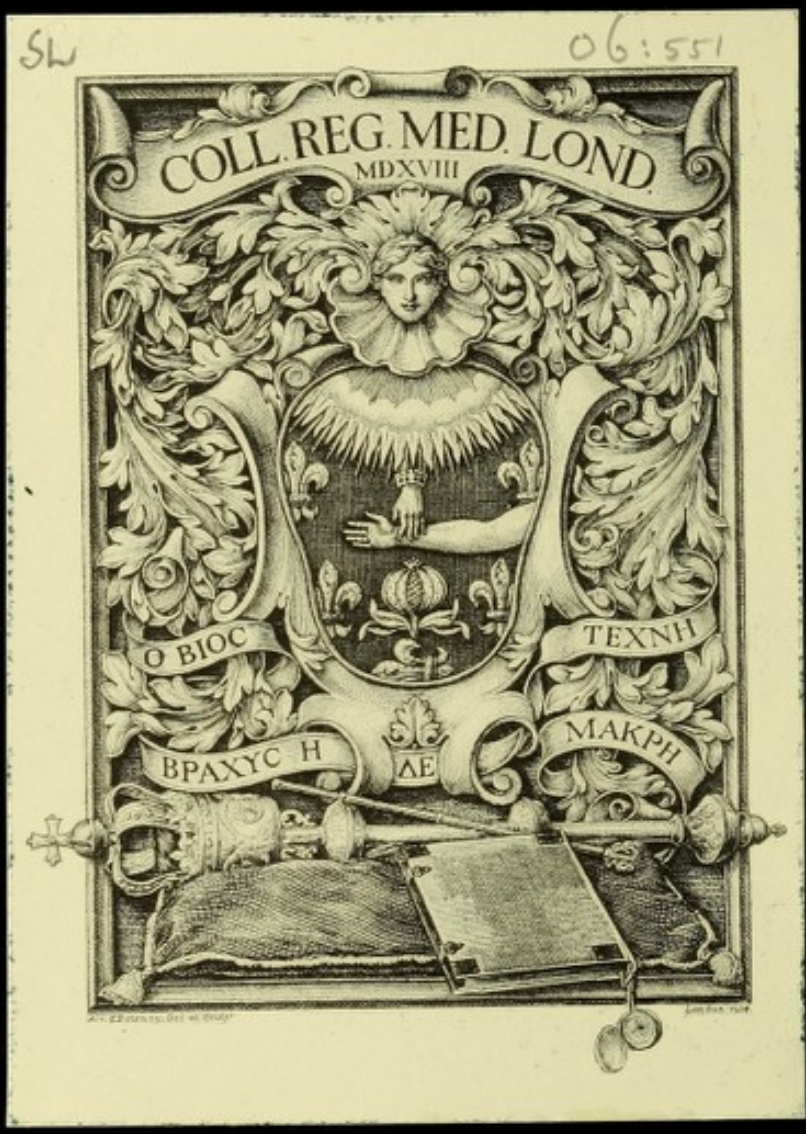
The first hundred years of the Geological Society of London : an address... at the Geological centenary celebration of 1907.

The Centenary Celebration of the Geological Society of London 1907



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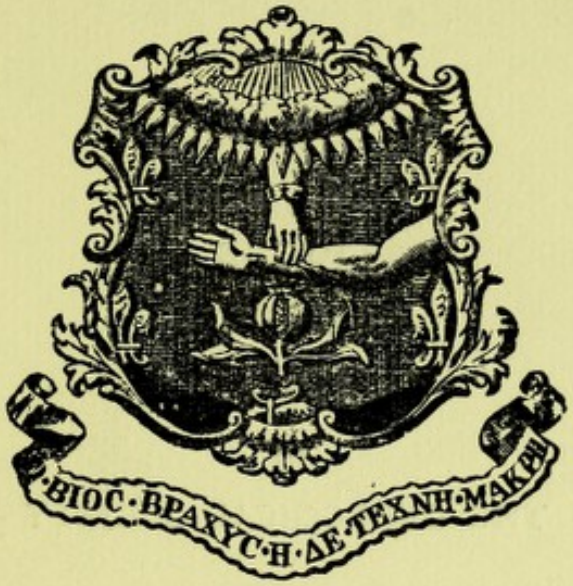
Geological Society of London

