

December 22, and January 12, he assigned to the body a parabolic orbit. But he was not satisfied with the accordance between this path and the observed motions of the body. When he attempted to account for the motions of the comet by means of an orbit of comparatively short period, he was struck by the resemblance between the path thus deduced and that of Comet I, 1805. Gradually the idea dawned upon him that a new era was opening for science. Hitherto the only periodical comets which had been discovered, had travelled in orbits extending far out into space beyond the paths of the most distant known planets. But now Encke saw reason to believe that he had to deal with a comet travelling within the orbit of Jupiter. On February 5, he wrote to the eminent mathematician, Gauss, pointing out the results of his inquiries, and saying that he only waited for the encouragement and authority of his former teacher, to prosecute his researches to the end towards which they already seemed to point. Gauss, in reply, not only encouraged Encke to proceed, but counselled him as to the course he should pursue. The result we all know. Encke showed conclusively that the newly discovered comet travels in a path of short period, and that it had already made its appearance several times in our neighbourhood.

From the date of this discovery, Encke took high rank among the astronomers of Europe. His subsequent labours by no means fell short of the promise which this, his first notable achievement, had afforded. If, as an astronomical observer, he effected less than many of his contemporaries, he was surpassed by few as a manipulator of those abstruse formulæ by which the planetary perturbations are calculated. It was to the confidence engendered by this skill that we owe his celebrated discovery of the acceleration of the motion of the comet mentioned above. Assured that he had rightly estimated the disturbances to which the comet is subjected, he was able to pronounce confidently that some cause continually (though all but imperceptibly) impedes the passage of this body through space, and so, by one of those strange relations which the student of astronomy is familiar with, the continually retarded comet travels ever more swiftly along a continually diminishing orbit.

Bruhns' life of Encke is well worth reading, not only by those who are interested in Encke's fame and work as an astronomer, but by the general reader. Encke the man is presented to our view, as well as Encke the astronomer. With loving pains the pupil of the great astronomer handles the theme he has selected. The boyhood of Encke, his studies, his soldier life in the great uprising against Napoleon in 1813, and his work at the Seeberge Observatory; his labours on comets and asteroids; his investigations on the transits of 1761 and 1769; his life as an academician, and as director of an important observatory; his orations at festival and funeral; and lastly, his illness and death, are described in these pages by one who held Encke in grateful remembrance as "teacher and master," and as "a fatherly friend."

Not the least interesting feature of the work is the correspondence introduced into its pages. We find Encke in communication with Humboldt, with Bessel and Struve, with Hansen, Olbers, and Argelander; with a host, in fine, of living as well as of departed men of science.

R. A. PROCTOR

OUR BOOK SHELF

Elementary Introduction to Physiological Science. (London: Jarrold and Sons.)

ANY one may teach the higher branches of science; none but masters should dare to give elementary instruction. The truth of this fundamental article of the teacher's creed is very strikingly confirmed by this little book, which professes to give uninstructed persons some elementary knowledge—first, of the chief chemical products of animal and vegetable life; secondly, of vegetable physiology; and lastly, of animal physiology. One of the rules of teaching which a real teacher has soonest and most forcibly brought home to him says, "Never use an illustration if you can do as well without it." The practice of the author of this work is evidently, "Never miss a chance of using a metaphor, or simile, or image, or illustration that occurs to you. If it is 'striking' or 'homely,' use it as often as you can." The author possibly understands his subject; we cannot tell for certain whether he does or no, for we cannot disentangle the real things from his striking illustrations of them. We never know whether he is speaking soberly or in metaphor, and we are perfectly sure that a lad of lively imagination, reading this book by way of an introduction to biology, would get into his head such fearful and vivid ideas of what was going on inside plants and animals, that no subsequent teaching could ever set him right, and life would ever afterwards be a burden to him.

Compendium der Physiologie des Menschen. Von Prof. Julius Budge. Zweite Auflage. (Leipzig: Günther. London: Williams and Norgate.)

VERY truly called a compendium, an account of as many as possible of the facts of human physiology being compressed into about three or four hundred pages. To a reader ignorant of physiology, the book would probably be wholly unintelligible; to a German student about to undergo an examination in physiology, it would doubtless be very acceptable, for by it he might refresh his memory on every point about which he is likely to be questioned. Perhaps after all, however, it is well for the English student that we have nothing like it in the English language. The author, in the second edition, has done his best to bring the work up to the level of the most recent knowledge. Unfortunately, however, science will not stop while an author is correcting proofs; and this, like all works professing to give the latest results, records not the ultimate but the penultimate researches. This is not, however, of very great importance; for, as in so many German physiological investigations the ultimate result is the exact opposite of the penultimate, it is very easy to calculate out the former from the latter, and add it on.

Chenes de l'Amerique Tropicale.—*Iconographie des Espèces nouvelles ou peu connues. Ouvrage posthume de F. M. Liebmann, achevé et augmenté d'un aperçu sur la Classification des Chènes en général, par A. S. Oersted.* Copenhagen, 1868. 1 vol. folio, 29 pp. Tab. 57.

LIEBMAN was occupied at the time of his decease in 1856 with a monograph of the American Oaks. He left behind him a number of folio copper-plate engravings which he intended for the illustration of his work, and brief descriptions of fifty-two new species. These were entrusted for publication to Prof. Oersted, who has put all in proper train, drawn up a valuable essay on the classificatory characters of the genus, prepared an analysis of many of the species, and added ten plates of leaves of various species of oak in physiotype,—making altogether an important contribution to illustrated botanical literature, and a worthy memento of his friend. Liebmann died comparatively young, about thirteen years after returning from his botanical expedition in Mexico, where he amassed very fine collections, which are still in course of determination and distribution by the Danish botanists. A