Echelon Spectroscopes and the Green Mercury Line.

IT is interesting, in reference to Prof. Nagaoka's letter in NATURE of April 23 (p. 581), to note that I exhibited photographs of the green mercury line, showing a number of new components, at the Leicester meeting of the British Association. I did not publish the number or position of the lines in the report, not being quite satisfied that some of the fainter ones might not be produced in the instrument, and I discovered later (NATURE, vol. lxxvii., pp. 198 and 222) that secondary effects, due to light reflected in the echelon, have to be taken into account. Since then Von Baeyer's measurements with a Lummer and Gehrcke spectroscope and Galitzin's echelon measurements have confirmed two of the lines that were new, and added confirmation to my values for the old ones. A doubt still remains, however, about some of the fainter lines, and as a comparison of the values given by different instruments is the most obvious way of confirming the true components and eliminating false ones, I give my results for comparison below.

It is usual in stating results of this kind to give the wave-length intervals between the components and the principal line, but this leads to mistakes in comparing results, because the principal line given by most of the observers has been divided by Von Baeyer and Nagaoka into two components, and by taking the brighter component as the principal line they shift the reference point about 15 milli-Ångström units, and the agreement, which would otherwise be evident, is quite obscured. I have given below the distances of the various components from the component of shortest wave-length, which happens to be a good reference line. The differences shown in Prof. Nagaoka's comparison are in this way much reduced.

Comparison of Recent Echelon Spectroscope Determinations of the Components of the Green Mercury Line, λ 5461.

Janicki	Galitzin	Nagaoka	Stansfield	
0	0	0	0	17 bright
			23	faint
		31		
			41	very faint
			59	,,
		72	75	,,
			93	,,
		105		
133	137	137	135	12 bright
166	168	163	165	12 ,,
	189	189	188	8 medium
232	**236**	{223 / **247**}	**232**	{52 bright / *principal line*}
		280	277	5 faint
320	321	315	319	16 bright
			345	8 medium
365	365	356	363	12 bright
		390	386	8 faint
			409	very faint
		448	448	14 faint
		477	473	very faint

The numbers give the distances of the components from the component of shortest wave-length in milli-Ångström units. In the fifth column the widths of the brighter lines, taken from the photographs, are given in the same units.

It will be seen that there is generally close agreement as to the position of the five bright companion lines. As to whether the principal line is single or a close double, it is interesting to note that several of my photographs showed it divided, the brighter component being on the longer wave-length side as Nagaoka and Von Baeyer give it, but owing to the secondary effects in the echelon I have not been able to make sure of the division.

Prof. Nagaoka's values agree fairly well with mine for all the faint lines on the list below the principal line, although he does not give the lines on my photographs at 345 and 409, but we do not agree about the positions of those which fill in the long gap between the first and second bright companion lines. The agreement is not sufficiently good to exclude the possibility of some of the faint lines having their origin in the echelons.

H. STANSFIELD.

The University, Manchester, April 25.

Appearance of the Slug Testacella in a Flooded District.

SOME time ago I wrote to you to say that the remarkable slug Testacella occasionally appeared in large numbers on the surface of the ground in my garden. This phenomenon only occurs when the district is heavily flooded. The abnormal weather of the last half of April has brought severe floods out in many parts of the Thames valley, and yesterday, through the kindness of a friend who now occupies the house and garden referred to, I was able to collect about a hundred of these animals. I shall be pleased, therefore, to send specimens alive or preserved to those correspondents who wrote to me on the subject when my previous letter appeared in NATURE, whose addresses I have mislaid, unfortunately, while changing houses. I may add that it is only in this particular garden that I have seen these animals. What the conditions may be that cause the slugs to live there and not elsewhere, so far as I know, in the neighbourhood, I am quite unable to suggest. They live too far down even in wet weather to be found during ordinary gardening operations.

M. D. HILL.

Eton College, Bucks, May 3.

THE TOTAL SOLAR ECLIPSE OF JANUARY 3, 1908.

SINCE the brief announcement made in this journal (vol. lxxvii., January 23, p. 273) in the first month of this year, relative to the success of the eclipse expedition organised by Mr. F. K. McClean, further information has become available.

The communications received give a complete account of the doings of the expedition from the time it left Auckland in the Union S.S. Company's *Taviuni*, which Mr. McClean had chartered specially for the expedition, to its return to that port. A detailed report, containing the scientific results of the expedition, will in due course be presented to a society, but a short sketch will no doubt be of interest to many readers of this journal who have been waiting for further information.

The members who finally formed Mr. McClean's party were as follows:—Joseph Brooks, F.R.A.S., retired surveyor in charge, Trigonometrical Survey, N.S.W.; W. E. Raymond, F.R.A.S., first assistant, Sydney Observatory; J. W. Short, astronomical photographer, Sydney Observatory, and magnetic observer; Rev. F. W. Walker, of Auckland; Henry Winkelmann, of Auckland.

