

that one of the usual evening discourses will be given as a Sir William Hardy memorial lecture, and will deal with the preservation of meat, fish and fruit, a subject peculiarly appropriate to Aberdeen, where the work of the Torry Research Station is very well known. The name of the lecturer is not yet announced. The other evening discourse will be given by Prof. W. L. Bragg on "The Exploration of the Mineral World by X-Rays". Reverting to the subject of science and the community, the programme states tentatively that an evening symposium on the general relations of these may be arranged. The sectional programmes, so far as can be judged from the short summaries furnished in this preliminary announcement, are certainly no less wide-ranging than usual. An ambitious series of excursions is under consideration, and inasmuch as the occasion of a

meeting in a centre commanding this part of Scotland must needs be rare, the opportunity should be taken.

This programme is accompanied by a circular addressed to those who are not life-members of the Association, which in effect asks them to pay regular subscriptions to the Association by signing a banker's order form, whether they attend the meetings regularly or not. The hope is to assure a more stable income for the Association, and thus "alleviate the difficulty of allocating grants in aid of important research", for which the applications "habitually exceed the sums available". The Association's support of research, and the preparation of "reports on the state of science", which began in 1834 and has never since been intermitted, sufficiently justifies this appeal.

Obituary

DR. WALTER ROSENHAIN, F.R.S.

IT is a grief and a shock to me, on returning from a holiday abroad, to read of the death of Walter Rosenhain. I have had many pupils, but none more gifted with the imaginative insight of the discoverer, more discriminating in criticism, or more skilful in the technique of the experimentalist. He came to me, in the late 'nineties, with a research scholarship from the University of Melbourne, when I was professor of mechanism at Cambridge, and asked me to suggest a piece of research which he might undertake in my laboratory. At that time Roberts-Austen, Arnold, J. E. Stead, Osmond and others were applying to metallurgical analysis the microscopic methods which had been initiated by Sorby in his earlier study of metals, and it was beginning to be recognised, somewhat vaguely, that the irregular grains which a polished metal revealed in the microscope were crystals the boundaries of which had interfered with one another in the process of crystal growth. I suggested to Rosenhain that this opened up a good field, and that it would be interesting to see what happened when a plastic metal was overstrained. The supposed crystal grains must alter their form, but how?

Rosenhain had already begun in Melbourne a research on steam-jets which he was anxious to finish first, and we arranged that as soon as he had completed that he should take up the metallurgical inquiry. This was done, and I recall very vividly how, after he had acquired some skill in polishing and etching metallic surfaces so as to bring out the granular structure, we put a plastic strip one day under the microscope, fixed in a straining stage so that it could be stretched while one watched the surface of the grains. As the straining proceeded we saw lines appear, sharply defined parallel lines which were black in the reflected illumination, becoming more numerous the more the specimen was stretched, and tending

to develop criss-cross patterns. The laboratory was closing for the day, so we went our several ways, each brooding on what these curious lines might mean. That evening I saw the interpretation: the lines must mean finite slips, taking place on parallel layers within the grain. Consequently the grains were definite crystals, and remained crystals after the deformation: they gave way, when the straining passed the elastic limit, by the sliding of bands or layers on a group of parallel planes, much as a pack of cards might be sheared. Slips of this kind in three directions inclined to one another within each grain would allow the grain to assume a new form consistent with the plastic straining of the piece as a whole. Next day we met again, and I found that Rosenhain had, quite independently, come to the same conclusion. That was the discovery of 'slip-bands' which we published jointly in a preliminary notice to the Royal Society in March 1899 (*Proceedings*, vol. 65), and later (along with much more) in the Bakerian Lecture of that year (*Phil. Trans.*, A, vol. 193, p. 353).

We pursued the research hotly together. It was a happy as well as a fruitful association. To work with such a pupil was, for the professor, a rare delight and a constant stimulus. It turned out that metallurgy did offer to Rosenhain the most congenial field that could have been chosen. Looking back now, I feel a natural pride in having guided him to it. Afterwards, when the days of pupillage were past, I had the continued pleasure of watching him go on from strength to strength and receive growing recognition, of visiting him from time to time at the National Physical Laboratory where he made a position worthy of his powers, and of listening to his admirably lucid expositions, public or private. An old man, such as I am, must reckon with the loss of his contemporaries, but it was far too early for us to lose Walter Rosenhain.

J. A. EWING.