phosphorescence emitted did *not* diminish, but a thin layer of pure water entirely arrested the *n* radiations. These radiations may be concentrated by a quartz lens, but are regularly reflected by a polished glass surface, whilst an unpolished glass surface diffuses them.

THE SPECTRA OF METALS AND GASES AT HIGH TEMPERATURES.—In No. 25, vol. xxxviii., of the *Proceedings* of the American Academy of Arts and Sciences, Prof. J. Trowbridge gives the details and results of an exhaustive series of experiments on the spectral phenomena observed when gases and metals are together subjected to high temperatures. Employing a large variety of conditions as to the temperature employed, the size of the capillary tubes and the materials from which they are made, and the distance and material of the poles, Prof. Trowbridge arrives at several interesting conclusions, all of which tend to show that in many cases the lines obtained are possibly due to products of the interactions between the gas, the poles, and the containing tube, which take place at high temperatures, rather than to the elements themselves. For instance, the metallic lines obtained from terminals placed 1cm. apart in rarefied air, or hydrogen, were reversed, the reversal coinciding in position with the line obtained in ordinary air, but the line was much broadened on the least refrangible side. The author suggests that this indicates the presence of a gaseous product, probably due to the oxidation or hydration of the poles. Again, when highly heated and rarefied hydrogen, or air, was passed through a tube of amorphous silicon or glass, broad bands, coinciding with the fainter silicon lines obtained under ordinary conditions, were produced, and Prof. Trowbridge believes that in the case of highly refractive metals, such as silicon, these bands are not really due to the metals themselves, but to the interaction between the metals and gases present.

The experiments showed that iron lines did not appear under what seemed to be favourable conditions, whilst aluminium lines did appear under these conditions. For this reason the author enters a *caveat* as to the care it is necessary to exercise when classifying stars solely from the variations in the appearances of their respective spectra.

ZENITH-TELESCOPE RESULTS.—In vol. ii. part i. of the *Publications* of the University of Pennsylvania (Series in Astronomy), Mr. C. L. Doolittle, director of the Flower Observatory, gives the results obtained from the observations made with the zenith-telescope during the period September 6, 1898, to August 30, 1901. After describing the corrections applied to the observed values, the report gives full details of each observation and its corrections, and then gives the values of the "aberration constant" determined during 1898–1899 and 1900–June, 1901, as $20''\cdot540 \pm 0''\cdot0103$ and $20''\cdot561 \pm 0''\cdot0085$ respectively. A curve and a set of tables, showing the variation of latitude at Philadelphia from October 1, 1896, to August 30, 1901, are also included in the report.

PHOTOMICROGRAPHY WITH A BROWNIE CAMERA.

THIS article does not put forth anything new in principle, but is the explanation of a simple method by which any student can, with little trouble and little expense, produce his own photographs of microscope objects, the idea being to direct attention to the inexpensiveness of the necessary apparatus.

The apparatus required includes only a small microscope and a light "fixed-focus" camera, and, of course, the necessaries for developing the negatives. The writer used a microscope of the rigid type generally regarded as little more than a toy, and worth only a very few shillings, and a Brownie Kodak. The instruments need practically no alterations to make them fit for use; the utmost that need be done is this:—Cut a piece of rather thick cardboard the same size as the front of the camera, and in the centre of it make a round hole to fit the eye-piece of the microscope. Glue this to the camera front.

In use the microscope is focused on object for distinct vision for a normal eye. If the experimenter be long- or short-sighted, then he must use appropriate spectacles.

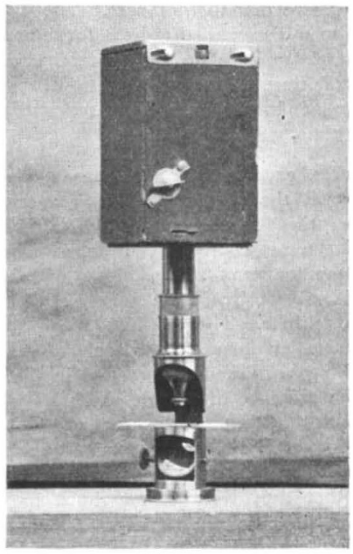
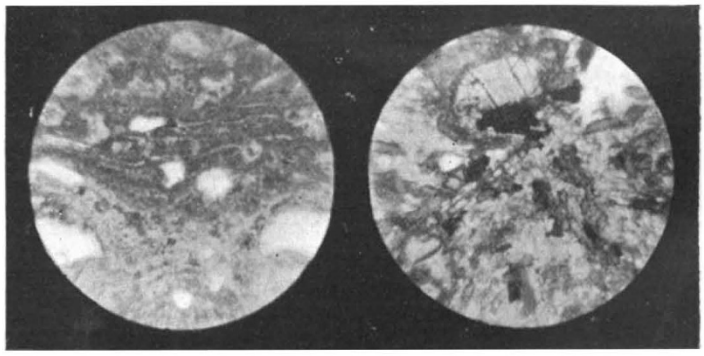


FIG. 1.

