off with a monograph on Washington Irving, and this will be followed by one on Noah Webster by Mr. H. E. Scudder. Mr. Lowell's biography of Hawthorne, already mentioned by us, will be included in the series, which is designed to contain some fifteen volumes. Among the others will be N. P. Willis, by Mr. Bailey Aldrich; Thoreau, by Mr. Sanborn; Fenimore Cooper, by Prof. Lounsbury; and W. G. Simms, by Mr. G. W. Cable. The English publishers are to be Messrs. Sampson Low & Co.

The College for Men and Women, Queen Square, Bloomsbury, has reopened under Mr. Stopford Brooke as Principal. There will be no further change in the officers of the institution, and it will be worked on precisely the same principles as before, with the advantage of greater force on the side of literary teaching.

Messrs. Kerby & Endean will shortly publish 'White and Red,' by Mr. J. R. Henslowe, author of 'Dorothy Compton.' 'White and Red' deals with the period of the Reign of Terror and the insurrection in La Vendée, the principal incidents being matters of fact.

On October 6th Prof. Seeley delivered a most interesting address at Birmingham as President of the Birmingham Historical Society. The main feature of it was an earnest insistance on the desirability of studying the history of Europe since the French Revolution on the same accurate plan as that on which earlier periods have been studied, and on the need of organizing societies for historical study, if such study is to be regarded as special and scientific.

The Commission instituted, with Imperial sanction, in connexion with the Russian Ministry of Education, for the publication of the letters and papers of Peter the Great, intends, if possible, to commence printing this year. As, however, many pieces of which indications exist are not yet among the documents collected, the Commission appeals to all who may possess any manuscripts written or signed by Peter the Great to lend them for the purpose of being copied, so that the published collection may be as complete as possible. The documents will be returned uninjured to the owners, each of whom will receive a copy of the publication.

Herr Jakob Lökke, the Norwegian writer of a great many valuable educational works, chiefly on the English language and literature, died suddenly at Berlin on the 29th ult., as he was returning home from Carlsbad, where he had been taking the baths. Herr Lökke, who was widely known in England, a country which he was particularly fond of visiting, had not completed his fifty-third year at the time of his death.

A new monthly magazine for self-helpers is announced under the title of *Amateur Work Illustrated*. Messrs. Ward, Lock & Co. are the publishers, and the first part will be published on November 25th. It proposes to include, among other subjects, bee-keeping, carpentry and building, amateur printing and bookbinding, gardening, poultry-keeping, organ-building, ceramics, turning and other woodwork, painting, photography, clockmaking and repairing, boot and shoe making, electro-plating—in fact, everything that may come within the compass of the powers and ability of the amateur, for whose requirements this magazine is specially projected.

Prof. Beal will lecture at University College on Tuesday and Friday next at 3 p.m. Subjects: (1) 'The Mahâkâvya by As'vaghosha'; (2) 'The Mâtangî Woman, its Resemblance to the History of the Samaritan Woman.'

A new weekly paper will be commenced immediately in Huddersfield, to be entitled *The Northern Pioneer*. Its political tendencies will be democratic.

Messrs. Oliphant, Anderson & Ferrier announce a quarto volume, entitled 'The Religious House of Pluscardyn, Convent of the Vale of St. Andrew, in Morayshire,' by the Rev. S. R. Macphail. An introduction will be prefixed, containing the history and a description of the present state of the mother-house of Vallis Caulium (Val des Choux) in Burgundy.

The November number of *Good Words* will contain an article by Mr. J. H. Stone, a member of the well-known publishing house Marcus Ward & Co., upon the Viking ship which was discovered last year in Norway. The illustrations are from photographs taken by the author.

Our last number was the two thousand six hundred and tenth issued by Mr. John Francis, he having become the publisher of this journal on the 4th of October, 1831. The fact is, we believe, unprecedented in journalism; no other London publisher, at any rate, has been connected with the same paper for a period of fifty years.

SCIENCE

The Formation of Vegetable Mould through the Action of Worms, with Observations on their Habits. By Charles Darwin, LL.D., F.R.S. (Murray.)

