less truncated as the verge is reached, and bearing little evidence of attrition (Fig. 2). Mr. Molyneux is of opinion that the cutting back of the falls is due to the perpetual hammering action of the vast bodies of water falling into, and down upon, the cracks between the basalt columns, assisted by the constant vibration of the rock from the precipitated masses of water, and that by this constantly exerted force the columns are rent asunder and fall into the chasm, taking with them huge and deep flakes of the precipice. At low water heaps of these blocks, as yet angular and unreduced, may be seen in the shallower ends of the chasm.

Such is one phase of the erosion of the falls. Another power is at work below the water line. The blocks that fall into the chasm disappear in the deeper waters at the jaws of the gorge—yet, impelled by the rush of the current in the confined walls, they must be grinding down and perpetually deepening the cañon, to emerge at the eastern end as rounded pebbles and form the shingle beds of the middle reaches.

The extraordinary zig-zags or acute angles in the cañon have always aroused comment, and the author thinks that two main causes are responsible for them—the position of islands that probably studded the river (as now) and also the existence of master joints and fissures in the basalt. On Boaruka Island this action is exemplified in a striking manner, for a stream can be seen falling down a crevice, that forms, peculiarly enough, another acute angle with the chasm.

Granted that the falls are due to the action of moving water, such parts as are protected by islands must be free from such erosion. To-day there are three important islands on the lip of the chasm, and more than fourteen large ones in 4 miles of river above the falls. In the channels between, there must be more prolonged submission to moving currents, by which the cataracts at the ends of the chasm are being deepened into sloping by-washes.

The falls have checked the deepening of the Upper Zambezi, and until they chisel the groove of the Grand Cañon back to the western edge of the basalt sheet, the upper reaches must continue to run at a high altitude and amid low-lying hills. This has prevented the Zambezi becoming a navigable river throughout, and has also had a marked influence on the geography of South Africa.

