monograph enable us to trace the numerous and rapid changes which these carboniferous strata undergo within comparatively limited areas. The manner in which the several members of the series overlap one another, as has already been pointed out by Mr. Davies, is also admirably illustrated in this work of Mr. Morton's.

Perhaps no part of this excellent memoir will prove of more general interest to geologists than Mr. Morton's account of the numerous faults which traverse the district; the positions and effects of these being illustrated by a map and several sections. The isolated patch of carboniferous rocks faulted down among the Silurian strata near Corwen is also more fully described than by any previous author. Besides the numerous woodcuts and lithographic plates, the work is illustrated by three admirable photographs by Mr. W. H. Wilson. We heartily recommend this exhaustive monograph to the attention of our readers, as a model of the kind of work which may be advantageously undertaken by the members of local scientific associations.

J. W. J.

Magnetism. The High School Series. (London: T. Murby, 1879.)

THE anonymous author of this little work of sixty-eight pages has produced a very readable and in many ways admirable primer of Magnetism for boys and girls. Clearly written, well illustrated, and dealing with such matters of experiment as boys and girls can verify for themselves, it will be sure to command popularity. The experiment on p. 22, which suggests the form of the curve of magnetic intensity along a bar-magnet by the length of the chain of nails which can be hung on at equidistant points, thus building up visible ordinates on the abscissæ is new to us, and as neat as novel. One cannot help wondering, however, why the author has assumed that "high-school" pupils must have mathematics and even arithmetic kept almost entirely out of sight. Why the separate chapters are entitled as "Lectures" is not very evident. The "Lecture," for example, on "Diamagnetism"—the ninth of the ten—is just thirty-seven lines long, and takes just two minutes to read aloud!

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

To Astronomers

I HAVE the honour to inclose to you a copy of a circular which I have lately sent out from my observatory to upwards of 200 observatories, public and private, scattered over the face of the globe. I have long felt that it was highly desirable that some means should be found whereby the discoveries in astronomy should be made public in a rapid and systematic manner, more especially in this country, where I am proud to say we number so many among all classes who take an intelligent and earnest interest in the highest of the studies of nature. After much thought as to the best means of carrying out the plan, I determined, it may be presumptuously, to endeavour to do the work myself, and to that end I issued the circular to all directors of observatories whose addresses I could lay my hands upon. Should I have the fortune to receive favourable replies from abroad, I hope to make the matter successful. Now as to the distribution of the news in the British Islands: I am making a list of those who apply to me for the circulars and I will endeavour to post these within 24 hours of receiving the notice myself. I have made arrangements with the telegraph officials, that any telegram addressed (as below) shall be sent out at whatever hour it may arrive: I have further set up a small printing press in my observatory from which to pull the circulars, as I feel sure that this is the most convenient method and the least liable to error.

In conclusion I may add that should any devise a better means

for doing this work, I will at once place my experience at their disposal and do all I can to assist them.

LINDSAY

Haigh Hall, Wigan,

November 29

"The Observatory, Dun Echt, Aberdeen,

"November 1, 1879.

"SIR,—I am very anxious to form some system whereby information of astronomical interest may be rapidly and widely disseminated among English observers; and I would beg to ask for your assistance in carrying out my plan.

"In the event of your discovering a comet, new star, or other object of immediate interest, I would ask you to send me a telegram announcing the discovery and giving such details as are usual.

"I have purposely omitted to mention minor planet discoveries, inasmuch as this branch is already admirably carried out by the Berlin Observatory.

"For convenience, the telegram should be in the form recommended by the Vienna Academy in the 75th vol. of the *Astr. Nachr.*, No. 1785, page 142, as follows:—'Comet (new star, &c.) Discoverer, Date, Local Mean Time of Observation (in hours and minutes), Place of Discovery, Right Ascension *in Arc* (degrees and minutes), North Polar Distance (degrees and minutes), Daily Motion in R.A. and N.P.D. (minutes of arc) plus or minus, Description, Diameter of Comet, &c. (in minutes of arc).

"Thus a telegram would run:—

"'Comet Winnecke 5 April. 1445 Strassburg 33°15' 07508 Motion 0 minus 60.'

"This would read:—

"'Comet discovered by Winnecke, 5th of April, 14 hours 45 minutes Mean Time Strassburg, R.A. 33° 57', N.P.D. 75° 8'. Daily Motion, stationary R.A., minus 60' in Polar Distance.'

"Noughts should be put in where are no significant figures, so as to make three figures for degrees, and two for minutes (five in all), in R.A. and in N.P.D., similarly four in the Local Time.

"Telegrams, &c., should be addressed—

"'Observatory, Dun Echt, Aberdeen.'