After forty-four years our great naturalist returns to the subject of one of the earliest papers written by him. With the absolute simplicity and frankness which constitute the chief literary merit of his books, he recounts the observations, scattered now over fifty years, which he has made upon the habits of earthworms, the amount of fine earth brought up by worms to the surface, the part which worms have played in the burial of ancient buildings, and the action of worms in the denudation of the land.

A brief and readily intelligible account of the structure of the earthworm is given. The attempt to distinguish the different British species is not hazarded, as being foreign to the purpose of the work. At the same time some allusion is made to the existence of very numerous exotic species and of their abundance in all parts of the world, including not only the temperate and tropical regions of the great continents, but the remote Polar islands, both north and south, such as Iceland and Kerguelen's Land. Mr. Darwin, citing various authorities and appealing more especially to his own experiments, points out that earthworms can live long (many weeks) under water, but are destroyed by the dry atmosphere of a room even in one night. Their habits are nocturnal; at night they issue from their burrows and crawl on the surface of lawns and foot-paths in great numbers, but in the day usually remain in the burrows, often with their heads near the surface, so that they are largely caught when in that position and destroyed by birds. They have no eyes and yet are sensitive to light, retreating rapidly when brightly illuminated into their holes. Though deaf they possess the power of attention, as shown by Mr. Darwin's experiments, and are sensitive to heat and cold. They possess a feeble power of smell and considerable acuteness in taste, preferring one leaf to another as food. Their most highly developed sense is that of touch, which is almost uniformly active in every part of the body. The complex and beautiful structure of the outer skin has recently been elucidated, and is no doubt the mechanism appropriate to this delicate sense of touch and possibly of light-perception. Of their "mental qualities" Mr. Darwin says:—

"We have seen that worms are timid. It may be doubted whether they suffer as much pain when injured as they seem to express by their contortions. Judging by their eagerness for certain kinds of food, they must enjoy the pleasure of eating. Their sexual passion is strong enough to overcome for a time their dread of light. They perhaps have a trace of social feeling, for they are not disturbed by crawling over each other's bodies, and they sometimes lie in contact.....One of their strongest instincts is the plugging up the mouths of their burrows with various objects; and very young worms act in this manner. But some degree of intelligence appears, as we shall see in the next chapter, to be exhibited in this work,—a result which has surprised me more than anything else in regard to worms."

This intelligence of the worms has been made the subject of most careful and patient experiment by Mr. Darwin, and nothing could more forcibly exhibit the character of the great naturalist's method of work than his account of the study given by him to what must appear, to those who have not the happiness of being naturalists, so trivial and unimportant a subject. It must seem almost preposterous to the many worthy but unthinking persons who have heard of Darwin as the man who has shaken to their foundations the theological and political creeds of the world, whose name will mark the present century as that of Galileo marks the seventeenth, that he, the great philosopher and iconoclast, should occupy days and nights in cutting up paper into triangles and watching to see what the earthworms will do with the bits of paper. And yet *that*, simple and childish as it seems, is the way in which Mr. Darwin spends his time, and has spent his time in past years, and, as a consequence, has gained the immense knowledge of living things and the insight into the working of the natural world which have made him the leader of scientific thought in our time.

We shall not recount those experiments here, which, interesting as they are, form a digression from the main topic of the volume. Observations upon the digestive processes of the worm are more to the immediate purpose. Mr. Darwin shows that earthworms swallow earth for the purpose of extracting nutriment from the organic matter contained in it, but also that they swallow it under other circum-

stances for the mere purpose of burrowing. Moreover, although earthworms can feed on earth alone, yet it is shown that they also are very fond of eating succulent vegetables (especially celery), fat, raw meat, and even their dead comrades. The action of the digestive juices upon these bodies is discussed, and it is shown, as a new fact of great physiological interest, that the earthworm ejects from the mouth on to leaves a fluid which partially digests them before it proceeds to nibble and swallow the softened fragments. Mr. Darwin does not discuss the partiality of worms to manure heaps, which seem to furnish some species (*e.g.*, *L. olidus*) with their natural food. The earth swallowed by the worm is ejected from its intestine in the form of "castings," which are familiar objects enough. Mr. Darwin describes the mode in which these castings are carefully deposited by the worm, and gives figures of remarkable castings made by species of earthworms found in India and Ceylon.