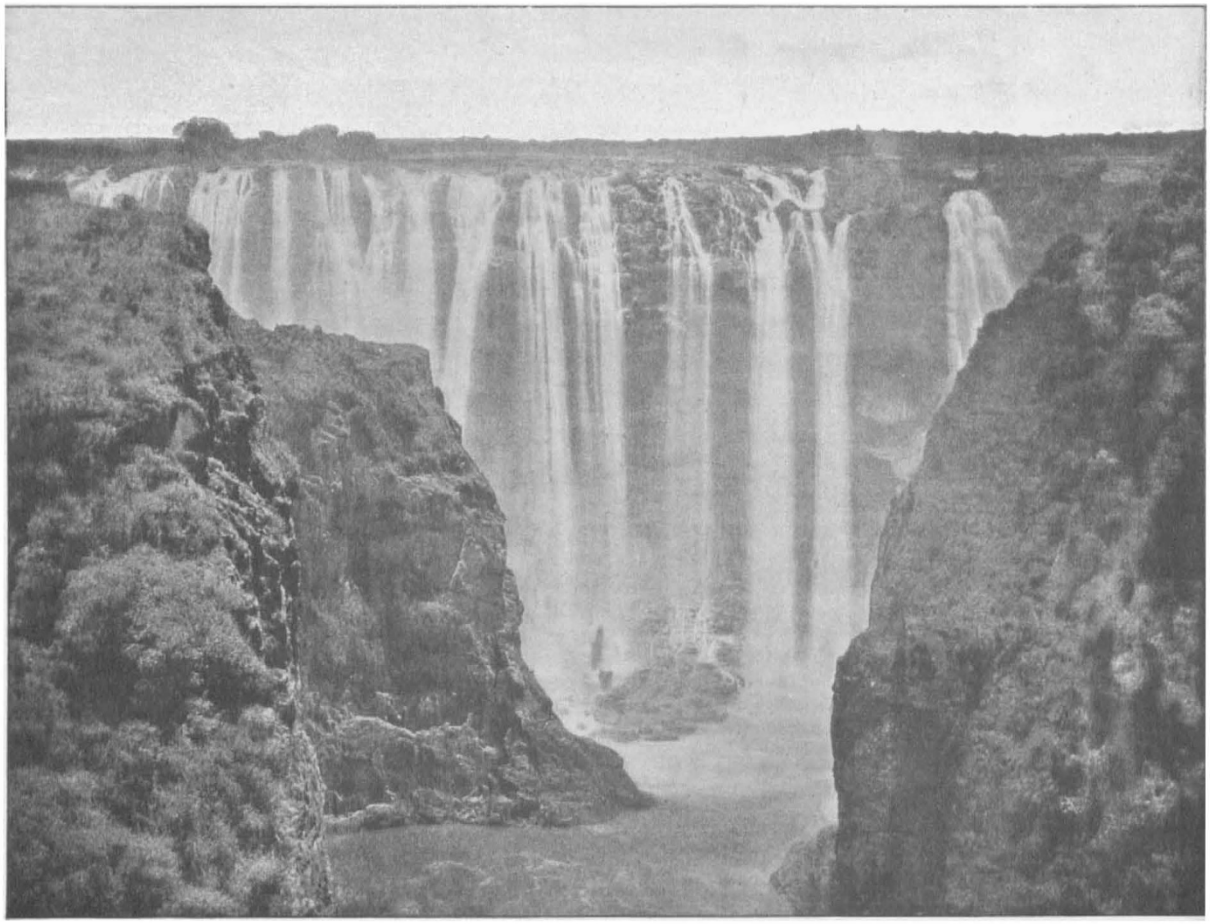

Photo. by Pedrotti, Bulawayo.

FIG. 2.—View of Victoria Falls seen through the jaws of the Gorge. Danger Point on the left; the promontory of the "knife edge" on the right. From the *Geographical Journal*.

SEISMOLOGICAL NOTES.

THE attraction of the moon has always been felt by earthquake workers, whatever may be its effect on earthquakes themselves. The latest contributions to this aspect of seismology are two papers in No. 18 of the *Publications* of the Earthquake Investigation Committee in Japan. Prof. Omori deals with the lunar daily distribution, finding maxima of frequency between 0h. and 5h., and again between 12h. and 13h., reckoning from the upper culmination. Dr. Imamura, dealing with the synodic monthly variation in frequency, finds that this shows an increase at the syzygies and quadratures; the former is attributed to the combined effects of the attraction of the sun and the moon, while the latter is explained by the fact that the time of high water at Tokio then coincides with that of the diurnal maximum of barometric

pressure. In spite of the ingenuity of this explanation, its validity seems doubtful, for the stresses involved can at most be only a subsidiary cause of earthquakes, and consequently any effect due to them would naturally be looked for at the time when they vary most rapidly in amount rather than at that of their maximum.

The same publication contains a paper, of some importance in this connection, on daily periodic changes of level in artesian wells, by K. Honda. It is the account of a record, obtained by a self-registering instrument, of the daily changes in level of two artesian wells, 380 metres and 300 metres depth, in Tokio and Yokohama. Each of them showed a periodic change of level which is directly correlated with the tides in the neighbouring sea, and also a variation due to changes in barometric pressure, of such amount as to show that one-third of the changes in the first case, and one-fourth in the second, are absorbed by the rocks overlying the water-bearing stratum.

The catalogue of earthquakes felt in Austria during the year 1903, forming No. 26 of the *Mitteilungen* of the Austrian Earthquake Commission, is the last of the series which will be published under the auspices of the Academy of Sciences. In the introduction to the catalogue it is announced that from the beginning of 1904 the task of collecting and publishing the records of all earthquakes, whether of local or distant origin, observed in Austria, was taken over by the Zentralanstalt für Meteorologie und Geodynamik. The Earthquake Commission, having published the earthquake registers up to the end of 1903, will in future confine itself to the encouragement and publication of purely scientific investigations.

After the collapse of the campanile of St. Mark's, in 1902, there was a popular demand, inspired by the idea that the detonation was likely to precipitate the destruction of other historic buildings in Venice, for the cessation of the usual mid-day gun. The idea was, of course, unfounded, but to allay the alarm Prof. Vicentini was requested to instal one of his microseismographs, and his report has now been published. The instrument was attached to the wall of the ducal palace which faces the lagoon and is directly exposed to the sound waves of the cannon; it indicated a vertical displacement, in consequence of the report, of 0·012 mm. to 0·014 mm., and a horizontal displacement of 0·007 mm. to 0·012 mm., being about one-half of those produced by a person jumping on the floor of the room in which the instrument was installed, and one-fifteenth of the displacement caused by a high wind. From these figures it is evident that the sound waves of a cannon can have no appreciable effect on a building, though plaster may be detached where this has become loosened and separated from the wall by an air space.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, February 23.—"The Colour-physiology of the Higher Crustacea," Part iii. By F. **Keeble** and Dr. F. W. **Gamble**. Communicated by Prof. Sydney J. Hickson, F.R.S.

