[D]EVELOPED IN SIXTY YEARS

[L]YDEKKER WRITES OF THE MARVELS OF SCIENCE DURING VICTORIA'S REIGN.

MR. DARWIN'S DOCTRINE REVIEWED

New and Wonderful Fauna—First Knowledge of the Giant Moa's Existence—Remarkable Animals Discovered.

For The Statesman.—Copyrighted.

London, May 29.—Not the least remarkable among the events which have occurred during the reign of Queen Victoria are those which form mile posts in the paths of biology. Within the sixty years referred to we have first learned of the gorilla, the potamogale, the water-chevrotain, the parti-colored bear, the Australian lung fish and others. The dark corners of the earth have been explored and opened up and the fauna of Thibet and other parts of Central Asia, or a large part of Africa, of New Guinea, of Central Australia, and of many oceanic islands as well as the interior of Borneo and Celebes have been revealed and described.

The orthology of South America has received an especial attention during the reign, while the magnificent expositions have made known the entire fauna and flora of the central districts of the New World. In the classification and morphology of fishes, as also in our knowledge of whales and other marine animals great advances have been made. In embryology and physiology, the strides have been enormous.

New doctrines in connection with the evolution of animal life have also been propounded by Darwin within the period of which I write. Among these one of the most important, and one which has probably played a very considerable part in nature, is that of parallelism in development that is today the independent development of similar structures in different groups of animals living under similar conditions of life. Mimicry, too, is another important factor in nature, the discovery and recognition of which has taken place during the queen's reign.

The cutting of thin sections of animal and vegetable tissues and their examination under the microscope, and the wonderful results that have been obtained thereby, are also a development of the reign as is likewise microscopy in general. Bacteria and microbes, again, are low types of life whose investigation forms one of the greatest achievements of the latter part of the era, and the incalculable benefits which have already been conferred upon suffering humanity by this line of study are well known.

The reign of Queen Victoria will be notable in future generations for scientific discovery and progress, and among the sciences that have advanced by leaps and bounds during the lengthened period, biology must surely occupy one of the most prominent positions. Indeed, it is almost impossible for workers at the present day to realize how imperfect was our knowledge, and how comparatively few were our books on biological subjects in the year of grace, 1837. To give any adequate idea of the amount of progress that has been made in even one branch of this science during the reign, would be manifestly impossible in an article of the present length, and it is hence a matter of extreme difficulty to select points for special mention.

Of Owen's works the greater portion has appeared during the reign, although his memoir on the mammary glands of the duckbill bears the date 1832. This serves to remind us that the history of the monotreme mammals has been practically worked out during the same period, the discovery that these animals lay eggs not having been announced till the year 1884. Although, owing to his persistent opposition to the doctrine of evolution, his theories of the relationship of animals have not met with acceptation, it is difficult to estimate the debt which zoology and paleontology owe to Owen for his work during the reign.

To him is due the honor of making known to the world the former existence of the gigantic extinct moas (Dinornithidae) of New Zealand, and also of the wonderful extinct marsupial fauna of Australia, while he was the pioner in the elucidation of the equally marvelous fossil mammal in South America. Had these faunas not been discovered and worked out, we should never had gained our present ideas of the geographical distribution of animals. To the same master of anatomy is due the description of the long tailed Jurassic bird (Archaeopteryx) in 1862, the fossil being one of the most remarkable "missing links" ever discovered—too late, unfortunately, for Darwin's "Origin of Species." Although many of his views are now proved to be erroneous Owen also did much for the extinct Mesozoic reptiles which he well christened Dinosaurs, and his labors laid the foundation for almost all subsequent work on fossil reptiles in general.

The mention of Dinosaurs naturally leads on to Huxley, who, although by no means essentially a paleontologist, was the first to point out the connection between that extraordinary group of reptiles and birds, a line of investigation in which he was ably seconded by J. W. Hulke. The life work of Huxley was entirely produced during the reign, and how much it contributed to systematic and morphological zoology needs no mention here. One of his most famous memoirs—on the structure of the palate of birds—forms, to a great extent, the basis of the present classifications of the group.

But in popular estimation Huxley's greatest claim is probably his brilliant advocacy of the evolution theory. That doctrine will ever remain the crowning biological achievement of the record reign and it is no disparagement to its illustrious expounders—Darwin and Wallace—to say that it was only through the unwearied labors of workers in other branches of biology during and previous to the early part of the reign, that it was possible for them to have woven the scattered facts and observations into one harmonious fabric.