"I will engage to distribute the notices of discovery within 24 hours of receiving the telegram, by means of a circular, sent out by first post from my Observatory, to all those who would be likely to make useful observations, and who will also favour me with their addresses.

"At present, it is only by accident that private observers hear of the discovery of Comets, &c., and it is obviously greatly to the advantage of astronomy that early and reliable information should be spread over the British Islands, without having to wait for its publication in some of our scientific journals.

"I should feel much gratified if I may feel assured of your valuable co-operation in this matter.

"Believe me, yours very faithfully,

"LINDSAY,

"Pres. Roy. Ast. Soc."

The Cresswell Cave Exploration, 1876

It seems to me proper to notice the statements made by Mr. Heath in a pamphlet on the bone-caves of the Cresswell Crags, published in August last, and since more broadly put in the Manchester press, calling in question the results of the exploration carried on by the Committee in 1876.¹

It is insinuated that the engraved bone now in the British Museum, discovered by the Rev. J. M. Mello, and the tooth of *Machairodus*, discovered by myself, are not *bond fide* discoveries in the caves of the Cresswell Crags, but were placed there by some one, not specified, and were derived from some other locality, which also is not specified. With regard to the engraved bone, it is only necessary to say that Mr. Heath was not in the Robin Hood Cave when Mr. Mello's discovery was made, while

¹ Committee:—President: Sir John Lubbock, Bart., F.R.S., M.P. Secretary: Prof. Boyd Dawkins, M.A., F.R.S. Treasurer: Fredk. Longden, Esq. Members: Prof. Busk, F.R.S.; Prof. Prestwich, F.R.S.; John Evans, Esq., F.R.S.; A. W. Franks, Esq., F.R.S.; the Rev. J. Magens Mello, M.A., F.G.S.; Rooke Pennington, Esq., LL.B., F.G.S.; William Bragge, Esq., F.G.S.; R. D. Darbishire, Esq., B.A., F.G.S. The work is under the direction of the Rev. J. M. Mello, Prof. Boyd Dawkins and Mr. Heath, F.R.H.S., being superintendents. The Report will be prepared for the Geological Society of London by the Rev. J. M. Mello and Prof. Boyd Dawkins.

it so happens that I was present, and can testify to the accuracy of Mr. Mello's statement. With regard to the tooth of Machairodus, which I discovered and afterwards showed to Mr. Heath, it is asserted that it was without adherent matrix, and without the moisture which it would possess had it been imbedded in the cave for ages. These assertions are disproved by the facts that the tooth unfortunately split in pieces in process of drying, and that the matrix of red earth, only partially removed when it was repaired and gelatinised in the Owens College Museum, is still to be seen in the pulp cavity.

In the exploration of the caves, in 1876, the discoverer, Mr. Mello, was director, while I undertook to name and classify the remains, and we drew up a report published in the *Quart. Geol. Soc. Journ.*, 1877, p. 475. Mr. Heath and myself acted as superintendents of the work, under the direction of Mr. Mello.

It was Mr. Heath's duty as superintendent to hand over to the director the notes on which the above assertions are based, as well as any other notes relating to the work entrusted to him. He did not do so. If he had any fault to find, it was his duty to lay it before the committee, and in the interest of truth to make his statement when the report was read at the meeting of the Geological Society, at which he was present. He did neither of these things. Nor when he had many opportunities of saying what he liked at the meeting of the British Association at Sheffield, after my paper before the Geological Section, and our addresses at Cresswell, did he say one word, although he was present at both. The pamphlet in question was to us the first intimation that he differed with us as to the facts.

In conclusion it only remains for me to add that Mr. Heath was *not* a member of the Exploration Committee, that he was merely a subordinate to Mr. Mello, and that, on his own showing, he kept back for nearly three years notes considered by him to be valuable, which he was in honour bound to communicate at once to the director for the information of the committee—notes which were as much the property of the committee as the fossil remains discovered in the caves at their expense. I am instructed that the only notes which he gave to the director were certain measurements of the inside of the Robin Hood Cave, which it was found necessary to have done over again.

W. BOYD DAWKINS,

Secretary of the Cresswell Caves Exploration Committee, 1876

"The Society for the Encouragement of Literature and Science"

THE attention of the Council of the Geological Society has been called to the prospectus of a "Society for the Encouragement of Literature and Science," in which the letters "F.G.S." are appended to the name of one of the vice-presidents and to that of the "Secretary-in-Chief." I have been directed by the Council to make it generally known that neither of these gentlemen is a Fellow of the Geological Society, as would naturally be inferred from their use of these letters, and I shall feel greatly obliged by your insertion of this note in your columns.

