

frequently consulted volumes. The Big Butte is a conspicuous rhyolitic hill rising above a somewhat dreary country of quartz-monzonite and andesite. The bare surface, however, allows the mineral veins to be traced over wide areas, and the district is now second only to the South African Rand as a producer of metals. The main ores are those of copper, containing 14 per cent. of silver. The volume includes a large number of vein-plans, and illustrations of the connection between separation-planes and ore-deposits in the crystalline igneous rocks. The ores were accumulated in these fundamental masses at some epoch prior to the eruption of the volcanic rocks at the close of the Cretaceous period. The conclusions as to their modes of origin may be compared with those of J. D. Irving and H. Bancroft for the district of Lake City, Colorado (Bulletin 478), where similar conditions occur.

Paper 75 is by F. L. Ransome, on the Breckenridge District, Colorado. Here gold is again the attraction, and the district has rapidly developed since 1909, when new dredges were introduced for dealing with the gravels. The glacial deposits show, as is so very general in America, two epochs of ice-advance and ice-retreat (p. 72). The fissures containing the sulphide ores and the gold from which the placer ores are derived were formed by earth-movements in early Cainozoic times.

It is impossible in a brief outline to do justice to the large volume (Monograph LII.) on the geology of the Lake Superior region, by C. R. van Hise and C. K. Leith. Much of the discussion on the pre-Cambrian series concerns the Dominion of Canada also, and miners will find a comprehensive account (pp. 460-596) of the ores of iron, copper, gold, and silver in the district. The ferruginous cherts, with hæmatite or limonite, are held to have arisen from the oxidation of cherty iron carbonates and of the green silicate greenalite, $(Fe, Mg)SiO_3 \cdot nH_2O$. The green oolitic ores with hæmatite of Dodge County, Wisconsin (pp. 567 and 536), which are regarded as having been deposited in a granular form in the sea, and the greenalite rocks of the Mesabi District (p. 165), invite comparison with the ironstones containing green oolitic grains in the Silurian rocks of North Wales (p. 509), concerning which the last word has by no means been said; while the red banded cherts remind us of similar stratified deposits in South Africa. The authors believe that the iron, whether hæmatite or magnetite, was largely introduced into the Lake Superior sediments from the adjacent basic igneous rocks, at a time when the latter were hot and capable of sending magmatic waters into the sea in which the sediments were accumulating (pp. 516 and 527).

In Bulletin 503, E. C. Harder indicates the development of the iron and steel industry on the Pacific coast of California.

Bulletin 505 (1911), by A. C. Veatch, is a summary of the mining laws of Australia and New Zealand, with testimony by practical miners as to their operation. The material of the bulletin was brought together for a report to Congress, to assist in framing regulations for granting leases of public coal-lands in the United States.

The Geological Survey of Alabama, working in cooperation with that of the United States, reports (Bulletin No. 10) on the Fayette Gas Field in the north-west of the State, where gas rises freely from small "gas-pools" in a coalfield of Upper Carboniferous age. Further explorations are recommended. The development of roads throughout Alabama by the use of selected material is discussed by W. F. Prouty in Bulletin No. 11, and there seems evidence that the lesson taught to Europe by the Romans, and

long neglected by their successors, is at last spreading in the United States. It will be many years, however, before these civilised communities will possess the advantages given by French rule to the Berbers of North Africa.

The Wisconsin Geological and Natural History Survey issues (1912) a neat volume on the sandstones of Lake Superior, by F. T. Thwaites. The Bayfield group is the centre of interest, and is placed (p. 104) below the Cambrian, representing a sandy terminal phase of the Keweenawan sediments, in a region where a basin had been established which became choked by alluvial fans from the surrounding hills. The Survey also issues a large geological wall-map of the whole State, with a view to the requirements of public education.

