behind some record of their occurrence, Prof. Milne set to work with seismometer and seismograph to measure and register the extent of each disturbance. Nor was he alone in the work. A small group of enthusiasts founded in 1879 the "Seismological Society of Japan"; but it is to Mr. Milne's pen rather than to any other that this active little society is indebted for contributions to its *Transactions*. Some of his fellow-workers, like Prof. Ewing and Mr. T. Gray, have returned to this country; but their loss seems only to have stimulated Prof. Milne to increased activity, and the responsibility of working the society now rests mainly on his own shoulders. These personal facts are mentioned in order to justify the editor of the International Scientific Series in his selection of a writer for the earthquake-volume.

Much of the early part of this volume is devoted to descriptions of the various instruments used in seismometry, and of experiments on the production of artificial earthquakes. The nature of earthquake-motion, and the means of determining the position of the centre whence this motion proceeds, are subjects that hardly lend themselves to popular treatment; but the author does his best with his somewhat intractable material, and in a book intended for general reading rather than for the study of specialists he has been wisely economical in the use of sines and tangents. Many a reader, curious about the causes of things, will be anxious to hear the latest utterance of science on the origin of seismic phenomena. Are these shakings of the earth, as Mr. Buchanan has lately sung,

"The sudden and mysterious swell
Of some dark subterranean sea of fire"?

Prof. Milne is disposed to refer the majority of earthquakes to explosive efforts at volcanic foci, these explosions being frequently caused by the admission of water to the heated rocks below. At the same time, he admits that shocks may occasionally be due to the production of faults, to the sudden snap of strata in a state of tension, or even to the collapse of subterranean excavations. Dr. Johnston-Lavis, of Naples, whose volume on *The Earthquakes of Ischia* was issued too late to be noticed by Mr. Milne, regards the disturbances in that island as directly connected with volcanic action, being due partly to the rending of the rocks by subterranean lava, but mainly to the injection of the magma into the cracks so formed, whereby vibrations would be produced similar to those felt on suddenly shutting a tap from which water is issuing under high pressure.

It will be seen by the title of Prof. Milne's volume that it deals not only with earthquakes, but with "other Earth Movements." These movements he groups under the heads of Tremors, Pulsations, and Oscillations. Earth-tremors are minute vibrations, which usually escape attention through their small amplitude. Yet they are worthy of study. The astronomers at Greenwich have been seriously annoyed in their observations by those "microscopic earthquakes" that are produced at holiday-times by people running up and down Greenwich Hill. Earth-pulsations are large undulations which slowly disturb the earth's surface, and are usually overlooked on account of the length of their period; while earth-oscillations are vibrations of large amplitude and long period, which produce the slow elevations and depressions of the land that are familiar to geologists.

It is notable that the preface to Prof. Milne's volume is dated about three years earlier than the date of publication, and that the list of papers quoted as published by the Seismological Society of Japan, does not extend beyond the sixth volume, although at least eight must have been issued before the appearance of this work. It is consequently fair to conclude that unusual delay must have occurred in placing Mr. Milne's work in the hands of the public. Nevertheless, it comes before us at a very opportune time. The recent disturbances in both hemispheres have directed general attention to the subject, and many an enquirer will turn to John Milne for a solution of his difficulties. A better teacher he could scarcely have. Prof. Milne stands out as the leading figure in the recent development of seismic science—a worthy follower of Robert Mallet, with facilities of observation which Mallet, living in this part of the world, could never command. Nothing need be added in commendation of the work, when we have said that, though treating of a less popular subject, it forms a worthy companion to Prof. Judd's volume on Volcanoes in the same series.

F. W. RUDLER.

CORRESPONDENCE.

BABYLONIAN ASTRONOMY.

London: March 22, 1887.

It was not my intention to publish any of the conclusions I had arrived at concerning the astronomy of the Babylonians before I could, at the same time, give the proofs of my assertions. Though I have been working for several years with this object, so many tablets still remain to be examined or collated that I cannot hope to be ready for several months to come; but as an amateur Assyriologist has had the indiscretion to publish some of the results which I had communicated to him, I now wish to give to the public my general conclusions.

