

friends has assured me that I was perfectly justified in my statement on this point; and it was by one of these, who was present at the lecture in question, that I was informed of the very explicit statement made on that occasion by Mr. Crookes of the views he then held, which were universally understood in their plain common-sense meaning.

November 20

WILLIAM B. CARPENTER

Fluid Films

WITH reference to Mr. Sedley Taylor's interesting note on Fluid Films, allow me to say that if a drop of water, clinging to the outside of a glass goblet, be lightly dusted with lycopodium powder, and a fiddle-bow be drawn across the edge of the glass, the drop will exhibit vortices, rotating in opposite directions.

Higgate, N., November 19

C. TOMLINSON

Tuckey and Stanley.—The Yallala Rapids on the Congo

CAPT. TUCKEY is dead and gone and cannot answer for himself; it may therefore, perhaps, serve to clear his memory in some measure of a doubt about the correctness of his description of the Yallala Rapids in 1816, arising from the very different account of them given by Stanley sixty years afterwards, if I mention one of several facts in connection with American rivers.

The late Sir J. Franklin, in his first and disastrous overland journey to the Arctic Sea in 1821, describes the "Bloody Fall" on the Coppermine River as "a shelving cascade about three hundred yards in length, having a descent of ten or fifteen feet."

Between 1848 and 1851 this "fall" was visited five times; on one or other of such occasions the water was either at high spring flood, at low summer level, or at an intermediate elevation, yet under none of these conditions was the "fall" found to be more than thirty yards long, if so much, the height being about fifteen feet.

Franklin and the officers with him were most careful and correct observers, so that I can only attribute this wonderful change (from three hundred yards long to thirty) in the form of the cascade to the wearing away of the material forming the bed of the river, by the action of the water, assisted in a great measure by the large masses of ice and the stones carried down with it during the breaking up of the navigation in the course of thirty seasons, only half the interval of time between Tuckey's and Stanley's visits to the Congo.

Supposing a somewhat similar attrition, but in a less rapid manner, to have been going on at the Yallala Rapid, the description given by the former as he saw it may be equally correct as that of the latter when he visited it in its altered shape in 1877.

May I add that a cataract may become a fall or a series of falls, and *vice versa*, according as the water in a river is in flood or at low level.

Scientific Club, November 16

J. RAE

The Future of our British Flora

IT may interest Mr. Shaw to know that the stations given by Lightfoot in his "Flora Scotica, 1777," still exist (as far as I am aware, and I have visited by far the greater number of them) at the present day. Experience has led me to the conclusion that a plant however maltreated, does not become extinct unless the natural conditions are changed, as by the draining of a marsh, &c. I have over and over again found plants in stations where they were reported as "extinct years ago." Perhaps if Mr. Shaw visits his station for the "Lizard Orchis" (is this *Orchis hircina*, L.? if so it is, I fancy, new to Scotch botanists) in the course of a year or two he may find it in as large quantity as ever. As regards the maltreatment of plants, I agree with what Mr. Shaw says respecting professors of botany. Each teacher of the science ought to teach his students that it is a crime to exterminate a plant, and that they can best learn botany from the observation of the common plants of their district; there is great room for improvement in this respect.

While a student I was often disgusted by seeing rare plants torn up and then cast away as if they had been a handful of grass, or, worse still, put in the vasculum and forgotten till the next Saturday, when they were thrown away; and all this without a word of remonstrance from those who ought to have exercised

authority, "that's villainous, and shows a most pitiful ambition in the man who uses it."

Provided we reform a little, I do not think that, judging of the future by the past we have any reason to expect a large decrease in the ranks of our native flora. I do not suppose any species given by Lightfoot 100 years ago has become extinct even in his stations, and on the other hand we have had a considerable number added to it since his time.

Edinburgh

A. CRAIG-CHRISTIE

Selective Discrimination of Insects

IN continuation of the interesting observations of "S. B." on selective discrimination of insects in NATURE, vol. xvi. p. 522, permit me to send you the following notes from my journal, made in August last:—

"Watched by the roadside near Kew Bridge Station, several species of Hymenoptera, of the genus *Bombus* principally; I one visited thirty flowers of *Lamium purpureum* in succession, passing over without notice all the other plants in flower on the same bank—species of *Convolvulus*, *Rubus*, *Solanum*. Two other species of *Bombus* and a *Pieris rapae* also patronised the *Lamium*, seeking it out deep in the thicket, thrusting their probosces even into withered cups, although the *Rubus*' flowers were far more accessible and seemed much more attractive, being fresh and well-expanded.

