

estimate—the maximum effect, leaving out of account internal friction, would be equal to raising a column of rock 1000 feet above the normal of the Earth's surface; but, when we come to consider a local contraction of the crust, we have an exceedingly complex problem to deal with. Each section of the spherical shell, such as we have assumed, would initially possess tensile strength sufficient to put the same pressure per square inch upon the interior of the sphere that the whole shell would; but, as the area became flattened by contraction, its power of compression would become proportionally less. Taking this into consideration, together with internal friction, in small areas the elevatory effect by transference of material would become infinitesimal.

If this reasoning be true, and I believe it to be so, Mountain-Making by Tension is an impossibility. It will not account for either the shape, height, bulk, or linear direction of Mountain Ranges as we know them, much less the compression and folding most of them have undergone. We are thus thrown back upon some theory of compression would we account for mountain-structure as seen in Nature.

Before concluding, I would point out that, in addition to these quantitative deficiencies, Mr. Vaughan's theory seems to involve a mechanical contradiction. If the tensile strength of the contracting crust were great enough to do the required work, a strong enough anchorage would be needed at the boundaries; whereas by the hypothesis this is the weak part, otherwise it could not be elevated by material forced to flow under it from below the contracting area. It seems to me very like the case of a man trying to lift himself up by pulling at the chair he is sitting upon.

PARK CORNER, BLUNDELL SANDS, LIVERPOOL.

T. MELLARD READE.

OBITUARY.

WILLIAM TOPLEY, F.R.S., F.G.S.

BORN MARCH 13TH, 1841.

DIED SEPTEMBER 30TH, 1894.

(With a Portrait.)

WILLIAM TOPLEY was born at Greenwich, on March 13th, 1841; and after gaining his early education at local schools, he received, during the years 1858–61, the valuable scientific and practical training of the Royal School of Mines.

In 1862 he was appointed an Assistant Geologist on the Geological Survey, when Murchison was Director-General, and Ramsay was Local Director for Great Britain. He then commenced field-work under the guidance of Dr. (now Professor) Le Neve Foster, who, with others, was engaged in the Survey of the Wealden area. There he was initiated into the methods of geological mapping among the changeful Hastings Beds, at Mayfield and other places between Burwash and Lindfield, to the south of Ashdown Forest. There, too, in course of time, he gained a detailed knowledge of the Cretaceous and Neocomian formations, and his interest was aroused in questions of Physical Geology, to which for many years he gave particular attention.



*John Smiley
and Family*

In conjunction with his colleague Dr. Foster he made a study of the superficial deposits over a large part of the Wealden area, and more especially of the gravels of the Medway valley; and together they elaborated in 1865 the well-known paper in which they brought their knowledge to bear on the vexed subject of the Denudation of the Weald. In this essay they gave numerous facts and new arguments to prove, what had in general terms been taught by Ramsay, that the main features of the ground were sculptured by the agency of rain and rivers.

On the completion of the Geological Survey of the Wealden area, the preparation of the descriptive Memoir devolved upon Mr. Topley. Other colleagues, Mr. F. Drew, Mr. C. Gould, and Dr. Foster, who had mapped large portions of the region, had resigned their official positions; but Mr. Topley had had numerous opportunities of becoming generally acquainted with the entire district. How carefully his Memoir was written, and how exhaustively (so far as our knowledge then existed), is known to every geologist. The book, which was published in 1875, at once became the standard work of reference; for, apart from its original information, it gave evidence, as did all his writings, of a thorough study of the publications of other observers, and a full acknowledgment of all they had done.

Meanwhile Mr. Topley had been instructed to proceed to the Coal-field of Northumberland and Durham, and much of his literary labour connected with the Memoir had to be performed in that northern region in the winter time, or at other seasons when field-work was impracticable. In 1868, after six years' service, he had been advanced to the rank of Geologist on the Geological Survey—promotion in those earlier days being far more rapid than at the present time.

When, in 1872, the Committee of the Sub-Wealden Exploration commenced their active operations near Battle, Mr. Topley was, of course, specially interested. He was one of the first to be consulted, and, later on, he was expressly sent by the Geological Survey to the locality, to examine and report upon the cores brought up by the boring-apparatus. He was thereby enabled to record, in his Memoir on the Geology of the Weald, particulars of the strata and their fossils to a depth of over 1000 feet. The classification of the strata given in that work was subsequently modified, and Mr. Topley from time to time contributed many reports and other articles on the subject (see Appendix).

A considerable portion of Mr. Topley's sojourn in the north was spent at Rothbury, near Morpeth, and at Alnwick, where his studies were directed mainly to the Carboniferous rocks and to the Glacial Drifts. The nature of that great sheet of basalt known as the Whin Sill, also engaged his attention and that of his friend and former colleague, Prof. Lebour, and the result of their observations was to prove its intrusive character.

