LETTERS TO THE EDITORS

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Discoveries by Accident

PROF. H. R. ROBINSON writes in NATURE of November 21, p. 591: "In November 1895, Röntgen discovered X-rays, largely by accident. Becquerel's discovery of radioactivity in February 1896 was largely a second accident arising out of Röntgen's discovery".

One is tempted to ask, how can it be determined whether a discovery has been made by accident? My colleague in chemistry has provided the following instance of what may legitimately be called an accidental discovery: the fact that mercury acts as a catalyst in the oxidation of naphthalene to phthalic acid by sulphuric acid was revealed by the breaking of a mercury thermometer.

In his "Theory of Light", Preston refers to Arago's discovery in 1811 of the interference of polarized light in the following terms: "Placing by chance a thin plate of mica in the path of a pencil of plane-polarised light and examining it through a doubly refracting prism he observed that both the ordinary and the extraordinary images were richly coloured. . . ." It may have been *by chance* that mica was at hand, but few would call this an accidental discovery because of the associated work and thought of the experimenter.

In the case of Röntgen, no one would gainsay that he was fortunate, lucky perhaps, in having a fluorescent substance on the table, but it may be questioned whether we should call his discovery an accident. According to Glasser, "Röntgen had taken up the work with cathode rays because he had a feeling that there were still many unsolved problems connected with them. . . ." There lay the intention to enter a new field of inquiry, but when a man makes an outstanding discovery in a subject absolutely new to him (as shown by his fifty-eight original papers prior to 1895), it is not surprising to find it attributed to accident, luck or good fortune.

With Becquerel and the discovery of radioactivity the case is rather different, for it was clearly his intention to see whether fluorescent substances emitted anything like X-rays. So the discovery was no accident, though Becquerel had wonderfully good fortune in having at hand a unique collection of uranium compounds handed down by father and grandfather; it was a family discovery.

The subject is a difficult one, for national bias can rarely be eliminated in writing of world events; we become aware in fact of the pitfalls besetting the historian. But I hope that this particular issue may be clarified, for it is a recurrent question in radiological circles: Did Röntgen really discover X-rays, and if so, was it an accident? My usual answers until now have been Yes and No.

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PROF. RUSS has quoted a passage from my *summary* of the Rutherford Memorial Lecture; in the lecture itself I went on to pay a tribute to Röntgen and to Becquerel, emphasizing in particular that there was nothing in their general attack on the problems of X-rays and of radioactivity that could be described as in any way "accidental". My only reason for mentioning at all the element of chance was that in this part of the lecture I was directing attention to the remarkable sequence of largely unrelated events which prepared, at exactly the right time, a field of work for Rutherford and a gateway for his entrance into this field.

The lecture, which occupied about an hour, had to be pruned rather drastically to reduce it to the dimensions appropriate to a printed summary. My unskilful pruning, by divorcing a passage from its context, has clearly left the impression of an opinion of Röntgen's and Becquerel's achievements which I neither held nor wished to convey. I am grateful to Prof. Russ for his letter, and for the opportunity to comment upon it, and so, I hope, to remove all traces of this false impression.

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Retarding Effect of Ghost Formation on Absorption from Subcutaneously Implanted Tablets of Hexœstrol

IT has recently been reported[1] that when tablets of synthetic œstrogens are implanted subcutaneously into bovines, the outer or 'cortical' layer of the tablets becomes infiltrated with a structure apparently composed of relatively insoluble protein. The formation of this structure, for which the name 'ghost' was proposed, should not be confused with the phenomenon of encapsulation of the tablet within a sac of fibrous or connective tissue, which was considered by Geist *et al.*[2] to cause a considerable decrease in absorption from tablets implanted into humans. Whatever may be the effect of encapsulation, it was considered likely that ghost formation would retard absorption, and experimental evidence that this is so has now been obtained.

In connexion with investigations on lactation, the absorption (that is, loss in weight) from tablets of pure hexœstrol weighing very nearly 1,000 mgm. each, which were implanted subcutaneously into bovines for periods ranging from 10 to 105 days, has been determined. The tablets were disk-shaped, approximately 14·4 mm. in diameter, 7·8 mm. thick in the centre and 5·7 mm. thick at the edge.

Contrary to the findings of Emmens[3], Forbes[4] and others on rats, the absorption curve, though approximately linear up to 10–15 days (when about 12 per cent of the tablet had been absorbed), bends sharply at this point and thereafter pursues an approximately rectilinear course corresponding to a much-reduced absorption rate. The initial absorption rate was about 9 mgm./day, but by 20 days the rate had fallen to about 1·5 mgm./day. In practically all cases the tablets have been observed to be encapsulated on removal. Though the initial absorption rate is probably proportional to the surface area of the tablet, it is clear that in the present experiments the observed drop in absorption rate was not due to a decrease in tablet area as postulated on theoretical grounds by Emmens[3] and Forbes[4] for their rat experiments, since, after 63 days absorption, for example, the surface area had decreased by only about 8 per cent.