In continuation of its handsome series of cloth-bound volumes, the Maryland Geological Survey publishes a work by W. B. Clark (State geologist), A. B. Bibbins, E. W. Berry, and R. Swann Lull, on the Lower Cretaceous deposits of the State. Mr. Berry (p. 99) takes the opportunity to summarise, with specific lists, the Lower Cretaceous floras of the world. As regards British deposits, he points out that we are not yet in possession of all that may be expected from the work of Dr. Stopes. Vol. ix. of the reports of the Survey treats largely of highway construction, but includes a history and description of the iron industry in the State. Prince George's County has been described in the latest of the interesting county monographs, with complete topographical and geological maps on the scale of one inch to one mile. We can imagine nothing better for the information of teachers in the local public schools.

The Iowa Geological Survey, in a massive volume issued at the close of 1912, includes its annual reports and papers for 1910 and 1911. More than 1100 pages are devoted to a thorough study of the underground waters of the State, including (p. 268) several mineral springs.

In *The American Journal of Science*, vol. xxxv. (1913), p. 1, J. W. Goldthwait, whose Canadian work has been already mentioned, describes cirques in New England, which, as seems natural, were occupied by small glaciers both before and after the great extension of continental ice. On p. 139, F. A. Perret carries us to "The Lava Fountains of Kilauea," which may now be fairly styled American. The mobility of the lava is ascribed (p. 143) to its being highly charged with an inflammable gas. The blue, and therefore highly actinic, cloud due to the combustion of this gas is here shown in photographs. It is well to learn, in view of the great interest aroused by Brun's researches, that the evolved gases are being carefully studied on the spot. The author regards those emerging from a lava-surface, that is, from a mass subject to oxidation, as quite distinct from the far purer gas of a great paroxysmal eruption. We must admit, in spite of all the work done on fumeroles, that we are still on the verge of this great question. In the same volume of the journal, p. 611, Mr. Perret directs attention to the evidences of occasional explosive action during the past history of Kilauea.

RÖMER'S "ADVERSARIA."

"ETUDES sur les notes astronomiques contenues dans les Adversaria d'Ole Römer," is the title of a paper by G. van Biesbroek and A. Tiberghien, published in the Bulletin of the Royal Danish Academy of Sciences (112 pp.). The "Adversaria" were published in 1910, and were reviewed in NATURE (vol. lxxxvi., p. 4). The authors of the present paper give a detailed analysis of most of

the astronomical notes contained in the volume. This analysis is especially valuable on account of the way in which the astronomical notes in the "Adversaria" are mixed up with others on hydraulics, statics, the construction of thermometers (the scale known as Fahrenheit's is due to Römer), numismatics, &c. These notes all date from the last eight years of Römer's life (1702-10), although several refer to investigations made during his stay in Paris (1672-81).

The authors dwell particularly on the various discussions of the work done from 1704 in Römer's private observatory a few miles west of Copenhagen, which show him as a great practical astronomer, to whom the principal modern instruments of precision and methods of observing are due. Thus it is shown that it was Römer, and not his pupil Horrebow, who invented the method of determining latitudes by altitudes observed north and south of the zenith and nearly at the same time, now known as the Horrebow-Talcott method. In this the result is independent of refraction, and a micrometric measure takes the place of the reading of graduated circles. Horrebow has certainly the merit of having recognised and published the advantages of the method, but there is now no longer any doubt that the idea was due to Römer.

At the beginning of the eighteenth century the method of determining time by observing equal altitudes of the sun east and west of the meridian was still in general use. Römer constructed an instrument for this purpose, in which the telescope was attached to a bar suspended vertically from a crook at the upper end, and he prepared tables and formulæ for reducing the observations. By degrees the use of the transit instrument, as regards which he was himself the pioneer, superseded the observations of equal altitudes in fixed observatories.

Römer also examined the problem of time-determination in the vertical of the pole-star; he did not arrive at a simple solution, but tried to get over the difficulty by constructing extensive tables for twenty-seven selected stars. How much he was in advance of his time is shown by his having employed the formula for correcting transit observations for instrumental errors proposed fifty years later by Tobias Mayer. The transit instrument in the prime vertical, introduced by Römer, was employed by him to determine the time of the equinoxes by a method which was a modification of one which he had described to the Paris Academy in 1675, but which, like most of his other investigations, never was published.