(1) The chromatophores of Hippolyte and Crangon are multicellular structures. Their branches show differentiation into a firmer ectoplasm and a more fluid mobile endoplasm in which the pigment occurs. (2) The formation of the pigments in the larval and post-larval chromatophores is described. (3) In addition to pigments, fat, in the form of colourless globules, occurs in the chromatophores of Hippolyte. This fat lies in special cells of the chromatophore, and exhibits a mobility similar to that of the pigments of the chromatophore. (4) If fed and kept in the dark, or if starved and kept in the light, Hippolyte loses little of its chromatophoric fat. Depletion of fat occurs, however, in starved, dark-kept animals. These, when exposed to sunlight for five or six hours, show fat in their chromatophores. These results show that the colourless chromatophoric fat is a reserve food material, and point to the conclusion that in the accumulation of this reserve fat light plays an important part. (5) At the time of settling on the weeds of the sea-shore, *Hippolyte varians* is a colourless or faintly brown-striped animal. At this stage it is extremely sensitive to the light conditions of its environment, assuming the colour of its surroundings within twenty-four hours. If the environment be changed, sympathetic change of colour takes place in three days. Half- and full-grown Hippolyte are less susceptible. With them sympathetic colour-change occupies a week or more.

March 30.—"On the Distribution of Velocity in a Viscous Fluid over the Cross-section of a Pipe, and on the Action at the Critical Velocity." By J. **Morrow**. Communicated by Prof. H. S. Hele-Shaw, F.R.S.

Summary and Conclusion.—(1) The experiments provide a partial confirmation of the theoretically obtained law of velocity distribution, but show that this distribution can only be obtained under very special conditions, of which absolute freedom from obstructions and end effects are important; and hence (2) When the flow is direct and stream-lines exist, the velocity distribution is not necessarily exactly that which may be described as characteristic of "normal" flow. (3) At the critical velocity the irrotational straight line motion ceases and is followed by one in which the paths of the particles of fluid are eddying and turbulent. The law of distribution of mean linear velocity parallel to the axis simultaneously changes from the parabolic (or approximately parabolic) to that typical of eddying motion. (4) The critical velocity in question (being that at which eddying motion ceases to be transformed into direct motion, and not that at which a highly unstable stream-line motion is suddenly disturbed) is not accompanied by a sudden change in the velocity parallel to the axis at any point in the cross-section. On the other hand, as the total flux increases, the experiments show a gradual transition from one state to the other, due to the change which has occurred in the law of velocity distribution. (5) The observations have little bearing on the upper limit of stream-line flow, as observed by colour bands. They indicate, however, that the unstable direct motion would follow an approximately parabolic law of velocity distribution (as represented by the equation obtained for stream-line motion), and that at the higher critical velocity this distribution would suddenly change to that represented by the equation given for eddying motion. In this case, then, instead of a gradual change of velocity, there would actually be sudden and large changes in the velocity parallel to the axis at different points in the cross-section of the pipe. (6) The "Pitot law" ($v=\sqrt{2gh}$) is at least approximately true at exceedingly low velocities.

April 6.—"The Influence of Cobra-venom on the Proteid Metabolism." By Dr. J. **Scott**. Communicated by Sir Thomas R. Fraser, F.R.S.

Conclusions.—(1) Practically no change in rate of proteid metabolism was induced by the administration of cobra-venom, in spite of well marked local reaction. (2) A slight decrease in the proportion of urea nitrogen, quite insignificant compared with that produced by diphtheria toxin and various drugs, was observed. (3) A slight rise in the proportion of ammonia nitrogen occurred. (4) There was a slight rise in the proportion of nitrogen in purin bodies. (5) The nitrogen in other compounds showed no constant change. (6) The P_2O_5 excreted showed no constant change, but in two experiments there was a slight rise. The change produced in the proteid metabolism is, therefore, small, and such as it is, being in the directions of decreased elaboration of urea and increase in the proportion of nitrogen excreted as ammonia, it seems to indicate a slight toxic action on the hepatic metabolism rather than a general action on the proteid changes, and tends to confirm the view that the poison acts chiefly upon the nervous system.

Entomological Society, April 5.—Mr. F. Merrifield, president, in the chair.—Specimens of a melanic Grammoptera, discovered by Mr. J. C. T. Poole at Enfield, and apparently quite distinct from any member of the genus taken in Britain: H. St. J. **Donisthorpe**. Mr. Gahan, to whom the species had been referred, considered it to be a form of *G. ruficornis*.—A specimen of *Megalopus melipoma*, Bates, an insect which so much resembles a bee that Bates had said they were indistinguishable in