicated at its due time to one's fellow men is effectively stillborn [p. 20].

Perhaps Newton knew this and knew himself as well. Whiteside puzzles over why Newton left Cambridge.

> Watching over the minting of a nation's coin, catching a few counterfeiters, increasing an already respectably sized personal fortune, being a political figure, even dictating to one's fellow scientists: it should all seem a crass and empty ambition once you have written a *Principia*. . . . But it did not to Newton [p. xxix].

Perhaps here too Newton knew better than we.

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Wood Production

Tree Physiology and Yield Improvement. Papers from a meeting, Edinburgh, July 1975. M. G. R. CANNELL and F. T. LAST, Eds. Academic Press, New York, 1976. xviii, 568 pp., illus. $32.75.

This book is the proceedings of a conference held under the auspices of the International Union of Forest Research Organizations, a large, worldwide organization whose concerns range from the biology of trees to forest policy. The purpose of the conference was to stimulate communication between academically oriented physiologists and foresters concerned with wood production. The book contains 30 chapters grouped under six headings. An introductory chapter by A. H. Bunting is followed by six chapters on photosynthetic efficiency. These review instrumentation, field measurements, and computer modeling, discussing ways to find the desirable attributes and to provide criteria for mass selection. The second and largest part of the book is devoted to shoot and cambial growth. It includes two chapters that discuss productivity and its relation to the shape of tree crowns and forest canopies. Tree shape is the product of meristematic ac-