

THE "N" RAYS.

A Collection of Papers communicated to the Academy of Sciences, with Additional Notes and Instructions for the Construction of Phosphorescent Screens. By Prof. R. Blondlot. Translated by J. Garcin. Pp. xii+83. (London: Longmans, Green and Co., 1905.) Price 3s. 6d. net.

THE *n*-rays, so called because the first announcement of their existence came from Nancy, have attracted the attention of physicists and physiologists all over the world; but the peculiarity about them is that the phenomena said to be produced by these rays when they fall on a slightly fluorescing screen have been observed chiefly in France by Prof. Blondlot and others of his school, while many experienced observers in Germany, America, and England have wholly failed to obtain a satisfactory demonstration even of their existence. The reason is that the so-called proof of their existence depends, not on objective phenomena that can be critically examined, but on a subjective impression on the mind of the experimenter, who sees, or imagines he sees, or imagines he does not see, a slight change in the degree of luminosity of a phosphorescing screen. It is true that, more than once, a photograph has been taken of such a screen supposed to be unaffected and contrasted with a photograph of the same screen when it was supposed to be affected by the rays, with the result that the patch of luminous surface appears to be a little brighter in the latter case than in the former. Even this photographic evidence, however, is unsatisfactory, as a slight difference in the time of exposure or in the method of development would readily account for the apparent contrast.

Yet, in this little book, we have a reprint of Prof. Blondlot's original papers, in which experimental evidence is adduced, with a wonderful appearance of accuracy in detail, of the polarisation of the rays, of their dispersion, of their wave-length, and of other physical phenomena attributed to them. Prof. Blondlot's experiments are well contrived, and they give every appearance of being arrangements by which accurate data should be obtained; but in every case the ultimate test is the subjective one made on the mind of the observer as to whether a spot of slightly phosphorescent surface becomes more luminous or not. The *n*-rays, according to Prof. Blondlot, are a new species of light, light, however, which only affects the retina with the aid of a fluorescent substance. They traverse many metals, black paper, wood, &c. They cannot pass through sheet lead, but they pass readily through aluminium. They influence not only a fluorescent substance, but the spark of an induction coil. They can be reflected from a polished glass surface or from a plate of polished silver. They have a kinship with well known radiations of a large wave-length. They exist in solar rays. Produced from an Auer burner they can be focused by a quartz lens; the lens itself may even become a source of *n*-rays.

Calcium sulphide can store up the rays, while

aluminium, wood, dry or wet paper cannot do so. Ordinary light, when it falls on the retina, causes a more luminous sensation when accompanied by *n*-rays. Bits of wood, glass, rubber, &c., emit the rays when compressed. Bodies in molecular strain, like Rupert's drops, hardened steel, &c., emit the rays. An old knife, found in a Gallo-Roman tomb, equally with a new knife, sends out rays. There are other rays also, which must be called *n*₁-rays, which are emitted from a Nernst lamp. These diminish the glow of an induction spark. Ethylic ether, "when brought to a state of forced extension," emits the *n*₁-rays, &c.

To see all these wonderful phenomena the eye must be not only kept in the dark for a considerable time, but it must be specially trained. A. Broca states that in his own case it required practice for six weeks before he could see the effect of the rays. The eye must be adapted not only to darkness, but to very feeble light. The mind must be free, so as to concentrate itself on the observation to be made. These seem to be admirable arrangements for obtaining an illusive subjective impression! It is said that MM. d'Arsonval and Mascart have also observed some of the phenomena. Many other French observers, with less weighty names, have also been cited as witnesses. The general body of men of science are doubtful, as they cannot receive evidence of such a strangely subjective character, while not a few, and the writer places himself in this category, are of opinion that while they do not for a moment reflect on the *bona fides* of the French observers, they hold that these observers have been the subjects either of an illusion of the senses or a delusion of the mind.

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THE SCIENCE OF EDUCATION.

School Teaching and School Reform. By Sir Oliver Lodge. Pp. viii+171. (London: Williams and Norgate, 1905.) Price 3s.

THE science of education is as yet rudimentary and ill-defined. So little has it developed, indeed, that many schoolmasters deny its existence. An art of education they recognise, and that they claim to practise. Teachers, it is urged, are born, not made, and professional training is useless. Yet it is the possibility of the future existence of a complete science of education which is the inspiring belief of the best modern educators. These teachers are now approaching the problems of the class-room and the difficulties of school organisation as subjects for investigation and experiment by scientific methods, and there is every reason for hopefulness in the results which have been obtained in recent years.

The formulation of the fundamental principles of a complete science of education will probably be the work of some great educationist as yet unborn, who will be able from the educational material at his command to extract the essentials and to weave them into living generalisations round which the science will crystallise into an orderly and harmonious whole. To the elucidation of such a science many workers