

unmapped open country; and trigonometrical or geodetic surveys. An appendix adds a number of useful details on various points, including plan preparation and photographic reproduction. There is a serviceable index. B. C.

Bahnbestimmung der Planeten und Kometen. Von Prof. Dr. G. Stracke. Pp. viii + 365. (Berlin: Julius Springer, 1929.) 26 gold marks.

THIS is a volume of convenient size, and gives in a compact form all the details of orbit computation. Dr. Stracke has great experience in such computations from his extensive work on minor planet orbits for the Berlin Rechen-Institut. The first chapter gives a description of undisturbed motion about the sun, and the relation of the geocentric to the heliocentric places. The next gives the various reductions that the observed positions need before commencing the orbit computation. The third chapter is the fundamental one; it describes three different methods of deducing an elliptical orbit from three observations, and two of doing so from four observations; then follow two methods for a circular orbit, and two for a parabolic one; it is to be regretted that Leuschner's method is not included, as many computers prefer it to any other, and it is very effectively employed in America. The next chapter explains the calculation of ephemerides, including all the refinements necessary when exact ones are required.

The chapter on perturbations describes the methods of Cowell and Numerow, in which the co-ordinates x , y , z are determined by mechanical quadratures; also that of Eneke, in which the perturbations of x , y , z are thus calculated. Lastly, there is a chapter on the improvement of orbits by the inclusion of later observations.

There are numerous examples; the elliptical orbit of planet No. 996 is worked out from an arc of 50 days, and a parabolic orbit is found for Orkisz's comet from an arc of a month. There is a collection of tables at the end of the volume and also an extensive list of books and pamphlets relating to the subject. The very useful X , Y tables of Innes, published since the list was prepared, should be added to it. A. C. D. C.

Ur of the Chaldees: a Record of Seven Years of Excavation. By C. Leonard Woolley. Pp. 210 + 16 plates. (London: Ernest Benn, Ltd., 1929.) 7s. 6d. net.

MR. WOOLLEY'S brief but compendious account of the excavations at Ur during the seven seasons in which he has been in charge of the joint expedition of the British Museum and the Museum of the University of Pennsylvania, is both timely and convenient. Periodical reports and newspaper articles freely contributed to the Press by Mr. Woolley have kept his public informed of the progress of the work in each season, but everyone will be glad to have at hand this convenient summary of the results as a whole.

Reading through Mr. Woolley's narrative in this connected form, and surveying his material as it is possible to do here, only serves to bring home with

telling force the importance of this work for the history of civilisation. During the past two seasons, apart from the evidence for a flood of unexpected dimensions, of which the interest will vary according as it is taken to bear upon Biblical narrative, the excavation of the Royal and 'private' tombs, with their rich treasure and elaborate offerings of human and animal victims, has thrown an entirely new light upon ritual and culture in Sumeria at this early stage. It has given us a new view of the artistic achievements of the early Sumerians for which even the discoveries of previous seasons at El Ubaid and Ur itself had not prepared us. By the side of these achievements, the excavation of the great temple at Ur seems to pale in interest; but Mr. Woolley's account of this remarkable piece of work will serve to restore something of a sense of proportion.

Physical Chemistry. By Dr. J. B. Firth. Pp. iv + 292. (London: University Tutorial Press, Ltd., 1929.) 5s. 6d.

DR. FIRTH has undertaken a difficult task in attempting to outline the modern doctrines of physical chemistry in a book of less than 300 pages. This task has been rendered more difficult by the inclusion of an introductory chapter on the atomic and molecular theories and a final chapter on atomic structure. The author has therefore summarised the subject matter of the usual elementary course of physical chemistry within the narrow limits of about 240 pages, but has done his work so well that no important omissions appear to have been made. Of up-to-date topics the use of the parachor is briefly but adequately described, but the modern theory of complete ionisation of strong electrolytes is only referred to in a footnote which states that "the assumption . . . that the speed of the ions remains unaltered on dilution . . . holds for weak electrolytes but not for strong electrolytes". The text includes some 50 figures and a collection of 106 problems and test questions.

The Rise of Modern Physics: a Popular Sketch. By Prof. Henry Crew. Pp. xv + 356 + 24 plates. (London: Baillière, Tindall and Cox, 1928.)

FOR many years Prof. Crew has been lecturing to students of Northwestern University (in Evanston, a suburb of Chicago) on the history of science. He has now put his lecture notes into book form, so that they may benefit a wider circle. His book is not intended to be a serious critical study of the history of physics, but rather an outline that will enable the modern student to appreciate the labours of the pioneers of the science. This object it achieves admirably. It may occasion surprise to find that Galileo receives much more attention than does Newton, but this is probably due to the fact that the author had previously made and published an intensive study of the life of Galileo.

The book is lucidly written and may be perused with profit by all students of physics, and indeed by all whose interest is in the domain of science. L. J. C.