"On the same bank several species of Diptera—*Syrphus* chiefly—were visiting the *Rubus*, ignoring the *Lamium*. On another bank, some distance removed from the first, I observed, however, that the diptera were visiting the *Lamium* (one species was very busy on the convolvulus, applying its proboscis to the external aspect of the anther) while the Hymenoptera, species of wasp, were giving their attention to the *Rubus*."

I am sorry not to be in a position to identify the species of Hymenoptera and Diptera, being unable to capture specimens of either.

HENRY O. FORBES

Higgate, N.

The Earth-worm in Relation to the Fertility of the Soil

IN your number of the 8th instant there are some interesting remarks upon the habits, &c., of the common earth-worm. From frequent observations I fully concur with the remark that the worm does not consume living vegetation but only vegetable matter undergoing decomposition.

I am also rather inclined to the opinion that there are (or may be) two reasons for the drawing in to their holes dead leaves, &c., the one being, for use as food, and the other to protect the holes from a too plentiful supply of water.

In this same connection I may mention what I have not before seen mention of, namely, the little mounds of small gravel stones which the worms heap up around the entrance to their holes. These are very curious and may be partly to prevent the entrance of water; and also, as I think, partly for rubbing against the worm's slimy body, as fish do.

It is very remarkable the extent to which loose gravel-stones (some as large as a hazel-nut, and even larger) are removed from a gravel-walk from distances quite beyond a foot, leaving the walk pitted all over. I have never seen a worm in the act of moving these stones and it is difficult to imagine how it is done, but as it generally takes place in wet weather, it may probably be by an adhesion of the stone to the slimy body of the worm.

As regards fertilising effects, it would be interesting to know whether the earthy matter composing worm-casts had passed through the worm's body, as the writer supposes, for in that case it would probably have more fertilising properties than if consisting merely of the natural soil thrown up as by moles.

The remark by one of your correspondents as to his observation of a line of darker soil thrown up by worms from a substratum of ashes deposited a considerable time before, would almost make it appear that the mole-like action above referred to took place. The writer, however, repeats his conviction that the matter composing worm-casts has passed through its (the worm's) body.

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GEO. H. PHIPPS

Smell and Hearing in Moths

"J. C." seems to draw inferences that moths have not the power of smell but have that of hearing. I feel quite certain they possess the former, but am in doubt about the latter. For the purpose of catching moths I use a preparation of beer and

sugar boiled together, to which (after boiling) is added a little spirit, placing rags several folds thick, saturated in the preparation, upon garden-seats, low branches of trees, &c. I have in one evening taken as many as thirty-six moths (including red-, yellow-, crimson-underwing, swordgrass, angleshade, &c., &c.). What has attracted them unless smell? or what generally leads them to their food?

With reference to the sound of the glass, is it not the quick motion of the hand which disturbs the moth? E. H. K.

Carnivorous Plants

PROF. SERRANO FATIGATI, of Ciudad Real (Spain), has made some investigations upon two insect-feeding plants which he found during his last excursion to the province of Cordova, and on the general peculiarities of viscous plants during their flowering. The first of these plants is *Ononis natrix*; it grows at Sierra Palacios. The second appears to be *Silene viscosa*, and was found on the hill which connects the village of Belmery with the station. The experiments made upon these plants prove that when alive they were both covered abundantly with a viscous fluid, which in *Silene* was still visible after the specimens had been dried for four months. Prof. Fatigati has observed in several instances that every insect which touches their surface, and remains adherent to them, dies in a very few minutes. Remains of animals in different stages of decomposition may be seen on the plants he possesses.

The microscopical study of these plants has enabled the structure of their secretory glands to be examined. The glands of the plant *Ononis* are at the extremity of hairs composed of cylindrical cells, and are ovoid and multicellular. The protoplasm of the cylindrical cells always forms a parietal coating to the cell-wall. The glands of the *Silene* are simply conical epidermical protuberances, and are divided into two cells at the close of their development.

Prof. Serrano Fatigati has observed that in these species and in *Cistus ladaniferus* the secretion of the viscous fluid increases during their period of flowering; he is studying this matter, in order to ascertain whether this circumstance bears any connection with the production of heat and carbonic acid possessed by plants during the flowering period. FRANCISCO GINEZ

