

switching, volume indication and control. Special arrangements are also made for adjusting the volume distributed to each projector, and if necessary the operator can bring reserve apparatus into operation. At the opening ceremony, the control engineer watched the royal platform, the operating engineer stood by the amplifier panels, and all the observers were at their posts. When the control engineer gave the signal, the loud spoken signals were heard with the greatest ease by an audience of 120,000. The observers were all kept busy telephoning to the control station messages to increase or diminish the sound volume so as to give the most satisfactory results in each area. All the equipment was duplicated so as to obviate the risk of a breakdown.

The speeches were also carried by cable to the London Broadcasting Station, where they were broadcasted over the British stations by the British Broadcasting Company and the Marconi Company. The ceremony was heard excellently in receiving sets all over the British Isles, and in several distant towns it was made plainly audible to large crowds by means of loud speakers many of which were provided by some of the daily

newspapers. They were also heard at many stations abroad. The apparatus employed and the great care and forethought exercised by the engineers made both the "public address system" and the broadcasting methods a great success. There is plenty of scope, however, for inventors to increase the efficiency and diminish the cost of the former, and there are many acoustical problems in connexion with the latter that have still to be solved.

The Exhibition was inaugurated in the presence of a great gathering in the Stadium at Wembley; the proceedings were followed with enthusiasm and interest by a vastly greater body of the general public through the medium of the broadcasting services; the news of the opening was telegraphed round the world. It now remains for the Exhibition to justify its magnificent send-off and to make a name for itself as a landmark in the history of the world. It will be impossible for us to attempt to mention more than a few of the exhibits relating to science and technology, but we hope that the articles to be published in our columns will present some of the chief aspects of the Exhibition of interest to scientific readers.

### Obituary.

PROF. GRENVILLE A. J. COLE, F.R.S.

ON April 20, after several years of acute suffering, most patiently and cheerfully borne, died Grenville Arthur James Cole, professor of geology since 1890 in the Royal College of Science, Dublin, and since 1905 Director of the Geological Survey of Ireland. He was the son of J. J. Cole, architect to the London Stock Exchange and a pioneer in geological photography, was born in 1859, and educated at the City of London School under Abbott, and at the Royal School of Mines. He was trained in geology by Prof. Judd, and in 1880 was appointed to a demonstratorship created for him in the Geological Division of the Royal School of Mines, where he served until his appointment as professor in Dublin in 1890. In him, Prof. Judd found an active and able lieutenant in shaping and developing the practical laboratory course, the first established in Great Britain, which was made, and has since been maintained, as the characteristic feature of geological training at the conjoined School of Mines and College of Science. To such a course his most valuable contribution was perhaps his "Aids in Practical Geology," first published in 1890, and afterwards improved and kept up-to-date.

Cole's earliest published work was in conjunction with Prof. Judd, and related to the glassy basic rocks, tachylytes and the like, collected by one or other of the authors in the Western Isles. The interest of this study was maintained by subsequent work on the devitrification of glassy rocks, and the spherulitic, lithophysal, and other structures which they possess or acquire. This work was of value to him later when he came to study the rhyolites of Antrim. For this and other purposes he visited Hungary, Switzerland, and other European localities, and the result was the publication of such papers as that on the Rhyolites of the Vosges, that with Prof. J. W. Gregory on the variolitic rocks of Mont Genève, and that with G. W. Butler on the lithophysal of the Rocche Rosse. In

connexion with this work he was also attracted by the alteration of the basic glasses, and described examples of variolites from Anglesey and County Down. At this period he took an interest in the igneous rocks associated with the Lower Palæozoic sediments, visiting Cader Idris with V. Jennings, and Rhobell Fawr with Sir T. H. Holland, the rocks of these areas being determined as earlier than the Ordovician volcanic rocks of Arenig and elsewhere. He also wrote on the remarkable suite of acid and basic rocks between Kington and New Radnor, but without being able to determine their age, a problem yet unsolved.

Both at this time and later, Cole devoted much time to mineralogy, devising or elaborating new methods of recognition, correcting erroneous determinations, and describing new-found varieties. His paper on the Riebeckite of Mynydd Mawr is notable in that he clearly discriminated between the rock forming this mountain and the boulders of a rock of similar composition and also containing riebeckite, now known to have come from Ailsa Craig but at that date of unknown source, found on the neighbouring mountain of Moel Tryfaen.

On taking up his residence in Dublin, Cole at once threw himself into the scientific life of the country, took an interest in its politics, made studies of many of its districts, took an active part in the meetings of scientific societies and the Academy, and trained many students who have since done excellent work at home and abroad. In connexion with visits of the British Association and the Geologists' Association, he led excursions to places of geological interest, and published accounts of the geology of the districts of Dublin and Belfast, in which he included his own discoveries and conclusions. He paid much attention to Irish minerals and building stones, and contributed a descriptive account of the country and its mineral resources to "Ireland, Industrial and Agricultural." His interest in fossil organisms was perhaps greater than might



have been expected. He dealt with the peculiarly Irish ancient fossils, *Oldhamia* and its allies, with the Carboniferous *Fenestellidæ*, describing a new genus, and with the earliest known *Belinurus* from the Upper Old Red Sandstone of the country. He also published in *Natural Science* "The Story of *Olenellus*," a charming account of this curious trilobite and the advances in science due to the discovery of it and its age.