The authors give a detailed examination of his preparations for determining the vernal equinox of 1702 by this method. In the original method (described by Horrebow) the declination of the sun at its upper or lower meridian transit was deduced from the intervals of time between the transits over verticals near the prime vertical, employing an approximate value of the latitude of the place of observation. In the method of 1702 the declination of the sun does not enter, nor the latitude. The principal reason why Römer wished to eliminate the latitude, was, that he, like Picard, thought it was subject to an annual variation. Without knowing it, these two eminent practical astronomers had, in fact, perceived the effect both of aberration and of nutation on the apparent place of the pole star. Römer's method of determining the equinoxes is more ingenious than useful, since it not only assumes that the clock rate and instrumental errors do not change, but also requires that the sky should be clear for at least three consecutive approaches of the sun to the prime vertical as well as for time determinations.

It might have been expected that the man who had discovered the gradual propagation of light, and even foreseen the existence of aberration as its necessary

consequence, would in his private notebook have left evidence that he continued to be interested in the discovery. There is, however, only an examination of the question, whether it would be possible to determine the velocity of light by means of lunar eclipses. He found, of course (as he had already done in 1677), that the velocity is far too great to become perceptible in observations of that kind.

Römer was the only observer who succeeded in seeing Mercury on the sun's disc on May 6, 1707, just after sunrise; the authors have computed the particulars of the transit by Newcomb's tables, and find that the observation agrees perfectly with modern theory. The doubts thrown on Römer's observation by Halley and Bailly have thus been shown to be baseless, while Sharp's supposed observation must be rejected altogether. There are many other points of interest in this paper, which it is to be hoped will become widely known, as it gives a valuable survey of the varied activity of a man, who but for his reluctance to put his researches into shape and publish them would be reckoned among the greatest astronomers.

J. L. E. D.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Mr. D. G. Reid has been appointed junior demonstrator of human anatomy for five years in succession to Dr. Rogers, who has resigned the office.

The prize of 50*l.* from the Gordon Wigan Fund for a research in chemistry was awarded in the year 1913 to Mr. H. V. Thompson, for investigations on "Some Reactions of Diiodoacetylene," "Acetylenic Carbon," and "The Molecular Weight of Cellulose."

To the detailed report on the work of the score of men who have held John Lucas Walker studentships at Cambridge University, which occupies many pages in the present number of *The Cambridge Reporter*, the governors of the trust have added these words:—"During the twenty-seven years since the John Lucas Walker studentship, one of the earliest studentships in pathology, was established, the candidate who appeared most likely to carry out pathological investigations successfully, whether a Cambridge graduate or from some other school, British and Colonial, has always been appointed. While the work accomplished by the later holders of this studentship is perhaps too recent to be appraised, there has been ample time for that accomplished by the earlier students to manifest its worth and influence, not only upon the future careers of the students and upon the Cambridge Medical School, but upon the science of medicine. Moreover, it is now possible to form a fair estimate of the value of this foundation in particular and of graduate research studentships or fellowships in pathology in general. It would be difficult to cite any one position within the Empire which, in the same period, has been occupied by a succession of men so able, and who have attained such eminence in medical research."

LEEDS.—Mr. Henry Rutson, of Newby Wiske, Northallerton, has made a donation of 50*l.* to the funds of the University. It is only a short time since Mr. Rutson made a similar donation to the fund for new agricultural buildings.

Mr. Godfrey Bingley, an accomplished photographer, who has been connected for many years with the Leeds and Yorkshire Geological Association, has presented a collection of lantern slides, illustrating architecture, archæology, geology, and scenery in all parts of England, but especially in Yorkshire. There are about ten thousand slides of exquisite workmanship, and the collection is admirably arranged and cata-