being much less than for the auroral spectrum (about 20 volts).

Dr. W. C. Price described the energy-level diagrams for nitrogen and oxygen, indicating the nature of the various nitrogen emission bands, and also explained how the oxygen molecules, but not the nitrogen molecules, become dissociated by sunlight in the high atmosphere; both also become partly ionized, the nitrogen in the *F* layer and the oxygen (O_2) in the *E* layer. The energy of the night-sky light probably comes from the re-combination of some of the oxygen atoms throughout the night, and Chapman has outlined the processes by which this energy can be transformed into the observed light. The auroral light is probably due to the impact upon the molecules in the high atmosphere of fast-moving particles coming from the sun.

The temporal variations in the intensity of the night-sky light have been studied in a remarkable series of researches, carried on for eleven years under the exceptional difficulties of English skies, by Lord Rayleigh. He devised a simple instrument, which was described by the Astronomer Royal, containing a permanent weak comparison light-source (a radioactive uranium salt) and which by means of six simple colour filters enabled the intensity of the faint night-sky light, in three spectral regions, to be estimated within a range of no fewer than thirteen grades. Copies of this instru-

ment were used by other observers, and notably for about eight years at the Cape and Canberra Observatories, in a co-operative research organized by Lord Rayleigh. Variations of annual, semi-annual and eleven-year (sunspot) periods were observed, as well as irregular day-to-day changes. McLennan, and independently Lord Rayleigh, also found a variation during the night, with maximum at 12 or 1 p.m., which has since been confirmed also by Russian observers. In addition, Lord Rayleigh made the very difficult determination—of great theoretical interest—of the absolute photometric intensity of the green night-sky light (5577); this indicated that 1.8×10^{12} atomic oxygen transitions (1S_0 to 1D_2) occurred per second in each square centimetre column of the atmosphere.

In Lord Rayleigh's own contribution to the discussion, he stressed the difficulty of work on the night-sky spectrum, owing to its faintness, which makes it impossible, in the ordinary way, to get luminous spectra with much dispersion, unless large and expensive prisms are used. He considered that his father's tube-spectroscope might find a useful application in this field; this instrument consists of a tube, with lenses at each end, which contains numerous, perhaps twenty, glass prisms in a liquid, carbon disulphide, of very similar refractive index; it can give great dispersion with little loss of light.

Obituary Notices

Sir Robert Bolam, O.B.E.

THE death of Sir Robert Bolam, which took place at his home in Newcastle-upon-Tyne on April 28, not only removes an outstanding personality of the medical profession from the north of England, but also one who by reason of his activities in larger spheres of medical interest had made a name known and respected in the profession all over Great Britain.

Bolam's name will always be connected with the two bodies to which he gave such long and valued service, the General Medical Council and the British Medical Association. He was first a member of the General Medical Council in 1920, being elected as a direct representative for England; then from 1928 until his death he represented the University of Durham. It was only natural that his acumen and capacity for attention to detail led ultimately to his appointment as Chairman of Business, and this no doubt, had he lived, would have been followed by yet higher honour in the Council.

In the British Medical Association, Bolam was an active member for forty years, and here again his administrative ability, shrewdness and clear thinking soon brought him into prominence. He became a

member of Council in 1915, acted as chairman of the Journal Committee and of the Hospitals Committee; finally in 1920 he became chairman of the Council. His energy and initiative were responsible for the transfer of the Association's headquarters in London from the Strand to its present site in Tavistock Square. In this move to what is now rapidly becoming the intellectual quarter of London, Bolam displayed foresight and faith which have since been justified abundantly.

In spite of the energy which Bolam expended in the services to the General Medical Council and the British Medical Association, either of which would have been an ample occupation for a man of normal activity and talents, he gave his best services over a long period of years and in many capacities to his old school, the University of Durham College of Medicine and the associated Royal Victoria Infirmary. The posts he held were various; in the College of Medicine he was in turn lecturer on physiology and pathology, joint lecturer on physiological physics and chemistry, professor of medical jurisprudence, sub-curator of the museum, while in the Infirmary he was assistant physician and pathologist. Later he

became the first honorary physician in charge of the Skin Department and held this position until his retirement from the Infirmary staff in 1931. The accompanying lectureship in dermatology in the College of Medicine he held from 1914 until 1937.