The party left Auckland on the afternoon of December 12, 1907, arriving at Tahiti on December 20; Flint Island was reached on December 23, at 7 a.m. The expedition from the Lick Observatory was already located on the island, and Prof. Campbell came off to meet the ship.

The landing place is described as consisting of a small channel blasted through the reef and extremely dangerous. In spite of the rough surf, everything was safely landed. As it was raining hard all the time, the first piece of work was the erection of the tents and the temporary housing of all the instruments in them.

The camp was located amongst a number of cocoanut trees, some of which were at least 100 feet high, rendering the horizon invisible. Considerable lopping of branches was found necessary, not only to allow sufficient sky field for the efficient working of the large siderostat, but room for the tents themselves. The accompanying illustration (Fig. 1) will give the reader some idea of the tropical and dense nature of the vegetation on the island. The negative from which this illustration has been taken was made by Mr. Winkelmann.

December 24 was even wetter than the previous day, but in spite of that the remaining tents were erected, and the first layer of concrete for the large

22-inch siderostat was laid. On January 1 everything was complete and drills were commenced, and eventually the programme was arranged to be carried through, utilising the signals called by Prof. Campbell's timekeeper.

From the account given of the weather conditions, on the morning of the eclipse the party seems to have met with exactly the same peculiarities as those which were experienced by many of the observers at Palma in 1905. Fortunately, Mr. McClean was present at Palma on that occasion, so the experience was not new to him, and in his letter he writes, "It has been another Palma and four plates in my bag."

As the wind came in from between the north-east and east, special watch was kept in that quarter. First contact was observed in a perfectly clear sky, and it remained fairly clear to almost within a few minutes of totality. Everyone was prepared to carry minute with short intervals of clear sky, after which the eclipse was clearly visible, though light cloud was still present. At the call of 3 minutes 50 seconds, sunlight had broken out, several seconds before it was expected, and was preceded by a brilliant prominence.

Such a sudden and unexpected ending did not, however, spoil the plate which Mr. McClean was exposing at the time, for, as he writes, "then, while expecting another ten seconds, I looked up and saw a red prominence, and shut things up just in time. The others were not so lucky."

The eclipse does not seem to have been a dark one. It is stated that it never became too dark to read large figures, in spite of the instrument being surrounded by trees. Another statement is that a "newspaper could have been read without any difficulty whatever."

Photograph by H. Winkelmann.

FIG. 1.—Mr. McClean and party standing by the instruments they worked during the Eclipse.
(1) Mr. McClean. (2) Mr. Caffyn. (3) Mr. Short. (4) Rev. Walker. (5) Mr. Brooks. (6) Mr. Winkelmann.

out his allotted task when "five minutes before totality" was called out by the American timekeeper.

A heavy bank of cloud then made its appearance in the north-east, and at the signal "48 seconds to go before totality" it began suddenly to rain heavily, and it poured until one second before totality. It had been arranged to determine the instant of totality by observing the cusps, but the clouds prevented their observation. The timekeeper was to have received a signal from the "cusp" observer to commence his counting, but no such signal could be given. At what time the timekeeper started counting is not stated, but it is mentioned that just before totality, probably one or two seconds, because the thin crescent was seen to be just changing into beads, the cloud cleared, and the rain ceased.

The instruments were quickly uncovered, and the exposures made according to the prescribed programme. The clouds continued during the first

Captain G. H. Lacy, who observed the eclipse from the bridge of the *Taviuni*, compared the light during totality to that which would be produced from an arc lamp placed on deck.

Mercury and Venus were seen, the former to the south-west and the latter to the north-east of the sun. Very few stars were observed.

Mr. Raymond, who undertook sketching the corona, using a 4-inch Grubb refractor to project the sun's image on to a sheet of cardboard, likened the form of the corona to "an irregular star of seven points." The corona had a pearly-grey colour, and three of the streamers were shaped like pyramids. These were capable of being faintly traced down to the edge of the moon's limb.

Mr. Flynn, first officer of the *Taviuni*, also made a sketch of the corona.

With regard to the photographs, the following is a brief summary of the successful exposures secured:—

Messrs. McClean, Brooks and Walker, working with the 4⅝-inch De La Rue Coronograph, 8 feet focal length, obtained four pictures.

The same observers secured no results with the Voigtländer 4-inch objective, fitted with a Thorp replica grating.

Mr. Winkelmann, working with a telephoto lens of equivalent focal length of 5 feet 3 inches, obtained five pictures, showing various depths of corona.

Mr. Short (assisted by Mr. Caffin, purser of the *Taviuni*) worked a photoheliograph of about 7 feet focal length and a telephoto lens. Some of his results will also prove very useful.

It will thus be seen that while no spectroscopic results were secured, a very complete record of the form of the corona was obtained, and this was the chief object of the expedition.

With the exception of Raymond's refractor, all the objectives were fed from the 22-inch siderostat mirror taken out by Mr. McClean (see Fig. 1). The De La Rue and photoheliograph received the sunlight directly from the mirror, while the remainder were placed at right angles to the beam from the siderostat, and obtained their light by means of small mirrors placed in the path of the main beam.