Other, and for the most part later, work involved the application of Cole's experiences among the glaciers of Spitsbergen to the drift phenomena of Ireland, his interpretation of some of these deposits as requiring an interglacial episode, his study of the development of the Liffey drainage, involving a post-glacial reversal of part of the course of that river, and the application of the geology of Ireland to the elucidation of its geography. Before he became Director of the Geological Survey, he had paid attention to the collections of rocks dredged from off the coasts of Ireland, and the light thrown by them on the possible existence of submerged Cretaceous and Tertiary outliers, a subject to which he afterwards devoted a Memoir of the Geological Survey. A similar history attaches to his work on the bauxites and iron ores of Antrim.

Perhaps the most important geological work done by Cole was his study of the absorption of rocks and minerals by igneous magmas, which led on to research in various northern and western areas of gneiss and schist, from which he concluded that these were masses of intrusive magma which had invaded and incorporated vast quantities of pre-existing rocks and sediments. Thus he brought into harmony results obtained on one hand by the Canadian and American observers in "Laurentian" rocks, and on the other by the French geologists on *lit-par-lit* injection and metamorphism. These studies produced many by-products, among others being important new discoveries on the orbital structures of certain plutonic rocks.

This vast amount of purely scientific work, even combined as it was with Cole's teaching and administrative work, by no means exhausted his energy. He was a regular contributor to the columns of *NATURE*, *The Irish Naturalist*, and other scientific journals, and in addition contrived to find time to write a round dozen books, generally dealing with his science in some form, but including the observations of frequent travel and the gist of his own thought and imagination. These were written in a style as charming and attractive as were the speech and demeanour of the man himself. His literary instincts and attainments and his wide reading added no little to the influence of his scientific papers, but it must be confessed that this, combined with his unselfish insistence on giving due credit to the value of the work of his predecessors and contemporaries, though not detracting from the preciseness of his statements, makes them by no means easy to grasp.

It will remain a matter for lasting regret that one so perfectly equipped for the task in knowledge, critical acumen, judgment, and power of expression, was not spared to write a comprehensive work on the geology, free from fads and fallacies as it would have been, of the country to which, though an alien, he was so devoted a friend and in the service of which he freely gave health, comfort, and life itself.

#### DR. A. L. SMITH.

By the death of Dr. A. L. Smith, the Master of Balliol, on April 12 at the age of seventy-three years, the cause of science has lost one of its most sympathetic and effective supporters. Amid the many calls of his busy life he contrived to keep in touch with the progress of discovery, and for a layman he had a remarkably wide knowledge of science and clear grasp of its problems. Nothing did he enjoy more than hearing at first-hand an account of a research, and discussing the ideas underlying it and the nature of the investigation. It seemed likely that if in his school days there had been the wider opportunities of to-day, science would have had an irresistible attraction for him. But, as it was, he was elected to a Classical Exhibition at Balliol College, Oxford, in 1869, and after getting a "first" in classical Moderations and in Greats, he turned to modern history, in which he was to be the leading tutor in Oxford for nearly half a century.

Dr. Smith had all the qualities that go to make a great teacher—intense vitality, great humanity and sympathy, and keen critical insight. His memory was a vast storehouse of knowledge—classical, medieval, and modern—but rarely can learning have sat more lightly or been used to better effect. For thirty years he worked as a College tutor, and no man spared himself less, and then in 1906, at an age when most men are beginning to relax their efforts in anticipation of the evening of their lives, his appointment to a Jowett fellowship gave him the leisure to accept the opportunities that were offered him, and he quickly became a public figure. His activities grew continuously almost until his death, and his personal influence was felt in ever-widening circles. In Oxford he became a trustee of the University Endowment Fund, and served on many Boards, including the Hebdomadal Council, while in 1916 he was elected Master of Balliol. He was intensely anxious that the University should keep abreast of the changing needs of the life of the nation, and he took a special interest in new scientific developments at Oxford, many of which at one stage or another owed much to his help. He would take endless pains to find out all the details of any scheme in which he was interested, and to see every one concerned, and this was but one reason why his support was so valuable.

Dr. Smith took a leading part in founding the Workers' Educational Association; he was chairman of the Prime Minister's Committee on Adult Education, and he took an active interest in the social-economic aspect of industrial problems. He was a most effective speaker, and he had an amazing gift for getting into close touch with any audience. His humour, his simplicity, his lack of convention, his candour, and his humanity gave to every one the impression of his real personal interest in their individual problems. No man was more accessible to those who needed his help than the Master; no man gave more willingly of his best.

In 1922 Dr. Smith was president of the Science Masters' Association, and many will recall his address on science and history, its wisdom and insight, its raciness, its wealth of apt allusions, and the intensely human touch that ran through it. The Master was a great personality, and his death is a real loss to this generation.