The subject of Denudation never ceased to interest Mr. Topley, and when, during the early years of the *GEOLOGICAL MAGAZINE*,

many warm discussions took place concerning the origin of escarpments and other features, he joined in the fray on behalf of sub-ærial agents. In confirmation of views that had been expressed with regard to other regions, he pointed out how in East Yorkshire anticlines, by their fissured summits, had been readily acted upon by inland agents of erosion, whereas, in certain cases, synclines had better withstood the assaults of rain and rivers.

In 1880 Mr. Topley was called upon to abandon his field-work in Northumberland in order to superintend the publication of Maps and Memoirs at the Geological Survey Office in Jermyn Street. This post, which for many reasons was congenial to him, he continued to occupy; and on the retirement of Mr. Edward Best in 1893, Mr. Topley was entrusted with the entire charge of the office. Throughout this period in London the multifarious duties of the department gave but little opportunity for continuous scientific work: ever busy, he was seldom able to do more than the routine work of the office, but his wide knowledge and experience were always at the service of his colleagues and of others who frequently sought advice and information.

Eager at all times to promote the progress of Geology, Mr. Topley took a leading part in the work of that most useful compendium of geological literature, the *Geological Record*; and here his extensive acquaintance with bibliography was of great service. Finally, in 1887, he undertook the post of Editor, at a time when the *Record* was in a somewhat troubled condition, owing to delays in publication. These had arisen, despite every effort made by the untiring and disinterested exertions of the original Editor, Mr. Whitaker. In labour which is arduous, by no means uniformly interesting, which brings but little credit, and is wholly unremunerative, it is far from easy to gain and retain steady-working contributors. Men may come to aid the work; but too often they go after dissipating a small amount of energy in recording titles and making short abstracts of papers. Two volumes, dealing with the literature of 1880–84, were brought out in 1888 and 1889; but, even with the effective help rendered by Mr. C. D. Sherborn, the *Geological Record* had ultimately to be abandoned.

Mr. Topley joined the British Association at the Meeting held in Brighton in 1872, and was at once made one of the Secretaries of Section C (Geology); and from 1872 to 1888 he served this office during no less than fifteen meetings. He was for several years Secretary of a committee appointed by the Association to report upon the Coast Erosion of England and Wales. He was also for some years a member of the Councils of the Geological Society and of the Geologists' Association. In 1885 he was elected President of the latter body, and during his term of office he prepared the interesting account of "The Life and Work of Professor John Morris," which he read in 1886 in place of an Anniversary Address. The long excursion of the Association for the same year was made to the Ardennes on the frontier between Belgium and France; and this, their second foreign excursion, was one

of singular interest and success. It was organized with the aid of M. Dupont, but the arrangements and direction of the excursion fell largely upon the President, Mr. Topley. In the following year, aided by Professor Lebour, the President conducted the Association to many of the scenes of his former labours in Northumberland. On other occasions he led the Members to some of his old haunts in the Wealden area, and to several localities in and around London.

When the International Geological Congress arranged for a meeting in London in 1888, Mr. Topley (who had attended previous gatherings) was chosen as one of the Secretaries, and then, not only during the meeting, but for a long while before and afterwards, his energies were severely taxed with the many duties he had to perform. One feature of this London meeting was the promptitude with which the printed agenda and reports of proceedings were issued day by day—work that was only accomplished by dint of burning much midnight oil.

In 1885 Mr. Topley had prepared an elaborate Report on the National Geological Surveys of Europe; and he was much interested in the question of an international scheme of colouring for geological maps. He had, in 1881, been appointed to superintend the publication of the British section of the Geological Map of Europe, promised by the International Geological Congress; and in 1888 (conjointly with Mr. J. G. Goodchild) he prepared the excellent little Geological Map of Europe which accompanies the second volume of Prof. Prestwich's Geology.

Thus were his services in constant demand. At one time Agricultural Geology occupied a large share of his attention, and he had gathered together much material bearing on the subject, with the view of publishing a work on Soils in their relation to Geology. Several essays dealing with these matters were printed, and perhaps the most important outcome of his studies in the South-east of England was his paper dealing with the connection between the Parish Boundaries and the great physical features which are dependant on the geological structure. The subject was first brought before the Brighton meeting of the British Association in 1872, and it there attracted very considerable attention. The author showed how the ancient divisions of the land were made according to the water-supply, the soil, and situation; portions of down-land being taken to pasture sheep, the productive tracts for agriculture, and portions of forest-land, whether wood or open glade, for swine and as pasture for cattle.

In later years the subjects of Applied Geology occupied the greater part of Mr. Topley's leisure hours. He had given a good deal of attention to the mode of occurrence of Phosphates; he wrote a report on the geological distribution of Gold and Silver; discussed the schemes for the construction of a Channel Tunnel; and wrote concerning the discovery of Coal in Kent.

The subject of Water Supply, however, more than any other engaged his mind, and it was one on which he was recognised as a leading authority. The needs of Hastings, Tunbridge Wells,

Croydon, Birmingham, as well as of London, and many other centres, large and small, were investigated and reported on by him; and during the sittings of the late Royal Commission on Metropolitan Water Supply he gave most important evidence, besides officially doing much work for the Commission in the preparation of maps and sections for the Report.