An Address



by

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at the Geological Centenary Celebration of
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TO THE

PRESIDENT

AND FELLOWS

OF

THE GEOLOGICAL SOCIETY

Mr. President,

The satisfaction of all of us here present to-day to celebrate with you the birth of the Geological Society of London a hundred years ago, is perhaps especially the sentiment of the learned body on whose behalf it is my privilege to address you at this moment; for not only have we in our office as custodians of the public health participated in the benefits derived from your investigations, but also as men of science ourselves linked up with every kind of philosophical inquiry, have we, working with you in your own sphere of interest, contributed materially to the advance of Geology itself from the early days of its straitened infancy to the robust and satisfactory adolescence it attains to-day.

Common interests.

Ten of your principal officers in the ten decades under review have been trained in medical science; our progress has been concurrent; we have advanced by similar methods; used similar means; the microscope which has given you petrology, has also shown us the bacterial nature of many important diseases, such as diphtheria, erysipelas, typhoid, malarial fever, &c., and has helped us effectively to grapple with these destructive agencies; and we have been equally dependent upon the tributary assistance and resources of common allies in the sciences of chemistry, biology, embryology, and physics. In your early days you were domiciled—with a view to a 'greater appearance

Concurrent progress.

Geological Committee, 1810.

of respectability'—with one of our medical societies, and the physicians regarded your advent with the same fostering interest with which they have always greeted scientific research.

Early geologists.

The founders of the Geological Society, revered fathers in the science, although well acquainted with Aristotle and the ancient geologists, familiar too with the reasoning of René Descartes, were mainly occupied with the fossil-bearing strata and a limited mineralogy, though Kant fifty years earlier had started geological speculations on Newtonian principles as to the origin of things, and had prophetically found that 'the cosmic process is really simpler than the biological'.

But the earth was without form and void, and progress was barred by traditions to which investigations had to be accommodated. You were the pioneers of orderly method and patient investigation, and your initiative has everywhere been followed.

First principles.

Thus the broad outlines of palaeontology, the common property of the geologist and biologist, were traced in the infancy of research, when the widely extended observations of William Smith established the important truth that each stratum contained fossils peculiar to itself, and that the order in which the strata, characterized by these fossils, are superimposed one upon another, is always the same.

It would be difficult to mention any other generalization which has so profoundly contributed to the progress of Geology, for it has enabled geologists to identify rocks, however altered,—whether by interruptions of continuity or structural change; it has furthermore

established an orderly sequence in our knowledge of the appearance and extinction of the beings which have populated the earth during the vast periods of time indicated in the fossil-bearing rocks; and it has singularly justified the well-known analogy of geological and archaeological methods enunciated by Buffon, who appeared, Sir, exactly a century before the birth of your Society.

Founders.

De la Beche was born in 1796; Ramsay came in 1814, and dates his first geological work from 1834; Lyell's first edition was published in 1830. Darwin started in the *Beagle* in 1831, and made his suggestive observation, showing that the fauna immediately preceding that at present existing in a given geographical province of distribution presents the same peculiarities as its successors.

Present status.

It is therefore remarkable that the growth of geology, so deeply concerned with the names just mentioned, should in so short a period have acquired its present breadth of foundation and satisfactory stability.

Your groundwork is permanent, however the agencies we now associate with the processes of building up, depositing, and denuding may need reconsideration from time to time.

Geological Survey.

But Geology is now not only a science, but has also become a career, a profession, with a Department under the Government, ministering constantly to the growing requirements of our race. The splendid work accomplished by the Geological Survey of Great Britain and Ireland, from which the Geological Society of London is truly inseparable, has become a perennial fountain of