Although Darwin's name is, in popular estimation, more intimately connected with the doctrine of evolution, that of Mr. Wallace (happily still among us) has obtained a well deserved fame in connection with the geographical distribution of animals, a branch of biological science which may be said to be almost an exclusive product of the Victorian era. It was in 1835, two years only before the accession, that Swainson published his "Geography and Classification of Animals," and from that date till the appearance of Wallace's "Geographical Distribution of Animals," in 1876, this branch of science was being gradually evolved and perfected. Indeed, both on this and the other side of the Atlantic this interesting and important study is still employing the energies of several workers, although it would be obviously inappropriate to say much in this place regarding the labors of living writers. Evolution and geographical distribution may be regarded as sister branches of geology, as neither could exist without the other, and it is difficult to say which is most indebted to its fellow.

From the subject of the geographical distribution of animals and plants there is a gradual and imperceptible transition to the study of the changes in the relative distribution of land and water which have taken place on the surface of the globe during the later ages of its existence. And although this is in reality a geological rather than a biological problem, it is one intimately connected with the fauna of the ocean abysses. The interesting results obtained by the dredging cruises of her majesty's ships Porcupine and Lightning in the summer of 1868, 1869 and 1870, led to the dispatch on December 21, 1872, of her majesty's ship Challenger on a lengthened dredging and exploring voyage, which was brought to a successful termination on May 24, 1876, on the evening of which day the corvette anchored at Spithead. The results of this cruise revolutionized previous ideas as to the nature of the ocean bed and the fauna of its abyssal depths, while a vast store of information was acquired with regard to pelagic creatures of all kinds. During the voyage the art of deep-sea dredging and sounding was brought nearly to its present perfection. This and other cruises made during the reign have brought to our knowledge the luminous fishes inhabitating the dark ocean abysses, and they have also revealed the fact that creatures like the sea lilies, long supposed to be practically extinct, are still abundant at suitable depths in the ocean. The publication of the scientific results of the Challenger's cruise commenced in 1880, and has only recently been completed.

Deep sea dredging is closely connected with the establishment of marine biological stations, and the preservation and breeding of food-fishes and oyster beds. These two are exclusively a product of the reign, and their importance from both a biological and an economical point, and view can scarcely be overrated. Frank Buckland in the first place, and Huxley in the second, have, in this department, well shown how men of the highest scientific attainments can combine the pursuit of their own particular studies with others yielding untold advantage to our fisheries.

An equally close connection exists between deep sea dredging and the study of the growth of coral islands and coral reefs; a subject entering upon the domain of both zoology and geology. This, too, is a subject whose development has taken place during the Victorian era, Darwin's well known volume having in 1851, while Dana's "Corals and Coral Islands" was published in 1875. That the last word has not been said in regard to the growth of coral islands is proved by the recent partially unsuccessful boring expedition to the Barrier Reef of Australia under the superintendence of Professor Sollas. To the older biologists it would, doubtless, come as a severe shock to learn that our massive Palaeozoic and Mesozoic limestones are, to a great extent, merely ancient coral reefs, yet this is only one of the minor recent discoveries connected with the biology of the reign.

Although Cuvier had long previously described the fossil mammals of the gypsum quarries of Montmartre, while a considerable amount of work had already been done on the remains of those from the French and German Tertiaries, most other extinct Tertiary land faunas have been made known since 1837. And what an important part the discovery and description of these faunas and floras have played in regard to our ideas of the evolution of human beings, and also in respect to geographical distribution, needs no telling here. Falconer and Cautley's fauna antiqua sivalensis, in which are depicted the extinct mammalian remains from the Siwalik hills of northern India, seems to most of us a work of very ancient time; nevertheless, the first part did not appear till 1845, while the last was published in 1849. Gaudry's description of the fossil animals of Attica only dates from 1862, while the discoveries of the extinct mammalian faunas of Hungary, Persia, China, and Samos are still more modern events. Within the last twenty years the working of the phosphorites of Central France for economical purposes, has revealed the existence of a numerous oligocene land fauna with which we were previously only very imperfectly acquainted. More important than all are the paleontological discoveries which have taken place late in the reign in the Mesozoic and Tertiary deposits of the United States. These have revolutionized many pre-conceived ideas and have shown that for the future the most important advances in the structure and history of the higher vetebrates of past epochs must come from the other side of the Atlantic. Not only have entirely new groups of mammals, such as the horned dinosaurs and titonatherium, been discovered there, but the remains of dinosaurian reptiles are met with in a state of perfection to which there is no comparison in other parts of the globe. These complete skeletons have not only fully borne out the speculations of Huxley and Hulke as to the close structural resemblance between these reptiles and birds, but have also shown how nearly the restorations attempted by the English anatomists approached the reality. Equally important have been the paleontological discoveries in South America; discoveries which indicate, without doubt, a former tertiary land connection between that continent and distant Australia.

