

voluminous literature now exists on earthquakes and slight tremors experienced in Europe during the last quarter of the nineteenth century, special commissions having been appointed in most countries to keep a record of observations.

In Great Britain, Professor James Geikie, Davison, and White continue the work of R. and J. W. Mallet, and there is no lack of observations in North America, Guatemala, Mexico, India, Australia, and Africa. Seismological studies were initiated by Dr. E. Naumann and Dr. Knipping in Japan, and the newer reports of Dr. Milne, Koto, Sekiya, and others in the *Transactions of the Seismological Society of Japan*, contain full accounts of the earthquakes in these localities.

Of late years very delicate seismometers have been invented, by the use of which it has been possible to obtain accurate records, not only of violent shocks but of finer pulsations and tremors imperceptible to human sensation. Cacciatore of Palermo used as a seismometer a shallow shell filled with quicksilver, and having a number of notches at regular distances round the edge; small cups were placed below the notches, and in the event of any movement of the shell, the quicksilver escaped into these cups and could be weighed as a measure of the intensity of the shock. This simple apparatus was replaced by numerous others of much more complicated construction, which sometimes applied the pendulum, and were sometimes made self-registering by specially devised clock-work. Thanks to many ingenious inventions, meteorological science now possesses a wealth of observations on the frequency, continuance, periodic recurrence, and geographical distribution of earthquakes, as well as on the mode of transmission, direction, intensity, rate of propagation, and character of the shocks. Geologists have concerned themselves more with the destructive effect, the surface deformation and geological action of crust-tremors, and with the modifying influence exerted by the various kinds of rock upon the intensity and transmission of earth-movements.

Mallet, Von Seebach, Von Lasaulx, and Dutton proposed various methods of ascertaining the area of impulses during an earthquake. Both Mallet and Seebach concluded from geometrical methods that the seismic focus was at a comparatively small depth below the surface, but this result, so far from having been confirmed, seems to be contradicted by