practical utility. Every geological feature is now noted by an efficient staff, reduced to scale, and grafted upon the geographical ordnance maps of the country, and thus made generally available. Moreover, when the geographers have outlined the superficial features of a new country or colony, you, Sir, are the earliest forerunners in its settlement and adaptation to the needs of modern civilization; sending forth cultured persons, generally possessing the qualifications of a University education and the practical training of the Survey, who are called to indicate to the engineer where he shall seek for water, where place his reservoirs, what rocks he may have to pierce, determine sites for towns with reference to sub-soils and the influence of the superficial strata, to guide the search for minerals, and to protect in all these, and in many other matters here unmentioned, the community from irrevocable mistakes and losses. Furthermore geology is deeply indebted to the Survey for the skill and insight with which its officers have solved many of the more difficult of geological problems; propounded an intelligible sequence in stratification; explained the imperfection of the palaeozoic record and its gaps; shown the vast periods involved in denudations of materials of enormous thicknesses; the meaning of glaciation and the successive changes in geography and climate recorded in glacial deposits, and also much work of equal magnitude in every department of the science—nearly all of which has been enunciated in these rooms, and with which the imperishable names of De la Beche, Ramsay, Murchison, and Geikie are closely associated.

Practical

and

Scientific work.

The School of Mines and the famous Museum in Jermyn Street, with its practical applications of geology to the public requirements, the collection of minerals, and the series of fossils in stratigraphical order, are all due to the disinterested energy of the Survey officers, and the department is naturally beset with applications for advice on every subject to which Geology is related. Museum and School of Mines.

Thus, then, has your science become established and interwoven with the national life.

You will probably indicate, Sir, in the address to which we shall immediately listen, the direction which geological investigation may be expected to take in the early future. The future of Geology.

It may be assumed that steady progress will continue to be made on existing lines in every branch of present research, and that much will be added to our present scanty knowledge of the population of the earth during the Mesozoic epoch; whilst at any moment, some earlier and less-developed form than we yet possess of man himself may come to light, or at least some knowledge of influences and associations, humanizing in tendency, during which man may have emerged and have become a living soul. Man.

But geologists cannot much longer remain indifferent to the constantly accelerating speed with which our mineral resources are vanishing under the insatiable demands of a modern and wasteful progress. In the early days of the Geological Society, our coalfields were practically untouched, our sources of petroleum unknown; but almost every step since taken in the national advance and increase has contributed to the Mineral resources.

prospect of a paralysis of progress, and a waning of prosperity at no far distant date, by the wanton exhaustion of our material resources.

New fountains of energy.

New fountains of energy, solar or terrestial, must be tapped if population is still to increase and the evolution of our race is to proceed; and if, as we were told at the meeting of the British Association a few days ago, geological investigation is now to change its course and go deeper, we cannot do better than look into our vast stores of underground heat, as yet quite unutilized, and consider the practicability of their application to the supply of energy at the surface, whether by conduction, or by some simpler and more direct means of converting heat into electricity than we yet possess. The thermopyle may be our starting-point in this direction.

Under-ground forces.

Meanwhile, these underground forces have other interests for us, neither have we yet subdued them. They are constantly in movement; never quiescent; and from time to time they are manifest at the surface in earthquakes, sea waves, and volcanic eruptions. We register their force and forecast their outbreakings by instruments sensitive to vibrations.

Earth-quakes and Earth-currents.

I have reason to believe, however, from practical observations, that we shall by and by obtain a more exact estimate of the significance of underground commotions, by the measurement of the magnetic disturbances due to them to be observed in the conductors of the long submarine cables which now so amply link our continents in communication: and as a case in point I have notes showing magnetic disturbances

which gave, for three days at least, premonitory indications of a coming commotion which destroyed the cable in which I was observing, caused a huge landslip, generated a destructive sea-wave, and broke up so much of the sea bottom in the district agitated as to render it necessary to swerve fifteen miles from the old course in seeking for a smooth surface in the ocean to receive a new cable.

Time.

We may also expect some elucidation of the time problem. Geologists are constantly challenged by the physicists to defend their demands for the vast periods of time they require to account for the deposition and denudation of the rocks and also for the evolution of the present forms of living things from primitive types, and though 'they do not now consider the question of absolute dates as outside the scope of their investigation,' there is at present little agreement amongst them as to the period of time consumed in any single feature of errosion, though substantial efforts have been made to arrive at measurable data by the study of the influence of flowing streams, the recurrence of glacial epochs, and other means. The records are so vast that many of the earlier geologists were driven to regard time as an infinite quantity rather than to attempt to estimate in millions the years which may have been required for the evolution of the present order, inorganic and organic.