To even allude to some of the paleontological discoveries among the lower groups of animals is obviously impossible in the space at our disposal.

Systematic zoology and botany have passed through several stages during the period under review. As already said, at the commencement of the reign the former was laboring under the thrall of the circular hallucination, from which, however, it at length cast itself free. Since that time a steady progress has, on the whole, been made in most branches, as any one may satisfy himself who contrasts the Linnean system (which was chiefly in vogue in 1836) with that to be found in any better class of modern text books. And here it may be mentioned how vastly superior are these to their predecessors of half a centurry ago. Whether the progress has been equally satisfactory on the species question may well be doubted. Even early in the reign gibes and taunts were freely levelled at the "species monger," and it was thought by many that the publication of the "Origin of Species" would be the death knell of abstraction from which it took its name.

For a time, indeed, there was a lull, and naturalists seemed inclined to take a broader and more philosophic estimate of the amount of differences which ought to be regarded as of specific importance. But of late years, and especially in America, species making has once more taken a new lease of life, and every little more or less constant difference is now regarded as of specific "sub-specific" value. Indeed, we have even heard it whispered that a "species" of snail has been restricted to the individuals inhabitating a particular tree trunk. As in stamps, refinement in making distinctions is almost a inseparable sequence of ardent collecting; but it is permissible to doubt whether the hair-splitting in this respect, characteristic of the present decade, will eventually be included in the biological progress of the Victorian era.

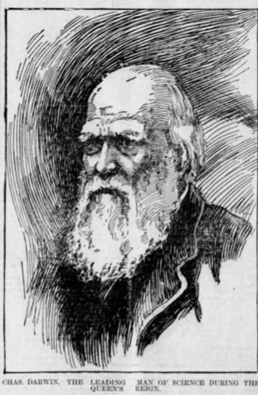
R. LYDEKKER,
B. A. Cantab., F. R. S.

NATIONAL CONVENTION

Travelers' Protective Association, at Nashville, Tenn.

To accommodate the delegates and friends, the International and Great Northern Railroad will run a special sleeper to Nashville without change, on Sunday, May 30, leaving Austin at 12:45 noon, arriving at Nashville at 11 p. m., Monday. This special service is one that should invite liberal patronage.

D. J. PRICE,
A. G. P. A.



CHAS. DARWIN, THE LEADING MAN OF SCIENCE DURING THE QUEEN'S REIGN.

An Open Letter.

Houston, Tex., May 19, 1897.

Col. W. D. Cleveland, Q. M. G., U. C. V., Division of Texas, Houston, Tex.:

Dear Sir—In promulgating advices to the Confederate Veteran camps throughout the state concerning the rates and arrangements made for handling those who will attend the reunion at Nashville in June, we beg that you will embody in your advices the following information concerning our line:

The price of tickets from any main line point in Texas between Houston and Dallas and Fort Worth, or along the line of the Houston and Texas Central Railroad, Missouri, Kansas and Texas Railway, or between Rosenberg, Fort Worth and Dallas on the line of the Gulf, Colorado and Santa Fe Railway, will be $15.50.

The rates from points on our line I give in detail as follows:

Station—	Rate.
El Paso	$29 95
Marfa	29 95
Del Rio	23 40
Eagle Pass	23 35
Uvalde	21 10
San Antonio	18 30
Seguin	17 30
Luling	16 80
Gonzales	16 80
Flatonia	16 00
Schulenburg	16 00
Weimar	16 00
Columbus	15 50
LaGrange	15 50
Eagle Lake	15 50
Rosenberg	15 50
Wharton	16 15
Victoria	17 15
Cuero	17 15
Goliad	17 70
Beeville	18 90
Houston	15 50
Galveston	16 70
Beaumont	15 50
Orange	15 50
Lake Charles	15 50
Welsh	15 50
Jennings	15 50
Crowley	15 50
Lafayette	15 50

The tickets will be on sale June 19, 20 and 21, and will be good for return within ten days from date of sale. An additional limit of ten days for return, making twenty days in all, will be afforded by the purchaser of the ticket depositing it with the agent in Nashville of the Louisville and Nashville Railroad, which agent will give a receipt, which is to be surrendered by the passenger within the required limit for the ticket to be returned with the necessary extension made on it.