Like all other Assyriologists, I took up the subject with a firm belief in the ancient and world-famed astronomical knowledge of the Chaldaeans. But, after examining a great many texts of all periods, I have been compelled to arrive at the conclusion that the Babylonians never had any idea of the celestial movements, but merely registered the phenomena in the sky together with the events occurring at the same time on the earth, in the belief that the same phenomena would be always accompanied by the same events. The apparent irregular motion of the planets—the regularity and period of which they had no idea whatever of—and also the physical appearances as to colour, size, &c., of the stars, indicated for them the actual events taking place at the time. They could neither predict the recurrence of an eclipse, lunar or solar, nor the reappearance of any planet at a particular place in the sky. They had, however, discovered that Lucifer and Vesper were identical, and also the double character of Mercury as evening and morning star; but the movement of these two planets was as unknown to them as that of the others.

As to the calendar, there are traces of many reforms. The most ancient calendar, which may be called prehistoric, and which was very likely introduced into Mesopotamia by the first Semites, divided the year into ten periods of thirty-six days each, grouped in nines, thus forming four weeks of nine days in each of the ten divisions of the year. This calendar was purely solar. The first reform was made, I believe, by the Akkadians after their invasion. Like all other Turanian populations, the Akkadians made use of a lunar year; and, when once established in Mesopotamia, they tried to adapt the older calendar of the conquered Semites. To do this they cut down the divisions of the year to thirty days, but increased them by two, making twelve months of thirty days each. This reform made the calendar less accurate, to remedy which use was made of supplementary or intercalary months—Second Nisan, Second Elul, and Second Adar. The first was no doubt discontinued at an early date, as it does not appear in the historical period; but the two others were used till the end of the Persian dynasty. It must be noticed that the supplementary months were not introduced into the calendar regularly and according to certain rules, but only when the priest found out that the civil year was no longer in agreement with the physical phenomena generally expected—as, for instance, the rising of the water of the rivers.

The Akkadian year, before the conquest of Babylonia, appears to have consisted of twelve lunar months of twenty-eight days, and each month to have been divided into four weeks of seven days. As this week could not fit after the adoption of a month of thirty days, it was therefore abandoned in the official calendar, but it was always used among the people. It is from this week that our own week is derived. Each day was similarly consecrated to one of the planets, and in the same order—Sun, Moon, Mercury, &c. The more scientific arrangement of the week of the astrologists was devised at Alexandria under the Ptolemies.

The zodiac or division of the ecliptic underwent several modifications at the same time as the calendar; but I need only repeat what I said in the ACADEMY a few weeks ago, that it was at the historical period divided into thirty parts, having each the name of a star or constellation. This zodiac remained in use till the fall of the Persian Empire.

With the Greek conquest, the Babylonians received a more correct astronomy. The conservative Chaldaean priests no doubt shrank for some time from adopting the foreign science, but it prevailed at last. The tablets of the Seleucid period give us astronomical calculations of lunar and solar eclipses, tables of the movements of the planets, and also a new series of signs to designate the twelve signs of the zodiac introduced by the Greeks. The Seleucid era, which was henceforth used, was no doubt adopted as the starting-point of this more correct astronomy.

GEORGE BERTIN.

IOMILKOS.

Dublin: March 21, 1887.

In the current number of the ACADEMY, p. 206, col. 1, it is mentioned that M. Homolle would identify Iomilkos with ΟΑΜΙΛΚΑΣ, which occurs in a fragmentary inscription at Athens. But surely it seems most likely that the latter is the remains of ΒΟΔΜΙΛΚΑΣ, which name would be comparable with several other Phoenician names, such as Bodbaal, Bodashtoreth, &c. (also Bidkar, 2 Kings ix. 25), in which *Bod* is a recognised contracted form of עבד. The more original form of ΒΟΔΜΙΛΚΑΣ—viz., Ebed-melech, actually occurs in the Old Testament at Jer. xxxviii. 8 and xxxix. 16. M. H. C.

SCIENCE NOTES.

MESSRS. GRIFFITH, FARRAN & Co. have in the press a work entitled *The Modern Treatment of Disease by the System of Massage*, three