The light issuing from the eye-piece is thus rendered parallel, and if the camera be placed on the top of the eye-piece an image of the object will be in focus on the sensitive film. Of course, the optical axes of the camera and microscope must be parts of the same straight line, and the card glued to the camera is to assist the centring. The visual field is the exact area photographed.



Rhyolite. Olivine Diorite.

FIG. 2.

The exposure is made in the usual way, using the camera shutter. In the middle of a fine day exposures of from one to two minutes have been found ample, while in the evening ten or twenty minutes are necessary, using plates of the speed generally known as "Special Rapid." The Brownie camera is made for roll-films, but plates may be used thus:—The camera back is opened and a plate $2\frac{1}{2}'' \times 2\frac{1}{2}''$ laid on the frame over which the film is generally passed. On the back of the plate is placed a piece of black paper or thin card, and the back closed. This paper is necessary in order to exclude the light from the little red window, which is not non-actinic.

After exposure development is proceeded with in the ordinary way, using pyro-soda or any other developer the experimenter may prefer.

It will be seen from the specimens that the definition is, of course, not of the highest order, but considering the apparatus, one must not expect too much. The photo-

graphs are certainly more accurate than the student's sketches would be, and are probably made in less time. The lack of sharp focus at the edges is due to the cheap microscope used, and not to the camera, which is good enough for combination with any instrument likely to be employed in this manner. Any microscope and any similar camera may be used. The specimens reproduced show a magnification of ×20 diameters.

Considering the simplicity of the method and the slight cost of the apparatus, the idea should recommend itself to a good many students. W. Moss.

SEISMOLOGICAL NOTES.

IN the nineteenth report of the Tokio Physico-mathematical Society Dr. F. Ōmori gives two short papers on the velocity with which earthquake waves are propagated. In calculating these velocities it is assumed that the paths followed are in all cases arcual, and that a correct velocity is arrived at by dividing the distance between Tokio and a station in Europe by the difference in time at which similar phases of movement were recorded at two such places. As to the soundness of this method, excepting as applied to the large waves of earthquakes, opinions vary. In another note by the same investigator, attention is drawn to the difference in the character of seismograms obtained at two stations about a mile apart. At one station, two distinct groups of maximum movements are shown. These are explained as the longitudinal and transverse components of elastic vibrations simultaneously produced at the seismic centre. At the other station the records are described as a series of maximum movements at fairly regular intervals. This feature is attributed to a rhythmic interference between the proper oscillation of a soft surface soil and the movements of an underlying harder ground. In a discussion on *pulsations* or small movements of non-seismic origin, it is shown that the period of these corresponds to the period of preliminary tremors, from which it is inferred that for both of these movements their periods depend upon the nature of the soil where they are observed.

The thirteenth number of the *Publications* of the Earthquake Committee (Tokio) consists of a series of papers also by Dr. F. Ōmori, several of which are identical with those to which we have just referred.

Long registers are given for the year 1900, the earthquakes in each of which originated in the same locality or at great distances from the observing stations in Tokio. In the earthquakes with distant origins, the periods of the preliminary tremors do not depend upon their duration, the duration of preliminary tremors being proportional to the distance such earthquake motion may have travelled. This is probably true for other phases of motion, and it has also been shown to exist for *macro-seismic* disturbances.

Other analyses relate to the relative magnitudes of earthquake movements, direction of first displacements, and matters of greater or less seismological interest.