The Southern Pacific route affords the unusual advantage of two trains daily, making connection with the Louisville and Nashville Railroad at New Orleans directly, without the necessity of a 'bus transfer, the Louisville and Nashville train passing through the Southern Pacific depot grounds, and having representatives, ticket and passenger, on hand to serve the wants and necessities of passengers.

Ample accommodations in sleepers and in day coaches will be furnished, so that there will be no crowding or discomforts.

If it develops that the business will warrant our making the arrangements, a solid special train will be started out from Houston, running through to Nashville without change.

The sponsor for the state, with her maids of honor, will use the Southern Pacific route, leaving Houston on the evening of June 20, and will arrive at Nashville at 6:45 a. m. on morning of 22nd. Yours truly,

L. J. PARKS,
A. G. P. & T. A.

GREAT GEOLOGICAL MARVELS

STORY OF PROGRESS BY GRENVILLE A. J. COLE, PROFESSOR OF GEOLOGY AT DUBLIN.

DARWIN PLACED IN FRONT RANK

Doctrine of Descent Declared Fully Confirmed—Curious Relationships Between Skeletons—Solution of the Ice Age Problem.

For The Statesman.—Copyrighted.

London, May 29.—As is the case with all other sciences, the progress of geology during the last sixty years has become more and more rapid. Its results have become more appreciated in proportion to the spread of education among the people as a whole. The doctrine of descent, so strongly supported and vindicated by Darwin's treatise of 1859, has found the fullest confirmation in the developments of paleontology.

The splendid series of remains of fossil horses known to us illustrating the successive changes in dentition and in limb bones, and notably in the digits of the foot, has furnished an example that is dealt with now in every text book. Cope has even argued for the independent origin of the horse as a species in America and in Europe by similar selective influences acting on slightly dissimilar original stock.

It must never be forgotten that Darwin himself stands in the first rank of geological observers whether among raised beaches or ancient lava flows or the coral isles of the Pacific. His diary of his share in the voyage of her majesty's ship Beagle appeared as Vol. 3 of the joint report in 1839, but his special geological researches were published in 1842, 1844 and 1846.

Even in the old days of book learning, pupils were at least trained to read books and hence the discoveries of scientific men became in due time accessible to the many. Gradually it was seen that in the observation of the world around us lay the only safe clue to the history of that world in long past ages, and a band of workers arose about the beginning of this century, prepared to treat geology as a branch of natural history, rather than as a ground for dogmatic contention and for the exploitation of theories of cosmogony.

Already, in 1807, the foundation of the Geological Society of London had brought together serious observers, and had a meeting ground provided for those interested in the mineral or the paleontological aspects of the earth. The Geological Society of Dublin commenced its publications in 1832, that of Liverpool in 1859, and that of Glasgow in 1864; while the well known Geologists' association, founded in 1858, has kept hundreds in constant touch with the field work which is the foundation of geological discovery. Thanks to the steady growth of this organization, and of the "field clubs," whose best meetings are held in the open air, geology has assumed its place at the present time as one of the most attractive sciences and its human aspect, the insight that it gives us into the long chains of life forms which preceded the appearance of man upon the globe, affords it, in our revolutionary days, increased importance and vitality.

The general spread of some knowledge of chemistry and physics in our schools and institutions promises that the new observer in geology will receive a more rigid training than was customary sixty years ago. In 1830, Lyell published the first volume of his famous "Principles of Geology" and he still found arrayed against him those who preferred rapid speculation to steady observation, and the reporting of "curiosities of travel" rather than the recording of connected details.

