The term "anode rays" for the rays discovered with so much *éclat* by Prof. Röntgen, whether they be the same as those previously discovered by Dr. Lenard or not, is suggested by remarks from Mr. A. W. Porter at a recent meeting of the Royal Society. They certainly do not start from the kathode, but from some opposed surface, a surface which may be an actual anode, and which always has some anodic properties. From each point of such a surface rays start in all directions; this is proved by the shadows they cast of slits, holes, and wires.

OLIVER J. LODGE.

I MAY state that in a lecture which I gave here on the evening of Tuesday last, the 25th ult., I showed to a large audience, by means of a sheet of barium platino-cyanide, rendered fluorescent by the Röntgen rays from a Crookes' tube, all the things referred to by Mr. Campbell Swinton in his letter in the last number of NATURE. The shadows of coins in a purse, and of a hand, were distinctly visible to the audience when placed behind screens perfectly opaque to ordinary light, and, though more dimly, even through a book of eight or nine hundred pages.

I must confess that I cannot see why, after Prof. Röntgen's account of his own work, the success of such experiments as those made by Mr. Swinton or myself should be regarded as surprising, or accounts of them received with incredulity. They seem to me to be merely a variation of Prof. Röntgen's own experiments, or at most to be a matter of the most obvious inference from these experiments.

The statements that have appeared to the effect that Signor Salvioni has devised a method of rendering the retina of the human eye sensitive to Röntgen rays, and that by his method objects are directly *seen* through planks of wood, sheets of aluminium, &c., are simply absurd. The fluorescent light produced is entirely distinct from the Röntgen rays, and affects the retina like ordinary light; and of course parts of the sheet which do not fluoresce, because they are shielded by the opaque objects behind from the Röntgen rays, appear dark. Seeing such shadows can no more be said to be *seeing the objects themselves* by means of the Röntgen rays, than a man can be said to see himself when he looks at his shadow thrown by an ordinary gas-lamp on the street.

Prof. Röntgen discovered the fluorescence of the barium platino-cyanide under the rays now called by his name, and the transparency of ordinarily opaque matter to these rays, and the discoveries of Signor Salvioni and others, so far, at any rate, as they have been described in NATURE[1] and other journals I have seen, amount to nothing more. It is only just that in accounts of verifications of Röntgen's discoveries an attempt should be made to show clearly that such observations are only verifications, so as to prevent the credit of discovery which is Prof. Röntgen's due from any appearance, however unintentional, of indirect diminution.

Scientific accounts of verifications, as far as I have seen them in NATURE or elsewhere, are in themselves unexceptionable; but extra precaution seems necessary in order that the public should not be led by newspaper paragraphists, retailing such accounts at second-hand, to regard as extensions of Röntgen's work what are only direct and obvious consequences, perceived by himself, of the facts which he has observed.

ANDREW GRAY.

University College of North Wales, Bangor, March 1.

IN your last issue (p. 399), in the account of the work appearing in the *Comptes rendus*, you state that M. de Heen "proves conclusively that the X-rays proceed from the anode and not the kathode." May I point out (as I did at the Royal Society, in the course of the discussion on Prof. J. J. Thomson's paper, February 13), that I have proved that this is undoubtedly true for the bulb that I have been using *throughout* my experiments on the X-radiation. The bulb is one in which the negative electrode is concave, and the negative stream is thereby focussed to a point on the anode, which is a platinum disc placed near the centre of the bulb. By measuring the positions of different parts of a radiograph of a series of concentric zones of tinfoil placed in a measured position, I have shown that the actinic rays diverge from the anode disc.

I am of opinion, however, that in this respect this bulb differs from those which have been employed by others. In these latter, judging from the published accounts, the negative stream impinges directly on the glass; and for bulbs of this kind, it has been shown conclusively by Prof. J. J. Thomson that the seat of the origin of the rays is the glass itself. The proof is that a sensitive plate placed inside the bulb in the path of the negative stream is not acted upon. I venture to think that, in the case of my bulb, a sensitive plate placed inside would be acted upon provided it lay in the hemisphere of the bulb in which the kathode lies. I intend to test this conjecture experimentally. Should it prove true, the behaviour of both varieties of bulb will probably be capable of description by the following single statement:—

The seat of the origin of the X-rays is where the negative stream first impinges against a solid, and gives up, or partially gives up, its negative charge.

ALFRED W. PORTER.

University College, London, February 28.

IN your "Notes" of last week you refer to a communication of M. de Heen, stating that the X-rays proceed from the anode. Some experiments, which I made at the beginning of last month, bearing on this point, may be of interest to your readers. It is of course not the case that the X-rays proceed from the anode in general, but they may be made to do so by placing a small disc as anode facing the kathode. The kathode streams impinge on the former, and the X-rays being generated there radiate from it. The experiment was made by placing a lead plate (4 cm. by 10 cm.), with a rough circular hole in it, at a distance of 10 cm. above the photographic plate, and the tube (a small one with a curved kathode facing a small disc anode) 10·5 cm. above the lead. After development the negative was replaced exactly in its former position. Several interesting facts showed themselves, the most striking being that the image of the hole consisted of a well-defined circle showing even individual splinters on the edge, and in addition diffused elongation on two sides. On placing the eye so that the hole exactly covered its well-defined image, it was necessary to put it in the position occupied by the anode.

The diffused images in the same way were seen to be due to the fluorescent parts of the glass sides of the tube—a kind of pin-hole photograph, in fact.

The rays leave the anode as if they were the splash of a jet of water occupying the position of the kathode stream. In other words—supposing the plane of the anode vertical and the kathode to the right, then no rays appear to the left of the plane of the anode, whilst on the right the space is exceedingly rich. The negatives show, in every case tried, two well-defined regions, viz. nothing to the left of the intersection of the plane of the anode with the negative, and a dense deposit on the right, the richest part apparently being close to this line. It is difficult to account for this on the supposition that the rays are due to waves generated at the point of impact. We should expect in this case the action on the plate to increase with the visual angle of the anode disc as seen from points on the plate. On the other hand, certain further experiments seem to show that the action is not in all respects similar to the splash of a jet. Whether the effect is due to the fact that the place of impact of the kathode stream is an anode, or simply an internal obstacle, I have not yet determined, but experiments in progress will, I hope, settle this point.

For photographic purposes, the best kinds of tube are those with a curved kathode converging the streams on a small plane anode, remembering, of course, that the strong field is on the kathode side of the anode plane. This behaves very approximately as a radiating point. With this I have obtained, with comparatively short exposures, and a $2\frac{1}{2}''$ to $3''$ spark length, strong negatives of remarkable definition, certainly finer than any I have yet seen.

W. M. HICKS.

Firth College, March 1.

I WAS interested to see in your last issue a letter from Mr. Swinton describing his reproduction of Prof. Salvioni's experiments with phosphorescent screens. Mr. Swinton uses a piece of blotting-paper impregnated with platino-cyanide of barium. I have tried this method, but have obtained better results with a screen prepared with the same salt, as follows:

A piece of fairly stout black paper, free from pinholes, is coated with gum containing a little glycerine, and, as soon as it has

[1] A translation of Prof. Salvioni's paper will be found in another part of this issue.—ED. NATURE.