It is by this habit of removing earth from a considerable depth and laying it on the surface in the form of a casting that worms acquire the importance in the general economy of nature which has led Mr. Darwin to devote a treatise to them. "In many parts of England a weight of more than ten tons of dry earth annually passes through their bodies and is brought to the surface on each acre of land." Thus the particles of earth forming the superficial mould are subjected to conditions eminently favourable for their decomposition and disintegration. The finely levigated castings, when brought to the surface in a moist condition, flow during rainy weather down any moderate slope. By this means of removal and others, results far from insignificant are produced. In many places a layer of earth ·2 of an inch in thickness is annually brought to the surface by the worms. If a small part only of this amount flows or rolls or is washed, even for a short distance, down every inclined surface, or is repeatedly blown in one direction, a great effect will be produced in the course of ages. "Archæologists," says Mr. Darwin,

"ought to be grateful to worms, as they protect and preserve for an indefinitely long period every object, not liable to decay, which is dropped on the surface of the land, by burying it beneath their castings."

And he gives some curious instances of the preservation in this way of Roman remains. Worms are shown, moreover, to prepare the ground in an excellent manner for the growth of fibrous-rooted plants and for seedlings of all kinds. They sift it and mingle its constituents intimately together, "like a gardener who prepares fine soil for his choicest plants."

"When we behold a wide, turf-covered expanse, we should remember," Mr. Darwin concludes,

"that its smoothness, on which so much of its beauty depends, is mainly due to all the inequalities having been slowly levelled by worms. It is a marvellous reflection that the whole of the superficial mould, over any such expanse, has passed and will again pass, every few years, through the bodies of worms. The plough is one of the most ancient and most valuable of man's inventions; but long before he existed the land was, in fact, regularly ploughed, and still continues to be thus ploughed, by earthworms. It may be doubted whether there are many other animals which have played so important a part in the history of the world as have these lowly organized creatures."

A writer commenting on Mr. Darwin's conclusions on this subject, first published many years ago, has remarked that, considering the weakness and the small size of earthworms, "the work they are represented to have accomplished is stupendous." And he accordingly combats and rejects those conclusions. In reference to the mental attitude of this critic Mr. Darwin makes an observation which applies very generally to those who have not been able to appreciate the significance of the facts which he has brought forward in relation to other problems presented for solution by the phenomena of life. He says:—

"Here we have an instance of that inability to sum up the effects of a continually recurrent cause which has often retarded the progress of science, as formerly in the case of geology, and more recently in that of the principle of evolution."

Mr. Darwin's method in all his great works consists essentially in recognizing that summing-up of the effects of a continually recurrent cause. No matter how small the cause, Mr. Darwin has shown, as Lyell before him, that the continuity of nature allows vast effects to result from their operation. "De minimis non curat lex" is a maxim which has no application to natural things, but rather, as the poets and philosophers of the ancient world vaguely apprehended, and as Lord Bacon finely phrased it, "Nusquam magis quam in minimis tota est natura."

A Short Sketch of the Geology of Yorkshire. By Charles Bird, B.A. (Simpkin, Marshall & Co.)—Yorkshire is well off in the matter of geological treatises. Probably no county has been more diligently studied by geologists and more fully described; witness the works of Phillips, Green, Miall, Tate, Blake, Davis, Lee, and Huddlestone. Nevertheless, Mr. Bird has felt there is yet room for a small and cheap volume suitable to those who delight in visiting the hills and dales of Yorkshire without caring to master the detailed works of the authors cited above. And Mr. Bird is probably right. To such readers as desire a carefully prepared sketch of Yorkshire geology his work may be confidently recommended. As he had to compress his descriptions of all the formations into less than 200 pages, it might have been expedient to omit much of the general geological matter, such as the description of cave-making in the Carboniferous limestone. Still we can hardly object to some of the every-day knowledge of geologists being occasionally introduced for the benefit of the unscientific reader. It remains to add that the volume contains a small geological map of Yorkshire, neatly chromo-lithographed.