Sanitary Science was another branch of the subject to which he had applied his knowledge. He assisted Sir George Buchanan, in 1867, in a Report on the Distribution of Phthisis as affected by dampness of Soil; and in 1890 he was appointed chairman of Section III. of the Sanitary Institute, at the Congress held at Brighton. He then delivered an address on Geology in its relation to Hygiene, as illustrated by the Geology of Sussex.

To the study of Petroleum in its geological aspects he had latterly devoted much time, and he had in view the preparation of a treatise on that subject.

Mr. Topley's published Papers and Memoirs amount to eighty-two in number; his Survey Maps to twenty-one sheets, with three vertical and five horizontal sections, illustrating the Northumberland Coal-field and the Wealden area.

His knowledge, however, was by no means restricted to matters of professional concern. In his early days in the Weald, as Professor Le Neve Foster informs the writer, Mr. Topley was fond of Botany, and the two friends collected many specimens for determination at their field-quarters. At that time, too, he was a great reader of the works of Carlyle. Poetry, again, and the Fine Arts were subjects in which at all times he was greatly interested, and with which he possessed more than an average acquaintance.

Since 1875 Mr. Topley had been Examiner in Geology to the Durham University at the Newcastle College of Science; he also succeeded the late Mr. Bristow as Examiner in Geology to the Science and Art Department.

He was elected a Fellow of the Geological Society in 1862; an Associate of the Institute of Civil Engineers in 1874; and a Fellow of the Royal Society in 1888.

Full of energy until within about three weeks of his death, he had attended the Zurich meeting of the International Geological Congress. There, as an acknowledgment of his services, and a testimony to his wide acquaintance with the subject, the chairmanship of the Committee on Bibliography was offered to him; but this he declined on the ground of insufficient acquaintance with spoken French. Leaving Switzerland he subsequently paid a short visit to Algiers, when serious illness overtook him. He had barely time to reach his home at Croydon, ere he was prostrated, and he finally succumbed to an attack of gastritis on September 30th, 1894.

The record of his life is one of constant and unremitting labour. Yet he was ever cheery, and what was perhaps most noteworthy, however much he was occupied, he was always willing, and without any trace of impatience, to be interrupted.

It is sad to feel that he has left unaccomplished several tasks which he had planned, and which he was peculiarly well fitted to perform; but, nevertheless, he leaves behind him a substantial record of good work done. It is far sadder to think of the loss of a most kindly, amiable nature—of a true friend, whose readiness in helping others too often stood in the way of the fulfilment of his own desires.

H. B. WOODWARD.

REV. HUGH MITCHELL, M.A., LL.D.

BORN JUNE 22ND, 1822.

DIED NOVEMBER 10TH, 1894.

HUGH MITCHELL was born on 22nd June, 1822, at Aberdeen, where his father held a situation in an ironwork. The son, after attending a private English school, proceeded to the City Grammar School, and afterwards went through the curriculum of Marischal College and University. He was always a diligent student, and graduated Master of Arts in 1841.

Of all the classes he attended none pleased him more than that of Natural Science, then admirably taught by Mr. John Shier, LL.D., a much abler man than the aged Professor for whom he acted as substitute. Hugh gained the second prize, and also distinguished himself highly in the chemical class. In company with the writer of this notice, he subsequently roamed the country for miles round Aberdeen, making Natural History collections. Geology and Mineralogy were his heart's love.

Having studied for the Christian ministry, he was ordained in 1848 to the Free Church of Craig, near the southern shore of the South Esk, in Forfarshire, and not far from Montrose. Many of his congregation were Ferryden fishermen, whom he spiritually benefited and whose affection he retained for the 46 years that he continued in the active discharge of his pastoral duty. He took much interest in the condition of the children, and for more than fifteen years was Chairman of the Craig School Board. Whenever leisure was obtainable, he employed it in prosecuting his scientific researches, but was careful that they should not encroach on his proper duty. Only one slight failure in this respect is remembered.

The "Dundee Advertiser" in a long and appreciative notice of Dr. Mitchell, to which the writer has been much indebted in preparing this obituary notice, puts it on record. We give the details, feeling assured that the one solitary lapse will be condoned, if not even regarded with positive favour, by readers of the GEOLOGICAL MAGAZINE. Mr. Mitchell had walked some miles in July, 1857, to baptise a child in a part of Forfarshire, some distance from his ordinary sphere of labour. On arriving, he found that the father had not returned from his work, so, not to lose time, the minister asked the mother to lend him a hammer, and took his way with it to a quarry. He had previously found ichthyic fragments in Canterland Den, but here, at Farnell, on splitting a slab, he laid bare a small, beautifully distinct, and almost perfect fish. He dropped the hammer, forgot all about the baptism (which he performed, with an apology, a fortnight later), and hid him home-ward with his treasure. Sir Philip Egerton named it after him,