the actual source of light upon the object under examination) is carefully examined. The well-arranged and conclusive experiments described by the author lead to an unconditionally negative answer which will not surprise those who are familiar with the theory of microscopic image-formation, but the results, being experimental, may put an end to the barren discussions on this subject by practical microscopists. A very neat and compact arrangement for the efficient and perfectly controlled illumination of objects in accordance with the results of the investigation is described. Some of the theoretical views in the first part of the paper are not acceptable. Whilst it is true that the usual methods of illumination do not strictly realise the assumptions underlying Abbe's theory, it is surely not open to question that the *theoretical* work and the rare *theoretical* calculations of images have always been carried out in accordance with the theory. The statement that if the ideals of critical illumination were realised, then resolution would be destroyed, is quite untenable, for as that ideal is to make the object behave as if it were self-luminous, the statement amounts to claiming that a self-luminous object—say a white-hot one—could not give a distinct image, which is absurd.

WE have received the fourth report (for 1916) of the seismological observations at De Bilt, Holland (Konink. Nederl. Meteor. Inst., No. 108, 1918, pp. 1–102), in which are given full details of the records obtained from horizontal motion seismographs of Galitzin and Wiechert and a pair of Bosch horizontal pendulums, as well as a summary of the results from other observatories of the more important earthquakes. From this report we learn that the munitions explosion at Faversham on April 2, 1916 (see NATURE, vol. xcix., 1917, p. 250), was registered by the Wiechert and Galitzin pendulums at De Bilt. The effects of the air-waves of this explosion were widely manifested in Holland, especially in the western districts, by the shaking of doors, windows, and pictures, as if by a slight earthquake.

ONE of the strongest earthquakes felt in Porto Rico since the European occupation occurred on October 11, 1918, the official Report of the Earthquake Investigation Commission (Washington, 1919), by Prof. H. F. Reid and Mr. S. Taber, having recently been published. The approximate position of the epicentre is given as 18° 30′ N. lat., 67° 20′ W. long., in the north-east portion of Mona Passage, and the time of occurrence, within a very few seconds, at 2h. 14m. 38s. p.m. (Greenwich mean time). The earthquake was followed after a few minutes by a sea-wave which reached a height of about 4½ metres above mean sea-level along the north-west coast of Porto Rico, the first movement of the water, wherever seen, being one of withdrawal. The epicentre lies along a deep submarine valley, the slopes of which are so steep that they must be regarded as the result of faulting. During the last half-century the north-west coast of the island has been noticeably subsiding, and the authors attribute the earthquake and sea-wave to a vertical displacement near the head or on one side of the submarine valley.

Our Astronomical Column.

ECLIPSE OF THE MOON.—There will be a total eclipse of the moon on the night of May 2–3. The following are the Greenwich times of the various stages:—

Moon enters penumbra	...	May 2, 10.49 p.m.
Moon enters shadow ...	...	,, 12.0 mid.
Beginning of total eclipse	...	,, 3, 1.15 a.m.
End of total eclipse ...	...	,, 2.27
Moon leaves shadow	...	,, 3.41
Moon leaves penumbra	...	,, 4.53

At Greenwich the moon rises on May 2 at 7.5 p.m. and sets on May 3 at 4.34 a.m. The whole of the phases of the eclipse will thus be visible.

During some lunar eclipses the disc of our satellite has remained fairly bright, while at others it has been scarcely visible. If atmospheric conditions are favourable, observations of the character of the shadow on this occasion might be made and, possibly, photographs taken. During the lunar eclipse of July 4, 1917, observations made at the Bordeaux-Floriac Observatory showed that throughout totality the north edge of the moon seemed brighter than the south.

MARS AND WIRELESS SIGNALS.—It is regrettable that in these days, when results of great interest concerning solar and stellar physics are continually being reached, the public should have its attention concentrated upon sensational assertions, such as the Porta planetary scare last December and the suggestion of wireless signals to or from Mars which is now under discussion in the daily Press. Leaving aside the physical difficulties of such communication—which, though considerable, are perhaps not insuperable—a very little consideration suffices to show the utter improbability, closely approaching to impossibility, that the idea of signalling should be mooted simultaneously on the two planets. On any view as to the development of the planetary system, the periods when Mars and the earth pass through corresponding stages would be likely to be separated by millions of years. The suggestion that the Martians have kept up the practice of signalling at every opposition through such a period as this, in the patient hope that they might one day be answered, makes too strong a demand upon our credulity.

THE APRIL METEOR SHOWER.—The weather was moderately fine at the time the Lyrids were expected, and a fair number of them were visible. The best night seems to have been that of April 21, when the sky was generally clear and the maximum abundance occurred near midnight. The phenomenon was observed by Miss A. Grace Cook at Stowmarket, Mr. S. B. Mattey at Plumstead, S.E., Mr. C. P. Adamson at Wimborne, Mr. W. F. Denning at Bristol, and others. The Lyrid meteors formed about one-half of the total number visible on the nights of April 19, 20, and 21, and nearly all of them left streaks. They moved with moderate velocity, being decidedly slower than either the Leonids or the Perseids. As regards brightness they were much above the average, and some fine ones were recorded on the dates mentioned.

THE WASTING OF STELLAR SUBSTANCE.—This is the title of a paper by Prof. F. W. Very in *Scientia* for April. It will be remembered that Prof. Eddington made the suggestion in the *Observatory* last September that the immense duration of the radiation from the stars might be explained by the annihilation of some of their component atoms through collision, and the consequent liberation of their stores of energy.

