

a thing to be avoided we have avoided it. We have made our start by treating education as a single and indivisible whole—and by trying to keep the different kinds of students in one organisation. How powerful this tendency is we may see by the example of Cambridge. We have done even more, for we have developed in connection with our new universities a system of evening teaching for a separate class of student. That the tendency to recognise this kind of instruction as legitimate for the British university is increasing appears when we look at such cases as those of Glasgow and Manchester, where the great technical colleges of these cities are being brought into the closest relation with their universities. I believe this to be entirely right, and I am glad that you in Bristol took the same course at the beginning when you brought the Merchant Venturers' College, with its evening teaching, into your new University organisation.

Specialisation in each city university there will be and ought to be. *Non omnia possumus omnes.* In one place the distinctive strength will be in chemistry—general and applied—for exist without each other they cannot. In another, as in Sheffield, it will be the metallurgy of iron and steel; and it is not unimportant in this connection that Sheffield is the chief centre for the manufacture of the national guns and steel plates, an industry in which we dare not dispense with high science. In another place, as in the case of the Imperial College in London, we should have the great training place in the metallurgy of the precious metals for the students of a people which leads the world in their production. Some universities will be strong in engineering, civil and mechanical, or, it may be, marine. But the one thing requisite is that the broad foundations of the highest general knowledge should be there in each university, and that all specialisation should rest on these foundations. You cannot, without danger of partial starvation, separate science from literature and philosophy. Each grows best in the presence of the others. Another essential feature is adequate provision for the postgraduate student—that is, the student who, having taken his degree, has in him the passion for excellence sufficiently strong to desire to continue in the university as a place of research and of the still higher learning which is inseparable from research. Such students may not be numerous, but when they are present they leaven the whole lump, and by their presence give a distinction to the university and to the professors under whom they work which could not be possible in their absence.

#### WILLIAM BOTTOMLEY.

THE death of William Bottomley at Glasgow on October 19, at sixty-three years of age, removes one who, throughout the greater part of his life, did genuine, unobtrusive service to the cause of applied science by the assistance he gave to his uncle, Lord Kelvin. A son of the late Mr. William Bottomley, of Fortbreda, County Down, and of Anna Thomson, the second of Lord Kelvin's sisters, Bottomley was trained as a civil engineer. In 1872, Sir William Thomson and Fleeming Jenkin undertook to act in partnership as engineers for the manufacture and laying of telegraph cables which were to connect the cities of the Brazilian coast, from the Amazon to the River Plate. Bottomley was put in charge of a staff of young assistants at the works of the

Hooper Company at Millwall Docks where the cable was being made.

In those days there were no college laboratories which could compare with the testing-room of a cable factory as a scientific training ground for the practical electrician. The writer, who was a very junior member of the staff, well remembers Bottomley's cheery kindness, his capacity for management, and the ardour with which he threw himself into what was then a novel task. The art of cable testing, the necessities of which had been a chief factor in bringing into existence the scientific system of electrical units, was still undergoing evolution: new methods had to be devised, tested, and licked into shape for everyday use.

In 1873, Bottomley, along with his colleague W. F. King, accompanied Thomson and Jenkin in the maiden voyage of the cable ship *Hooper*, when the first section, from Para to Pernambuco, was laid. The sections from Pernambuco southward were laid in subsequent expeditions under their supervision, and in the absence of the chiefs.

Probably there are few parts of the later work of Kelvin in applied science with which William Bottomley was not in some degree concerned. With the Kelvin compass he had an early and intimate association. When the long struggle was over which preceded its general acceptance in the Navy and the mercantile marine, the task of looking after it as an article of manufacture and an object of business enterprise fell mainly on his shoulders. He had to train and superintend the skilled compass adjusters whose services were essential to its success. His own energy, his tact and judgment, and his appreciation of the scientific points at issue were in constant exercise for many years with the happiest results. The Kelvin compass came into universal use primarily, of course, because of its intrinsic merits; but these had to be demonstrated, defects had to be corrected, and prejudices to be overcome. In this work Bottomley's unfailing geniality, his simplicity and directness, and the warmth of his enthusiasm were valuable adjuncts to his technical knowledge: they were qualities, too, that endeared him to his friends.

J. A. E.

#### PROF. LEWIS BOSS.

IT is with deep regret that we have to record the death of Prof. Lewis Boss on October 5. While working as an assistant astronomer on the U.S. Northern Boundary Commission in 1877, Prof. Boss was greatly impressed by the urgent necessity for greater accuracy in star catalogues, and forthwith made the remedying of the defect his life-work; the immediate outcome was the extremely valuable "Boss's Declinations," in which, after discussing some hundred catalogues, he gave the declinations and proper motions of 500 stars for the epoch 1875. In 1878 he was appointed director of the Dudley Observatory, Albany, N.Y., a position which he held until his death, and after observing the corona at the solar eclipse of that year, he settled down to the solution