Though Lyell himself can not (mainly on account of his defective eyesight) be classed among the great geological discoverers, yet his methods of work, his continual adaptation of the known processes of the present to the explanation of past phenomena, make him rank among the foremost teachers of the age. His caution, his very respect for the recurring cycles of James Hutton (1795), who had founded the "uniformitarian" school made him at first skeptical as to the reality of organic revolution, but his acceptance of the views of Darwin and Wallace very shortly after the publication of the "Origin of Species," gave a great and further stimulus to geology. Geology has since gone hand in hand with zoology in seeking to unravel the past history of the earth, and the catastropic school, of which even Cuvier was a supporter, has reserved its epochs of deluge and explosion for periods before life existed on the globe.

With the acceptance of rational views as to the origin of the rocks which we see around us, the systematic story of the organic remains found in them became a matter of more serious interest. The foundations of historical geology had been laid by Williams Smith, the land surveyor and engineer, between 1790 and 1815, and Lyell's classification of the stratified rocks that were formed nearest to our own times was only an advanced and special study of Smith's principle. Lyell established the well known terms, pliocene, miocene, and Eocene, and showed what immense changes had gone on in the earth's surface even during these more recent periods. His demands on time were naturally repugnant to those who still held that the earth and all that therein is had existed for only some 6000 years, and physicists, even in later times, have stoutly opposed the geologists in their views of the extreme antiquity of life upon the globe. In the last few years, however, physical experiment has shown that the earth's crust would have reached its present temperature, on the surface of a cooling globe, in a time vastly longer than the physicists were formerly able to concede; and, consequently, geological time, though of course not limitless, may be restored to us in something like the proportions insisted on by Lyell.

It is thus much more easy to conceive the successive evolution of the various life zones that mark out the strata one from another. In 1859, Charles Darwin's "Origin of Species" afforded satisfactory reasons for regarding fossil organisms as a continuous series, the forms of one geological epoch having descended from those of a previous one, and fossils, instead of being treated as more or less imperfect experiments in creation, became the essential alphabet whereby we may trace out the progress of life upon our planet. It was only to be expected that at first many rash genealogies should be put forward, and that many supposed "connecting links" should have later to be shorn away. Even at the present time, the methods of William Smith, involving patient observation as to the relations of the beds themselves, form the only safe basis in deciding the succession of life forms.

Owen, who seemed a lineal successor to Cuvier, brought together into the collection of the British museum a series of fossil vertebrates from all lands and many of Huxley's laurels were gathered while

(Continued on sixth page.)

GREAT GEOLOGICAL MARVELS

(Continued from Fifth Page.)

investigating similar crimes. The discovery of the relationships in structure of many of the cumbrous reptiles of the Mesozoic era the light limbed birds that seem to have arisen side by side with them, is one of the most striking results of these studies in comparative anatomy. While Mantell, Owen, Hulke, Seeley, and other workers have put before us the variety and richness of British reptilian remains, Marsh and Cope have atacked the American fossil vertebrates, and have restored a long series of Dinosaurs, from the Trias to the highest beds of the Cretaceous, which have given us altogether new conceptions of the age of giant reptiles. At the same time, the Permian and Triassic reptiles of Texas and South Africa have been shown to embody hints of the incoming of the mammals, the group of the "Theromorppha" being far less specialized along the reptilian line than are the reptiles of the present day. Owen's Tritylodon, from the Karoo beds of South Africa, remains our best preserved and oldest mammalian skull, and the recent investigation of the milk-teeth or Orinthorynchus has shown relationships between the earliest known animals and the lowest existing order, the monotremes.

Our knowledge of structural geology has progressed with the spread of these accurate surveys, and private workers have occasionally shown how much may be done by patient investigation of a critical district, if aided by that power of comparison and generalization which converts the work of a recorder into that of a scientific master. Professor Lapworth has thus unravelled the complex region of northwest Sutherland and has shown us, since 1883, how we have in our highlands the basal sections of truly Alpine mountain chains. Heim in Eastern Switzerland, Baltzer and others in the Central Alps, Bertrand in the Juras, Lory in Savoy and in Dauphine, have revealed the amount of intermingling and overfolding that has gone on in these regions since Oligocene times. The relations of the central granitic and gneissic cores of mountain chains to the strata upoa their flank becomes one of the most interesting questions raised; and it appears that, far from being the oldest masses, thrust up from below, these cores often represent re-melted material, which flowed into its present position during the actual period of mountain building. Similarly, Dr. Lawson has shown in Canada that the "Laurentian" gneiss is intrusive in the Huronian series, and is thus, in part at any rate, by no means the fundamental mass that it was once believed to represent.