Kelvin.

Estimates of time.

The Earth's first fitness for living things.

But the students of physics not only opposed all this, on Lord Kelvin's well-known deductions from tidal retardation and the rate in loss of the earth's underground heat, &c., but they turned upon the geolo-

gist, and cast upon him the onus of fixing a date for the first fitness of our planet to support living things, and for the more ancient beginnings of the first stratification.

Lord Kelvin on the age of the Earth as an abode fitted for Life.

'The age of the earth as an abode fitted for life is certainly a subject which largely interests mankind in general. For Geology it is of vital and fundamental importance—as important as the date of the Battle of Hastings is for English History.'

'It is quite certain that a great mistake has been made—that British popular Geology at the present time is in direct opposition to the principles of Natural Philosophy.'

'Further as to the future, we may say with equal certainty that the inhabitants of the earth cannot continue to enjoy the light and heat essential to their life for many million years longer, unless new sources, now unknown to us, are prepared in the great storehouse of creation.'

Life in the first century of the solid Earth's history.

Such announcements, and the authority with which they came, profoundly affected every thinking geologist, and very serious efforts—some of them extravagant—were made to harmonize the record of the earth with the mathematical limit now imposed. Estimates in years fell from five hundred millions to twenty millions, as giving sufficient time to account for everything; and Lord Kelvin wrote: 'We cannot doubt that Confervae in a pool or rivulet of warm water, in the early years of the first century of the solid earth's history, if favoured with sunlight, would have lived and grown,' &c.

But everything was felt to depend upon the reliability of the material which the mathematical mill (Huxley) had been set to grind. Mathematical mill.

Meanwhile, in quite recent years investigations of momentous importance have been made, and we are now in possession of Radium, and the almost universal manifestation of radio-activity as a property of matter. These discoveries, which week by week seem to be affecting our conception of the elements in a manner truly revolutionary, have shown that we have present with us 'no new sources of light and heat prepared and stored up', but a concurrent and unexpected form of energy, whose powers and limitations we have yet to grasp; and if we are not yet prepared to go the length (with Ray Lankester) that 'away go the restrictions imposed by the physicists on geological time, who are now willing to give us not merely a thousand million years, but as many more as we want,' we may at least consider the radium emanation in association with the vast volume of Helium discovered by Lockyer in the solar atmosphere, and contemplate the entirely new and deep significance of such an influence in relation to the sustaining causes of an unwaning energy. Howbeit, experimental verification has yet to show that the ample super-structure reared by mathematicians and physicists upon the apparent properties of radium, is well-founded and worthy of general acceptance. Radium and Radio-activity. Helium.

The first paper received by the Geological Society on Foreign Geology came from Madeira, and was published in the first volume of *The Transactions* in 1811; and it is certainly impossible to gaze upon these same

Myocene rocks.

myocene Atlantic rocks where these words have taken shape; to contemplate in the clear cut vertical faces of the stupendous sea cliffs the history of many a long period, now of volcanic activity, and again of long repose and slow erosion—all bearing testimony to the reiterated obliteration and renewal of old habitable surfaces—and to view the many forms of living things which have either long ago developed locally or are surviving emigrants from a former myocene continent; without a deep sense of the vast antiquity of the structure thus slowly evolved. The changes here registered, moreover, have been accomplished in the region subject only to the placid flow of time, to slight climatic changes and disintegrating agencies; and when we consider that the whole epoch involved is but a small and later part of the myocene division of the Tertiary formations in the tremendous series of all the earth's stratified deposits—almost all of them associated with impenetrable periods of erosion and denudation, we may surely ask the mathematician, if his mill has to be reset, to deal gently with the geologist, and to afford him all reasonable scope for his vast meditations.

Evidences of vast antiquity.

'Deal gently and without shedding of blood' was the mediaeval formula for burning alive.

Kant.

But, again, 'the cosmic process is really simpler than the biological,' and although the conviction may be settling in the minds of nature-searchers that matter from the beginning possessed, or was given, potency in the evolution of living tissue, the deep gulf between the inorganic and organic is at present quite unfathomed. Neither have we any knowledge of an organizing tendency in any concourse of atoms (? fortuitous), pointing out a way to us towards transition.