Some of the original negatives, and glass positives of others, which have arrived from Auckland indicate at a glance what a magnificent sight the corona must have presented. No wonder the eclipse was not described as a dark one when such an extent of corona encircled the dark moon!

It has been stated, I do not know on what authority, that this eclipse resembled that of 1898. Mr. McClean's beautiful negatives do not in the least remind me of the form it took in that year. Mr. Raymond's description, as quoted above, "an irregular star of seven points," seems to define it very well, and that description could not be given to the form of the corona of 1898, which I observed in India.

In my opinion the photographs of the 1908 eclipse display a form which approaches more to that generally seen when the sun is most active, that is, a "maximum" corona, than to those of the "square" and "wind-vane" variety. Perhaps if it be classed as intermediate between a "maximum" and a "square" form, one cannot be far from wrong. In looking up the records of eclipses, I find that the drawing made by Mr. Weedon of the corona of 1860 July 18 (Memoirs, R.A.S., vol. xli., 1879, p. 543) more closely resembles that of 1908 than any I have been able to find. The year 1860 was a time of maximum sun-spot activity (and also probably a maximum of prominence activity, only no data are available to state this definitely).

Mr. McClean's photographs show several streamers more than one and a half lunar diameters in length. One striking feature of them is their great length and comparatively small breadth, giving them a very spiky appearance. Several prominences are also recorded on some of the negatives. Polar rifts are by no means clearly evident, and this is due possibly to the presence of some streamers in high latitudes.

As was to be expected, Prof. Campbell rendered considerable assistance to Mr. McClean's party, and Mr. McClean writes further in flattering terms of the cooperation of Mr. Mortimer, resident on the island, who rendered him "every assistance during the whole period we were on the island." He also expresses his deep obligations to Mr. A. B. J. Irvine, manager at Auckland of the Union S.S. Company, who did everything in his power to render the expedition a success.

Fortunately only one case of illness is reported. This was Mr. Raymond, who was confined to his bunk on board the *Taviuni* for four days owing to a severe attack of cholera. Although left very weak, he was able to rejoin the party ashore the day before the eclipse, and carry out his programme of sketching the corona as above mentioned.

In conclusion, it may be remarked that the results of the expedition are far more successful than one was led to believe from the previous information received, and the discussion of the photographs will form a valuable contribution to science.

WILLIAM J. S. LOCKYER.

THE MUTATIONS OF ŒNOTHERA.[1]

THE name of an animal or plant may become famous for one of two reasons. Fame may be due either to the intrinsic interest of morphological or developmental characters of "intermediate," "primitive" or rare species, or to the fact that the form in question has been the material by means of which discoveries, which help in the revelation of the fundamental nature of living things, have been made. Examples of plants of the first class are Ginkgo, Ophioglossum, Coleochæte, and Anthoceros. Examples of animals of the first class are Peripatus, Archæopteryx, Acanthobdella, Ceratodus, Okapia, Sphenodon, Anaspides, and Tarsius. Thousands of specimens of an animal which is an example of the second class are daily hurled into the corner of the knacker's stable in the shape of *Ascaris megalocephala*. Thousands of specimens of a vegetable example of the second class could be gathered in a very short time on the sand-dunes along certain tracts of the coast of Lancashire in the shape of *Œnothera Lamarckiana*.

Yet these two classes of forms agree in one respect, that there is a certain magic about their names. Any contribution, however trivial, to a closer knowledge of such forms is regarded as worth publication. The importance of the material is held to compensate for the triviality of the contribution. We are not arguing that this should not be so, but merely pointing out that it is. A new fact, which, if it related to Periplaneta, would not be thought worth publishing will soon find its way into print if it relates to Peripatus.

Every biologist is familiar with, even if he does not take a critical interest in, the wonderful series of observations which have made *Œnothera Lamarckiana* a household word in the mouths of everyone interested in organic evolution. It is not surprising, therefore, to find this form subjected to an investigation which for minuteness and exhaustiveness is without parallel. Those who are familiar with the mutation theory might be excused for thinking that de Vries did not leave much to be done. But the memoir before us shows that, much as de Vries did, this is by no means the case; there is nothing in "Die Mutationstheorie" which for minuteness of detail compares with Dr. Shull's description of the fluctuations of Œnothera.

The memoir is illustrated by a series of beautiful heliotype plates of the various new elementary species to which Œnothera has given rise. Plate 5, which is here reproduced, shows at a glance the striking difference between two of these, *Œnothera lata* and *Œ. albida*—forms with which everyone who knows de Vries's work must be familiar.

The part of this memoir which has interested us most is that which deals with the origin of mutants from strains of Œnotheras different from that which

[1] "Mutations, Variations, and Relationships of the Œnotheras." By D. T. Macdougal, A. M. Vail, and G. H. Shull. Pp. 92. (Washington: Carnegie Institution, 1907.)