ASTRONOMICAL NOTES.

Mr. W. F. Denning, of Ashley Down, Bristol, discovered a new telescopic comet, with "bright central condensation," in the constellation Leo on the 4th inst. at 15h (*i.e.*, about three o'clock in the morning of the 5th, civil reckoning).

Encke's comet is now receding from the earth, but is still approaching perihelion, and will attain its greatest apparent brightness next week, which is free from moonlight, the comet rising between two and three in the morning. The following are its approximate places until the end of the month from Dr. O. Backlund's ephemeris:—

Date.	R.A. h. m. s.	N.P.D. ° ′
Oct. 17	11 5 14	65 15
,, 18	11 14 26	66 50
,, 19	11 23 18	68 25
,, 20	11 31 48	70 1
,, 21	11 39 59	71 36
,, 22	11 47 50	73 11
,, 23	11 55 25	74 45
,, 24	12 2 42	76 17
,, 25	12 9 44	77 48
,, 26	12 16 32	79 18
,, 27	12 23 7	80 46
,, 28	12 29 31	82 13
,, 29	12 35 44	83 37
,, 30	12 41 48	85 1
,, 31	12 47 46	86 22

The comet (*e*, 1881) discovered by Mr. Barnard at Nashville, Tennessee, U.S., on the 20th of September, was observed by M. Bigourdan at Paris on the 1st and 2nd of October, and by Dr. Hartwig at Strasbourg on the 3rd. The latter describes it "in brightness somewhat greater than the eighth magnitude, round, 2′ in diameter"; as seen with the great refractor, showing only "a bright nebulous mass, destitute of nucleus." An orbit has been calculated by Herr Zelbr, of the Imperial Observatory, Vienna, by which it appears that the comet had passed its perihelion on the 14th of September, and that its apparent brightness is now only about a fifth part of what it was at the time of discovery on September 20th. Its place for to-night, October 15th, is R.A. 13h 48m, N.P.D. 67° 20′, and for Monday, the 17th, R.A. 13h 49m, N.P.D. 66° 22′; it is not far, therefore, from η Boötis, and is low in the heavens after dark, setting about two hours after the sun.

The long-expected fourth edition of Mr. Webb's 'Celestial Objects for Common Telescopes' has at last been published. It is superfluous to praise a book of which every astronomical amateur will as a matter of course possess himself.

ANTHROPOLOGICAL NOTES.

Among recent communications to the Paris Society of Anthropology is a report from M. Lucien Rabourdin, attached to the first mission of the late Lieut.-Col. Flatters across the Sahara from Algeria to Soudan, on the evidences of the stone ages in the centre of the Sahara. Fortunately for himself, M. Rabourdin was not able to accompany the second mission, every member of which was unhappily massacred about the 16th of February last, notwithstanding the encouraging words addressed to them by the mulatto marabout Si Maammar at their departure, "Those who go away for a good purpose find nothing but good and return with it." Fortunately for anthropology, too, he had been able, outside of his official duties, to pursue the researches into prehistoric times, the results of which are set forth in this report. The objects found by him form a collection of 367 specimens, deposited in the museum of St. Germain-en-Laye. From a flint workshop six kilomètres N.N.E. of Wargla 69 specimens were collected, most of them arrow-heads of perfect workmanship. The existence of this store was known to the Arabs, and flint implements had been found there as early as 1867; but M. Rabourdin succeeded in finding other flint workshops further in the desert, and collected in the country of the Tuaregs instruments of a very ancient type, resembling those of Chelles. The Arabs had no tradition of a former population of stone-workers, but gave the credit of the fabrication of these arrow-heads to the djinns, and the Tuaregs, whose own first appearance in Africa is lost in the night of time, were of the same opinion. So far as tradition to the contrary is concerned, therefore, the age of stone in the Sahara may be very remote. Proceeding southwards, he found a few other specimens at the well of Medjira, and as many as 137 at that of Rhatmaia, including a large ostrich egg, opened at one extremity, with the curious accompaniment of a marine shell (*Cypræa moneta*) belonging to the Indian Ocean and a fragment of a polished jade hatchet. These lead him to consider the