But as in London, so in Newcastle, Bolam was outstanding in his committee and administrative work. He was an active member of the senate of the University for many years and in 1931 was made pro-vice-chancellor, and was vice-chancellor in 1936-37. He acted as registrar of the College of Medicine in succession to Prof. R. Howden, and in 1934 was elected its president.

During the years following, Bolam's main object was to see the College rehoused on a site facing the Royal Victoria Infirmary, and to this task he applied himself with his customary vigour and enthusiasm.

Following the merging of the College of Medicine and Armstrong College into the present King's College in the University of Durham, Bolam continued as chairman of the Building Board, in which capacity he was able to see the realization of his dreams. In spite of periods of ill-health during the last six months, he was able to receive H.M. King George VI and H.M. the Queen and to conduct them around the finished building on the occasion of the official opening in February of this year.

An obituary of a man of such widespread activity as Sir Robert Bolam must necessarily tend to take the form of a catalogue of his services, in the recital of which the personal character is not given due weight. To those who knew him well, the memory of Bolam will be found not in a monument of brick or stone, not in the records of the minute books of the many committees on which he served or which he directed, but in the personal memory of the man himself. In this, his statesmanship, sincerity and directness of purpose will be remembered, but his never failing courtesy and kindness will above all be abiding to those who may claim to have been honoured by his friendship.

R. B. GREEN.

Sir William Butler, Bart.

THE death on April 5 of Sir William Waters Butler, Bart., deprived Birmingham, its neighbourhood and its University, of one of their most generous philanthropists.

Educated at King Edward's School, Birmingham, Sir William entered his father's business, which later became Mitchells and Butlers, Ltd., brewers. Further studies in the sciences were pursued at the evening classes held at the Midland Institute, and he became a fellow of the Chemical Society. To the last he maintained an interest in the technology of his trade, and on more than one occasion told me that the most pleasant times in his routine week were spent in the brewery discussing technical matters on Sunday mornings when the distractions of workaday business activities could be temporarily banished.

The British School of Malting and Brewing at the University of Birmingham, set up by subscription from a number of brewing firms in 1899, was strongly

supported from the first by Sir William's firm. In 1919, he initiated the endowment of the Adrian Brown chair of brewing, and in 1926 personally defrayed the entire cost of the new Department at the Edgbaston site. Without this donation, the erection of the new biology block there would have been virtually impossible. He also made repeated donations to various departments of the University; two of his most recent ones, £10,000 each, were respectively for the endowment of scholarships in science and commerce and for the University Medical School. In addition he had served since 1917 on the Council of the University, and was known to possess wide sympathies in all educational matters, and to be ever ready with business advice and help.

R. H. HOPKINS.

Mr. G. E. Blundell

THE National Museum of Wales has lost a good friend by the death of Mr. G. E. Blundell. For many years science master at Wellington College, Blundell retained his interest in scientific matters when he became lord of the manor at Newton Nottage near Porthcawl, paying special attention to chemistry and geology, and eventually to archaeology. He was a keen observer, always ready to bring new discoveries to the notice of those to whom the information was likely to be useful, with the result that although he seldom published the results of his own investigations, he contributed much that was of real value to the work of others.

It was this generous attitude that brought Blundell into contact with the National Museum of Wales. In 1922, when the Museum was preparing to open its doors for the first time, he became a member of the committee concerned with archaeological matters, and in 1926 he was elected to a seat on the Council.

As an example of Blundell's indirect contributions to archaeology we might take the discovery, made in association with his wife (a daughter of the late R. H. Tiddeman of the Geological Survey), of bronze objects and fragments of crucibles with adherent bronze, associated with fragments of iron and slag, pot-boilers and bones, in the sand dunes at Merthyr Mawr in Glamorgan. This proved to be the first Early Iron Age settlement to be found in Wales, and it was afterwards described by (Sir) Cyril Fox in "Archaeologia Cambrensis" in 1927.

To geology, Blundell rendered useful service by recording excavations made in the vicinity of his home, and by his interest in the early history of the subject. The latter is understandable since he was related to the descendants of William Buckland, and as a result of it, interesting manuscripts relating to Buckland's work in Wales have been deposited in the National Museum of Wales by Dr. Mervyn H. Gordon, one of the Dean's grandsons.

F. J. N.

WE regret to announce the death of Prof. S. L. Loney, professor of mathematics in the Royal Holloway College (University of London), from 1888 until 1920, on May 16, aged seventy-nine years.