

find out whether his results with γ rays hold also for X-rays.

Following closely Prof. Bragg's method of procedure with pairs of metals consisting of lead and aluminium, copper and aluminium, and copper and lead, I found that in every case the ionisation due to the "emergence" secondary kathode rays was greater than that due to the "incidence" rays. The "incidence" secondary rays were, in different experiments, from 50 per cent. to 90 per cent. of the "emergence." It appeared, however, that the difference was not as large in the case of lead as in the case of copper. This is in agreement with Prof. Bragg's result for γ rays.

A separate experiment showed that the thickness of the layer of copper from which the secondary rays can emerge is not great enough to absorb the primary rays to an extent sufficient to account for the marked difference between the "emergence" and "incidence" secondary rays.

On the other hand, however, both the "emergence" and "incidence" secondary radiation produced greater ionisation when it came from a metal of high atomic weight than when it came from a metal of lower atomic weight. This difference was very marked with the above-mentioned pairs, and also with lead and carbon. This is directly opposite to the effect observed by Prof. Bragg with γ rays.

It should be noticed that the ionisation chambers used in these experiments were so short that a very small fraction of the secondary X-rays coming from the metals was absorbed in them, while they were long enough to absorb all the secondary kathode rays. Thus practically all the ionisation was due to the secondary kathode rays.

Although these experiments, together with those of Prof. Bragg, show that for both X-rays and γ rays the secondary kathode rays are not produced equally in all directions, I cannot agree with Prof. Bragg that the evidence is conclusive that X-rays and γ rays must consist of some type of radiation other than electromagnetic pulses. The reason he gives on the neutral pair theory for lack of symmetry in the secondary rays is that these secondary rays are the negative parts of the primary pairs. As these primary neutral pairs possess momentum in the direction of propagation, it is natural to suppose that their negative parts, when liberated from the positive, would be more likely to continue in their original direction than to turn back.

On the other hand, an electromagnetic pulse possesses momentum also in the direction of propagation. Though little is known of the mechanism of the production of secondary kathode rays by ether pulses, it is not unreasonable to suppose that an ether pulse could contribute some of its momentum to the secondary kathode particles, causing them to go more in the direction of propagation of the primary than in any other.

Since we know that X-rays, which come from a region where electrons are being violently accelerated, must consist in part, at least, of ether pulses, and since all the experimental evidence previously gathered in regard to their nature has been favourable to the ether pulse theory, it seems to me more reasonable to look to the ether pulse theory for an explanation of both X-rays and γ rays than to a theory of neutral pairs. It must, however, be recognised that this lack of symmetry in the secondary kathode rays is a difficulty in the way of the ether pulse theory which needs explanation. I hope soon to determine by means of absorption experiments whether this lack of symmetry is due to a difference in penetrating power or quantity of secondary kathode rays.

CHARLTON D. COOKSEY.

Sheffield Scientific School, Yale University, New Haven, Conn., March 7.

Martinmas in May.

SIR NORMAN LOCKYER in his book on "Stonehenge" connects the festival of St. Martin, which falls on November 11, with the beginning of winter in the May-November year, which falls astronomically on November 9. He does not, however, seem to be aware that there was another festival of St. Martin which fell on May 12. This was the *Subventio St. Martini*, a festival which was appointed to be observed by a council held at Tours in 841 to commemorate the restoration of the relics of the

saint to Tours after they had been hidden on account of the incursions of the Northmen. Sir Harris Nicolas in his "Chronology of History," published in 1838, stated that the festival was still observed in the province of Tours. The date of the appointment of the festival is late, but reverence for sacred stones survived until long after that time, and it might be worth while to try to discover whether any connection can be traced between the appointment of the festival and an attempt to discourage the old stone-worship.

It seems clear that it was this festival of the *Subventio* which is alluded to in the entry in the Parker Manuscript of the Old English Chronicle for the year 913:—"In this year about Martinmas King Edward bade build the northern fortress at Hertford, between the rivers Maran, Beane, and Lea; and then after that in the summer between Gang-days and Midsummer King Edward went with part of his forces to Maldon in Essex." The King opened his campaign at Martinmas, May 12, by commencing a fortress at Hertford, and then between Rogation-tide (May 23-25) and Midsummer he marched to Maldon. The fact that the chronicler regards the period between May 25 and June 24 as summer has a bearing on the question of the observance of a May-November year. It is likely that the Martinmas of 919 is also the May festival, but it is clear that the Martinmas of 918 and of 921 must be the festival in November.

C. S. TAYLOR.

Banwell, March 24.

An Annotated Copy of Newton's "Principia."

ABOUT three months ago I was asked to look through a list of old books, which had recently come to Australia as portion of the personal property in an estate which had been in Chancery some years. The books had become the property of a resident of this city, who employed an agent to dispose of them.

Among a number of books which I bought was a copy of Newton's "Principia," and when I came to examine it more closely I found that it was one of the original edition of 1687, with the imprimatur of S. Pepys "Reg. Soc. Præses Julii 5 1686." I found also that it contained nearly five pages of MS. additions and corrections for a second edition, written in Latin, as well as numerous corrigenda throughout the book, with occasional detailed alterations in the diagrams.

Inside the cover, in another handwriting, there was the following note:—"The Amendments in this book were written by Sir Isaac's own hand. See his original MSS. of his Optics in Trin. Coll. Library, Cambridge."

I have since compared the handwriting of these "additions and corrections" with a facsimile of Sir Isaac Newton's handwriting in the Commonwealth Parliamentary library, and consider there is a distinct similarity.

I have now had the first two pages of the notes photographed, and have forwarded them to the librarian of the college referred to in the note, with the view of a further comparison.

The notes are punctiliously detailed, with a reference to each page, and the alterations in the body of the text of the book are made with almost microscopic care. As the notes are headed as intended for a second edition, I cannot see what other source but the mind and hand of the author they could have come from.

I am informed by the former owner of the book (Mr. H. C. Elderton) that it belonged to the family of James, of Ightham Court, Kent, probably to Sir Demetrius James, who is supposed to have been knighted about the year 1685. It and a number of other old books formed a small collection which were set apart, packed in oak chests, and stowed away in an old clock-tower, where they remained ever since until brought to Australia.

I shall let you know the result of my inquiries, and in the meantime, perhaps some of your numerous scientific readers may be able to throw some light on the book's history, for if it should be Sir Isaac Newton's personal copy, and contain his personal notes, it must become an object of great interest to the scientific world.

BRUCE SMITH.

149 Phillip Street, Sydney, Australia, February 25.