Probably no physical problem has been attacked by geologists more keenly than that of the "great ice age." Since Agassiz, Ramsay, and others pointed out, above 1850, how large a part of the northern hemisphere must have been subject to Arctic conditions of snow and ice, and that these conditions must have prevailed in quite recent geological times, theory after theory has been put forward to account for the widespread phenomena. Professor James Geike published his "Great Ice Age" in 1874—a work now in its third edition—and may be regarded as the strongest champion of the land ice theory. Gigantic glaciers, extending even from the pole, have been invoked by some, while others prefer a combination of land ice from local centres, with floating ice bringing boulders from a distance.

The cold epoch being a certainty, Dr. Croll set himself to account for it on astronomical grounds, and his elaborate theory, promulgated in "Climate and Time," in 1875, held sway over the majority of geologists. Quite recently, however, Mr. E. P. Culverwell has re-investigated the problem on a more modern basis, and regards the astronomical theory as entirely insufficient, so we may be thrown back on what were to Croll, after all, important considerations—the effect of changes in the distribution of snowfields, land, and sea, partially by causing deviations in currents of warm air and warm water.

While geology began its career as a close ally of minerology, the excitement of paleontological discovery for a long time caused the rocks themselves to be little studied. The microscopic observations of Cordier on the constitution of lavas, carried out in 1815, bore little fruit until 1856 and 1858, when Dr. Sorby of Sheffield drew attention to the value of the microscope in determining the characters and mode of origin of rocks. Delesse in France had been a faithful student of polished surfaces but Sorby now introduced the general use of sections, or of powdered materials embedded in Canada balsam. The study of minerals by this method became a favorite one in Germany and France and we owe some of the most important determinative tests to Fouque, Levy, Eusenbusch and Groth, to mention no other names. The establishment of the first geological laboratory by Professor Judd in 1877, whereby the the teachers trained under the department of science and art, as well as the students of the royal school of mines, received practical courses of instruction, probably did more than any other influence to promote the study of rocks in the British Isles and in our colonies. The position of geology as an educational subject rests largely upon its outdoor aspects and Anglo-Saxon geologists have always preferred to base their classification of rocks upon natural relationships traceable in the field.

We have left until the last one of the most vital problems of geological research and one that gives to geology, if we may say so, its enormous moral value. When Lyell published, in 1863, his work on "The Geological Evidences of the Antiquity of Man" he was able to take up an attitude of marked opposition to the prevalent opinions of his day. Early flint implements were, even then, only beginning to be studied, and human remains are notably prone to disintegration and decay. Still, Lyell was able to point to the upper part of a skull, discovered in the Leanderthal in 1857, and to Huxley's description of it, as indicating a type of extinct humanity far lower than that of the average of the present day. Considering the paucity of very ancient human remains, the discovery of two skeletons with skulls of the Neanderthal type at Spy, in Belgium, in 1866, gave immense probability to the idea that a race of men of low average capacity may have at one time peopled the earth; and in October, 1891, Dr. Dubois excavated from volcanic sands near Trinil, in Java, the calvarium described by him as Pithecanthropusverectus. This portion of a skull, with a well developed thigh bone and a molar tooth, were found associated with truly extinct and also locally extinct mammalia and are referred by Dubois to an individual intermediate between man and the anthropoid apes. Other discoveries in this promising area must be looked for before geologists and enthropologists are all in accord as to the significance of these remarkable remains.

Meanwhile, Dr. Fritz Noetling, of the Indian survey, discovered artificially chipped flint implements in pliocene beds in Burmah in 1894, and has rebutted his critics with considerable appearance of success, in a second paper in Natural Science in April of the present year. In the February number of the same journal, Mr. W. J. Lewis Abbott records similar implements from the Cromer forest bed, and few geologists can remain who would deny to man an existence in pre-glacial times. What forms precede reasoning man may still be left in darkness, but the extreme skepticism of some archaeologists and the self satisfaction of those who have failed to follow the course of paleontological discovery can no longer check research into this difficult and fascinating field.

In conclusion, whatever impressions have been made by gifted public teachers we must never forget that each generalization in geology has been founded on a multitude of researches published in our scientific journals. Hidden away there, known only to the specialist, lie the foundation stones of the science. In the multiplication of scientific observers, in their frequent self-sacrifice, in the high dignity of their aims we may see the most stimulating outcome of the progress of these sixty years.

GRENVILLE A. J. COLE,
M. R. I. A., F. G. S.
