Elliot-Smith's plates, 23 and 24, are interesting from another point of view. The Mediterranean artists have employed a strikingly similar method of representing the octopus as the Mayan quite *independently* of each other, and at two far separated localities. This fact gravely invalidates the moral pointed by the dogmatic sermons of Prof. Elliot-Smith and his disciples, if I understand them, that without contact no two minds have ever independently "brought forth similar products whether in social organisation, religion, or material culture." In Egypt "and nowhere else" did inventions originate! It is surprising that with his own plate 23 before his eyes Prof. Elliot-Smith failed to recognise the clue to the riddle of the Mayan indigenous symbolism, but wildly stumbled on so exotic a *motif* as a mahouted elephant's trunk in America.

HENRY O. FORBES.

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Active Nitrogen.

PROF. R. T. BIRGE states in his letter appearing in NATURE of November 1, p. 642, that "active nitrogen was discovered in 1900 by Prof. E. P. Lewis, . . . and was found by him to have a characteristic spectrum."

I dislike discussions about priority, but can scarcely avoid pointing out that the expression "Active Nitrogen" was coined by me to express the facts which I discovered in 1911—namely, that a stream of nitrogen in a peculiar state is able to react in the cold with certain metals to produce nitrides, with carbon compounds to form hydrocyanic acid, and so on. This was established by purely chemical methods. The luminous phenomena which gave the clue to this discovery were described by Prof. E. P. Lewis, and I was careful to make due reference to his work.

RAYLEIGH.

Terling Place, Chelmsford,
November 5.

The Mass-spectra of Cadmium, Tellurium, and Bismuth.

I HAVE now succeeded in obtaining and analysing the mass-rays of cadmium, tellurium, and bismuth. By the use of an anode containing cadmium fluoride, rays were obtained which, though feeble, gave satisfactory results with long exposures and the most highly sensitised schumannised plates. Cadmium is a very complex element, having six isotopes: 110 (c), 111 (e), 112 (b), 113 (d), 114 (a), 116 (f). The last is isobaric with the lightest isotope of tin. The intensities of the lines are in the order of the letters and agree reasonably with the chemical atomic weight 112·41. The most striking characteristic of the group is its remarkable similarity to that of tin. If we except the heaviest isotope of tin (124), which does not seem to have its counterpart in cadmium, the intensity relations between the isotopes of the two elements appear almost identical. This is a most suggestive fact and may have a deep significance in connexion with the relative stability of the nuclei of isotopes. The plates are not very favourable for accurate determinations of masses, but these seem integral with that of iodine.

The line of the latter element was extremely faint in these experiments, so I considered it a favourable opportunity to make another attempt on tellurium, which had defied all attacks during the earlier discharge tube work. A little pure metallic tellurium was ground into the anode mixture and success was at once obtained. Tellurium gives three lines of mass numbers—126, 128, 130. The intensities of the two latter appear about equal and double that of the first. I have repeated this result with an anode containing tellurium and lithium fluoride, and have no reason to doubt that these are all genuine isotopes. Comparison with other lines on the plates suggests that their masses may be less than whole numbers by one or two parts in a thousand, but it seems probable that the mean atomic weight is actually greater than 128, whereas all the later chemical determinations are less than that figure, the accepted value being 127·5. The element tellurium is unique among those so far analysed, as it seems probable that *all* its mass-numbers form members of isobaric pairs. These are shared by xenon, the element of next higher even atomic number.

The boiling-point of tellurium is not very different from that of bismuth, so that it seemed possible that the latter might yield to the same treatment. This hope was realised with an anode containing metallic bismuth, and a single line appeared in the expected position—209. This line is very faint, and owing to the great mass lies in an unfavourable part of the plate, but there seems no reason to doubt that bismuth is a simple element of mass number 209, as recent determinations of its atomic weight suggest.

F. W. ASTON.

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November 4.

Need for the Redetermination of the Atomic Weights of Uranium, Thorium, and Radium.

IT is known that the atomic weights of such radio-elements as have been determined experimentally agree approximately with those to be expected on radioactive theory, and also that small unexplained discrepancies appear when the actual instead of the approximate values are considered. The simplest explanation of these small discrepancies is, I think, that one at least of these determinations is wrong, and I give reasons below for this view in the hope that someone versed in atomic weight work will make fresh determinations of the masses of the elements concerned.

The following are the experimental values of the atomic weights to be discussed: uranium, 238·18; thorium, 232·15; radium, 225·97; radium Ω′, 206·04; thorium Ω, between 208·0 and 208·2. If the atomic weight of radium Ω′ be accepted as 206·04, that of radium should be 226·08 and that of uranium 238·09, assuming that the α-particle has a mass of 4·00, and allowing for the loss of mass due to the energy of the expelled particles. Each of these values is nearly 0·1 different from the experimental values. If the allowance for the loss of mass be neglected, the calculated value for radium is within the error of the experimental value, but the calculated value for uranium is 0·14 smaller than the experimental. Several workers, including the writer, have preferred to accept this second view and to explain the discrepancy between uranium's calculated and experimental values by assuming the existence of an isotope with a greater mass than that of uranium. The new contribution to this discussion is that this will not account for the discrepancy. Such an isotope would reveal itself by its product, and it is now known that the experimental evidence, while favouring the existence of this isotope, is against its concentration in ordinary uranium to an extent that would raise the mean atomic weight more than 0·03. The close relation between groups of radioactive isotopes and those of inactive elements, lately pointed out by the writer, leads also to this view. It would therefore