Prof. Very states that he made a similar suggestion many years ago. He conjectures that great gaseous nebulæ, such as that in Orion, are the synthetic laboratories where matter is being built up; he applies the idea to the Russell sequence of giant and dwarf stars, supposing that the loss of mass (contrary to Prof. Eddington's suggestion) is a large fraction of the whole initial mass, so that the dwarfs, on his view, are stars not merely of smaller diameter and greater condensation, but also of small mass. The increase of velocity with advance of spectral type would thus receive an explanation.

Map-making in India.

THE Report for the year 1915–16 (vol. x.) of the Records of the Survey of India (printed at the office of the Trigonometrical Survey, Dehra Dun, 1917), which has lately come to hand, is somewhat belated. The price of it alone would indicate this, viz. "four rupees or 5*s*. 4*d*."; which does no justice to the present value of the rupee. It is in other respects a new departure. There is no preface, and we look in vain for the usual summing-up of the scientific results of the year's work by the Surveyor-General, Sir Sidney Burrard, who, for that matter, has ceased to direct the Department and retired to a well-earned rest. On the whole, it is a dry record of useful progress in the work of map-making, supplemented by long tables of the results of scientific observation, which surely, if they are of any use at all, should be published in such an up-to-date form as to compare readily with the work of other observers elsewhere whose researches may lead them into the same scientific fields. There is no narrative or detail explanation showing how the results recorded have been attained; no excursions into the realms of geography to lend a flavour of romance to the volume; and no new theories or startling discoveries to save it from the familiar atmosphere of dry official dullness. It is, of course, not meant to be amusing, but it might easily be made more interesting. One unusual and redeeming feature it does indeed contain. There are seven most excellent photogravure portraits of those gallant officers of the Department who fell in the service of their country. They are so good that one cannot but hope that they exist otherwise than in this official environment, and have already become a permanent and honourable feature in the headquarters' offices of the Indian Survey.

The actual progress of mapping for military purposes under the difficult conditions of the war period, when so many men were absent on duty in the fields of France, Mesopotamia, and elsewhere, appears to have been most satisfactory during that busy time. The Punjab surveys extended into Kashmir, and included a great deal of revision on the one-inch scale as well as certain areas on four inches to the mile. This feature of variety in the scale of mapping is common to all the topographical parties, and is a most encouraging sign that the scale is now adapted to the quality of the district surveyed far more freely than used to be the case. Formerly, there is no doubt, much money was wasted over unnecessarily large scale work in districts which had no possible military significance and not much geographical importance in any sense. Practically the topographical surveys are scattered all over India, from the Punjab to Madras and Burma. An examination of cost rates is interesting, for it does not indicate that the cost has greatly altered during the last twenty years. Here again everything depends on the physical characteristics of the district. From 7·6 rupees per square mile in the Punjab (almost entirely revision) to 50·7 rupees in Burma is certainly a most reasonable outlay for the work of the one-inch class, especially when compared with the enormous costs of European mapping on the same scale. The two-inch-per-mile surveys were a trifle more costly (when compared with previous years) than usual, but the surveyors had to face special difficulties in the shape of large areas of dense forest growth.

There is no record of any extension of first-class triangulation, and the scientific branch of the Survey Department seems to have been directed towards the completion of "fore and back double levelling of precision" in the Punjab and the United Provinces, together with the usual programme of tidal and magnetic observations. It is interesting to note the generally increasing accuracy of tidal predictions, although certain errors seem to require explanation. For instance, there were five predictions at Moulmein which were more than thirty minutes wrong. Why? The tabulated magnetic results show that great disturbances occurred in 1915, particularly in the month of June; and on August 29, 1916 the seismograph was dislocated by the violence of its action in recording an earthquake shock. The report, however, says nothing as to the probable location of that shock. It would be interesting to know more about it. An ingenious instrument for calculating attractions, which the designer, Mr. J. de Graaff Hunter, calls an "integrator," is illustrated by photogravure in the report, and this is indeed the one new feature in it which will probably attract most attention from men of science.

The final record of publications by the Survey of India can be best studied by an examination of the index charts which form the appendix. Progress with the 1/M (one-millionth) Maps of the World Series is very satisfactory. It is this class of geographical mapping which has formed the basis for the Peace Conference boundary delimitations, and in their preparation India is working hand-in-hand with the Royal Geographical Society and the Geographical Section of the War Office.

Vol. xiii. of the Survey of India Records, which is issued as supplementary to the general report of 1917–18, brings the topographical records of the Department to a later date than the above. It deals with the same distribution of parties working on original, revision, or supplementary surveys in much the same fields, and denotes good progress at reasonable rates, but for purposes of comparison a more detailed summary is wanted of the amount of survey completed in each class and a few notes on its character and cost by the Officiating Surveyor-General, Col. Ryder, R.E. The geodesic and scientific operations are summarised in part ii., and in the appendices will be found useful reprints from the Journal of the Royal Geographical Society (March and October, 1918) on the problem of the Himalayan and Gangetic troughs, containing the views of such scientific experts as Sir Sidney Burrard and Mr. R. D. Oldham on this most interesting subject. A feature in the report which attracts attention is the distribution of Survey detachments (with the consequent weakening of field parties) amongst artillery practice camps, presumably for the same purpose of range determination as that which absorbed such a large and expensive staff of surveyors under R.E. direction during the later years of the war. This leads one to ask whether the gunners could not be trained to carry out such special surveys for themselves.

T. H. H.