Esparteros 9, Madrid

OUR ASTRONOMICAL COLUMN

MINOR PLANETS.—Mr. J. N. Stockwell, of Cleveland, Ohio, who has had much experience in calculations relating to the small planets, draws attention to a curious circumstance connected with the observations of Gerda, discovered by Prof. Peters at Clinton, N.Y., on July 31, 1872. It had been supposed that this planet was observed again in 1873, 1876, and 1877, but on forming equations of condition for the correction of the elements, Mr. Stockwell found that the observations of 1873 are quite irreconcilable with those of the other oppositions, or that some incompatible conditions had been introduced into the equations. "The discovery of these incompatible conditions," he writes, "has been the occasion of an unusual amount of trouble and annoyance, and will be the source of future mortification, should the explanation at which I have arrived ultimately prove to be erroneous." Mr. Stockwell's conclusion is this, that notwithstanding the planet observed from September 27 to November 12, 1873, was very near the computed place of Gerda, it was really another body that was observed in that year. To decide this point he calculated an orbit upon the observations of 1873, which it appears are very well adapted to furnish reliable results, and finds the following elements, placing the elements of Gerda, as perturbed to the same date, in juxtaposition for the sake of comparison. The epoch is 1873, November 7^o M.T. at Washington, longitudes from M.Eq. 1873^o :—

	PLANET OF 1873.	GERDA.
Mean long. ...	35 4 57	35 47 14
π ...	213 14 38	208 19 29
ϖ ...	178 53 9	178 56 40
i ...	1 36 3	1 36 19
ϕ ...	1 58 40	2 0 51
μ ...	613 ^o 6390	614 ^o 3842

It will be seen that four of the elements of the planet of 1873 are almost identical with those of Gerda, while the lines of apsides differ about five degrees. The actual distance of the planets from each other on November 7 would be 0^o 0188 of the earth's mean distance from the sun. Mr. Stockwell adds, "if there are really two planets moving in orbits so extremely near together, it must happen in the course of time, unless the mean distances are exactly the same, that they will approach each other so closely that their mutual perturbations will cause them to unite and form a single planet."

A similar case of near coincidence between the orbits of two minor planets is that of Fides and Maia, to which attention was first directed we believe by M. Lespaul, of Bordeaux. In 1876 the elements were as follow :—

		FIDES.	MAIA.
Epoch ...	July 27 ^o Berlin M.T.	Oct. 4 ^o Berlin M.T.	
Mean long. ...	326 33 33	27 37 21	
π ...	66 27 20	48 8 26	
ϖ ...	8 15 15	8 17 1	
i ...	3 6 49	3 5 40	
ϕ ...	10 11 21	10 4 31	
μ ...	826 ^o 4417	824 ^o 6400	

Here, however, the planets are much further from each other than in the case of Gerda and the planet of 1873.

At present Gerda and its companion will not be favourably placed for observation, but in the ensuing year no doubt an effort will be made to decide if there are really two bodies revolving in such near proximity to each other. Questions of much interest may arise if this should prove to be the case.

The discoveries of minor planets during the present year now stand as follow :—

- No. 170, Myrrha, January 10, by Perrotin, at Toulouse.
- " 171, Ophelia, January 13, by Borrelly, at Marseilles.
- " 172, Baucis, February 5, " "
- " 173, ... August 2, " "
- " 174, ... September 2, by Watson, at Ann Arbor, U.S.
- " 175, ... October 14, by Peters, at Clinton, U.S.
- " 176, ... November 5, by Paul Henry, at Paris.
- " 177, ... November 6, by Palisa, at Pola.
- A planet, ... November 12, by Watson, at Ann Arbor.

We adopt Prof. Peters' name for No. 170, instead of the inappropriate one proposed in France.

THE COMET OF 1672.—Mädler has pointed out a distant resemblance between the elements of the comet of 1672 calculated by Halley, and those of the comet of 1812, which has been found to have a period of revolution of about seventy years, and which therefore might have been in perihelion in the former year. The comet of 1672 was observed by Hevelius from March 6 to April 21, and also by Richer off the coast of Africa during his voyage to Cayenne, from March 15 to the end of the month, though he only described its position roughly. The observations of Hevelius are published in the rare volume of his "Machina Cœlestis" (of which, by the way, the British Museum possesses two copies), and we believe in the small special publication issued at Dantzic in the same year, and entitled, "J. Hevelii, Epistola de Cometâ, anni 1672, Gedani observato, ad Henricum Oldenburgium."

Halley's orbit gives for three dates of observation by Hevelius, adopting his corrected times, the following positions :—

	G.M.T.	Right Ascension.	Declination.
	h. m.		
1672, March 6, at	15 39	353 16	34 57 N.
" " 15, at	7 44	18 2	37 25
" " 29, at	8 8	52 21	30 21 N.

Without attempting an accurate reduction of the Dantzic observations, it may be seen that they agree sufficiently well with the positions deduced from Halley's orbit to render it probable that his elements would not be so far changed by a calculation from the improved places as to bring them materially closer to those of the comet of