The only living substance known to us is the offspring of parental tissue, and it is quite inconceivable that we can ever hope to reproduce and imitate synthetically that which is already impressed and specialized by antecedent association—whether by molecular arrangement or otherwise—for growth and development in a certain course; however accurately we can analyse the mere physical qualities of organized material. Life and Matter.

Hence the physicist is not afraid to assert that the commencement of life 'certainly did not take place by any action of chemistry or electricity, or crystalline grouping of molecules, under the influence of force, or by any possible kind of fortuitous concourse of atoms'. 'We must pause face to face with the mystery and miracle of the creation of living creatures'; while the biologist is equally confident that 'the whole analogy of natural operations furnishes so complete and crushing an argument against the intervention of any but what are termed secondary causes in the production of all the phenomena of the Universe; that, in view of the intimate relation between man and the rest of the living world; and between the force exerted by the latter, and all other forces, I can see no excuse for doubting that all are co-ordinated terms of nature's great progression, from the formless to the formed, from the inorganic to the organic, from blind force to conscious intellect and will'. Lucretius is on the same side. Lord Kelvin. Huxley.

> Haud, ut opinor, enim mortalia saecla superne
> Aurea de coelo demisit funis in arva
> Nec mare nec fluctus plangentis saxa crearunt,
> Sed genuit tellus eadem quae nunc alit ex se[1].

Lucretius.

[1] Lucretius, 50 B.C., De Rerum Natura, ii. 1151.

Formerly the mere enunciation of the latter views would have exposed the present speaker—whose orthodoxy would have availed him nothing—to the condemnation of the potent theologists of past times.

Hurt by no persecution.

But the modern investigator may proceed in peace of mind, for they who in the dawn of geology so ingeniously wrought upon the simple narrative in the first chapter of the grand old Book are equal to another effort; and it is impossible to contemplate the progress of the New Theology, and the attenuated views of Inspiration now prevalent, without reflecting that it may yet be the task of the geologist to restrain the theologist.

The 'educability' of the latter is far advanced, and it is probable that if life were manufactured in a laboratory to-morrow, the impiety would be received in sullen acquiescence, with the third only of the usual three struggles in the theological assimilation of a scientific truth [1].

Our next meeting.

I do not, however, presume to suggest that the biologist is about to give us a practical illustration of life as a property of matter—let me rather relegate the nebulous problem to the elucidation of my successor at your next Centenary celebration.

Practical work and speculative inference.

It is enough to give thus a vivid realization of the bewildering breadth of the path of investigation into which geology is inevitably being led by the growing ties of collateral science, and the increasing difficulty of a patient worker in a single track, as of palaeontology or petrology, to keep in touch with the speculative deductions which often outrun the progress of sub-

[1] (1) It is not true. (2) It is nothing new. (3) It does not signify.

stantial observation. Let such a worker apply himself to your motto—'Atque non disputando adversarium, sed opere naturam vincere, denique non belle et probabiliter opinari, sed certo et ostensive scire.'

As others see us.

Doubtless we are tending to a higher pitch and elevation of thought, and from the commanding view posterity will take, our present position will seem to betoken the yet early condition of our knowledge, and perhaps the penury of our mental resources and the inveteracy of the prejudices in which we are still immersed.

College of Physicians' fostering influence.

We, Sir, of the College of Physicians, have now entered upon the 389th year of our corporate existence; we took part in your foundation, as we fostered the rising of the Royal Society a hundred and fifty years before you; and in the plenitude of our priority and precedence, our wide influence acquired by the promotion of natural knowledge; we infer the assurance of your progression from the solid foundations on which you are building, and from the eminent services you have already rendered.

Progress.

Your progress will not slacken; discovery will beget discovery; practical work, prudent and sagacious, will regulate the scope of generalization, and knowledge will overflow—to the benefit of mankind, the credit of our race, and the honour of the Geological Society of London.

Τεθεμελίωτο γὰρ ἐπὶ τὴν πέτραν.

Oxford : Horace Hart
Printer to the University