In the *Bulletin* issued by the Philippine Weather Bureau for December, 1902, the Rev. Marcial Solá, S.J., gives an account of a violent earthquake which originated near Manila, and was recorded at many stations around the world. Materials from twenty-three of these stations are analysed, and the velocities with which waves were propagated through and round the world have been calculated. For the first waves, along chords corresponding to axes less than 46°, the velocity was 10·2km. per second., whilst for longer paths, up to 154°, this became 12·4km. per second. The maximum phase, travelling on arcs, did so with a velocity of 3·1km. per second, the lengths of the waves varying between 106 and 181km. Although these results fall closely in line with those of other observers, it may be pointed out that, if the time at which the earthquake originated was known, the values for velocities arrived at would be somewhat reduced.

In the last *Bolletino* (vol. viii. No. 8) issued by the Seismological Society of Italy, Dr. Giulio Grablovitz contributes a short paper describing a modified form of his *vasca sismica*. This is a circular tank about 1·5m. in diameter and 1m. in depth. On this there is a floating tray, the movement of which at the time of earthquakes is recorded upon a rotating cylinder. The chief feature in the records obtained from such a fluid pendulum, the period of which is short, is that the indicated amplitude of the preliminary tremors is usually more pronounced than that shown by other types of instruments.

Dr. G. Agamennone gives an account of the earthquake which, on June 29, 1896, originated in Cyprus, and was recorded at stations more than 3000km. from its centre. With the assumption that the wave paths were *arcual*, the first movements were propagated with speeds slightly exceeding 13km. per second. It may be pointed out that these values would be reduced had the wave paths been considered *chordal*. The remainder of the *Bolletino* is taken up with earthquake registers. These commenced in January, 1895, and have now reached June, 1901. Inasmuch as they do not simply refer to earthquakes noted in Italy, but to earthquakes which have spread over the whole world, for this class of earthquakes the Italian catalogue is for many purposes the most valuable which seismologists possess.

ETHNOGRAPHICAL STUDIES IN NORTH QUEENSLAND.[1]

THE student of folk tale, custom and belief will find in the last *Bulletin* issued by Dr. Walter E. Roth a mine of trustworthy data which will furnish new illustrations of the working of the mind of a primitive people. Though similar stories, ideas and habits may have been recorded previously by various observers in this and other parts of the world, yet none the less this record is of value as it confirms the older accounts in their broad aspects, and gives instructive variations in details. Some of the customs appear to be peculiar to the North Queensland natives, while others are definitely Australian in character. The information is given in those short, pithy paragraphs to which Dr. Roth has accustomed us; at times we could wish for more detailed information, but, on the other hand, we are spared any unnecessary verbiage, and there are no hypotheses or guesses. It is a comfort not to have to pick out facts from a mass of writing, and also to feel that the information can be absolutely trusted.

Readers of Spencer and Gillen's memorable book, "The Native Tribes of Central Australia," will remember that the Arunta do not recognise the relation between the sexual act and conception; this seemed so strange that it was felt that some confirmation of this ignorance was needed, and Dr. Roth now gives it to us, for he says that though the relation is not recognised among the Tully River blacks so far as they themselves are concerned, it is admitted as true for all animals—indeed, this idea confirms them in their belief of superiority over the brute creation. Dr. Roth offers the following explanation of this strange belief:—"When it is remembered that as a rule in all these northern tribes, a little girl may be given to and will live with her spouse as wife long before she reaches the stage of puberty—the relationship of which to fecundity is not recognised—the idea of conception not being necessarily due to sexual connection becomes partly intelligible." Various other beliefs and customs connected with sexual history are narrated, amongst which may be mentioned the seclusion of girls at puberty, at which period, as in the western islands of Torres Straits, as Dr. Seligmann has pointed out, the girls are half-buried and surrounded by a leafy bower.

Numerous magical practices are described; many have for their object the procuring of disease or death, others are curative, some induce success in love, while others give luck in hunting or fishing. A vital principle, breath, thought, will-power, soul, spirit, or whatever it may be termed, is recognised by all the tribes, but some deny this to animals and plants, while others will grant it to animals but not to plants. Dr. Roth's explanation of the opinion widely spread among the white men that the blackfellow believes he is transformed into a white man at death, or, as it is expressed, "black jump-up white-fellow," is that the vital principle, or spirit, of a native may be reincarnated in a white man, and not that his body is actually transformed into that of a European. A number of illustrations further add to the value of this important publication.

A. C. H.

[1] North Queensland Ethnography, *Bulletin* No. 5. "Superstition, Magic and Medicine," by Walter E. Roth, the Northern Protector of Aboriginals, Queensland. (Home Secretary's Department, Brisbane, C.A. 5, 1903.)