Geological Society,

Burlington House, November 27

W. S. DALLS,

Assist. Sec. Geol. Soc.

THE attention of the Council of the Linnean Society of London has been called to a paper or prospectus of a "Society for the Encouragement of Literature and Science," whereof W. Serjeant-Rodway is stated to be "Secretary-in-Chief," and wherein the names Lewis Biden, A. Ware, and Joseph Blackburn Leslie each appear followed by the letters F.L.S., which letters are those appointed to indicate "Fellow of the Linnean Society"—a chartered society. Its attention has also been called to another paper apparently put forth by a "Conchological Society of London," wherein the name W. Serjeant-Rodway appears as "Secretary and Founder," with the addition of the letters F.L.S. (Lond.).

As no one of these four gentlemen is a Fellow of the Linnean Society, the Council of the same Society has requested me to make the fact known, and I shall therefore be much obliged if you will be so kind as to give insertion to this letter in NATURE.

Linnean Society, Burlington House, ST. GEORGE MIVART
Piccadilly, W., November 27 Zool. Sec. Lin. Soc.

Does Sargassum Vegetate in the Open Sea?

If the correspondent in NATURE, vol. xxi. p. 80, under the above title, would again refer to my communication in vol. xx. p. 578, which I much regret he finds so unsatisfactory, he will

see that the several statements and quotations it contains are exclusively based upon "personal" observations made by myself and by the naturalists on board the *Challenger* during our cruise in the North Atlantic in the year 1873. In replying to his inquiries in vol. xx. p. 552, I was only anxious to supply him with what I considered to be the latest and the most reliable information available on the subject, and which hardly deserves to be qualified as "old reports" and as "a mixture of the prevalent opinion since Columbus and observed facts."

The term *Sargasso Sea* has been extended by geographers, and not incorrectly so, to all oceanic areas where large aggregations of sea-weed are met with, and it does not necessarily imply the presence of Sargassum, i.e., *Sargassum bacciferum* in these regions, since the original Spanish word *Sargazo* (in Portuguese *Sargazo*) simply means "sea-weed." I am, therefore, not surprised that the correspondent should not have found any gulf-weed while crossing the Pacific Sargasso Sea.

Nor can the obscurity in which so many details connected with the gulf-weed are still involved be fairly ascribed to want of observation on the part of the few naturalists who have had the opportunity of studying this interesting alga *in situ*, that is to say, in the middle of the North Atlantic, but rather to the great difficulty, if not impossibility, of ascertaining the life-history of a specimen accidentally found floating on the surface of the ocean. For this reason I fear that some time may elapse before the numerous questions put by the correspondent in vol. xxi. pp. 80-81 can be satisfactorily answered. A botanist stationed for several seasons at Bermudas, or on one of the Bahama Islands, might probably succeed in throwing some light upon the successive stages in the growth and decay of *Sargassum bacciferum*.

J. J. WILD

The Paces of the Horse

I VENTURE to offer the following illustration of the effect produced on the eye by a horse galloping.

I take a pencil, O A, and oscillate it rapidly between the positions O a and O a'. The impression produced on my eye is an indistinct fan-shaped figure, a O a', bounded by two rather distinct images of the pencil in its extreme positions O a and O a'. The indistinctness of the fan-shaped figure is caused by the rapid change of position of the pencil, which is reduced to a minimum at O a and O a', where the pencil swings up to, and returns back from, its extreme positions, passing over the same ground twice in successive instants of time, and thus seeming to pause in the immediate neighbourhood of those positions. An artist representing this effect would draw the indistinct fan-shaped figure; and the two rather distinct images of the pencil at O a and O a'.

The relative motion of the legs of a horse galloping may be looked upon as that of rapidly oscillating pendulums with this very important addition; that besides their pendulum-like oscillations they go through rapid internal changes of form, owing to the bending, or doubling up, of the legs at the knees, hocks, and fetlocks, at every stride. The rapidity of these internal changes is reduced to a minimum when the leg is in its extreme outstretched position. Again, it is in this same position that the rapidity of change of position owing to the pendulum-like oscillation is also at a minimum. The two minimums are, as it were, coincident, and, as a consequence, every leg as it reaches its outstretched position, seems for an instant to pause, leaving a rather distinct impression on the eye. The other legs on successively reaching their respective outstretched positions produce corresponding impressions on the eye. It is a fact that the legs do not reach these positions simultaneously; they reach them successively, but the image produced by one leg in its outstretched position has not time to be obliterated before the images of the other legs are produced in their corresponding outstretched positions. Therefore they appear to us to be all simultaneously in those out-