is limited only by the amount of hydrogen. The theory obviously contains several uncertain hypotheses, but a calculation of the amount of energy that would be set free by the process gives quite the right order of magnitude. In addition, the process fulfils the requirement of Eddington that its probability should increase very rapidly with the temperature at about 40 million degrees, and can also fulfil his requirement that it should contain a 'delay-period' which is not dependent on temperature or pressure. It thus seems possible that the stellar energy has a source in this method of element-building which the wave-mechanics has opened up to us. But there are so many astrophysical difficulties that we hesitate to express a definite opinion, more especially as it is difficult to see how the heaviest elements can be formed by this means at all.

A full account of the investigation will appear shortly in the *Zeitschrift für Physik*. It would seem worth while to investigate the effect of fast protons on light elements in the laboratory, and experiments along these lines are contemplated.

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Internal Absorption of γ-rays.

FOUR years ago (NATURE, **115**, 13, 86; 1925), one of us estimated the internal absorption of the γ-rays of radium-D and the fraction of the atoms emitting γ-rays. Due to an oversight and, in the latter case, an arithmetical error, both estimations are incorrect. They have recently been re-calculated in the following manner.

The relative ionisations produced by the β-rays of radium-E (in equilibrium with the radium-D), and the soft and hard γ-rays were measured in an electroscope, the walls of which consisted of paper coated with graphite and, after correction, were found to be 24,000, 40, and 2·6 respectively. Assuming that the energy in a beam of X- or γ-rays is proportional to the total ionisation produced in air, the respective energies in the three types of rays were found to be proportional to 1500, 13, and 23. As the respective average energies of single rays are 350,000, 12,000, and 46,700 electron volts, we find that for the disintegration of 43 atoms of radium-E or radium-D, 11 atoms emit a soft γ-ray (L-radiation) and 5 atoms a hard γ-ray. No allowance, however, has as yet been made for the fact that β-rays are ejected by the hard γ-rays from M and N levels (the consequent M and N radiations would not be observed in our experiments). Curtiss estimates that the intensity of the β-rays ejected by the hard γ-rays from the M and N levels is 70 per cent that from the L levels, so that, assuming the number of hard γ-rays absorbed to be proportional to these intensities, 8 atoms emit M and N radiations.

We arrive, therefore, at the following figures. Out of 43 atoms disintegrating, 24 atoms emit γ-rays. Of these 24 γ-rays, 19 suffer internal absorption. It seems probable that, in the case of all substances, only a fraction of the atoms emit γ-rays after a β-ray disintegration. This should be taken into account in estimating times of emission of γ-rays.

A further set of experiments was carried out to determine if there were any β-rays emitted from radium-E with energy of the order 2,000,000 electron volts. The method used may be of interest and is given below. An electroscope was placed on top of the poles of an electromagnet, which produced an average field of 1250 gauss. The active material was 10 cm. below the bottom of the electroscope. Sufficient material was placed beneath the electroscope to cut off secondary β-rays produced by γ-rays, and, directly over the active material, absorption sheets which cut down β-rays of energy 2,000,000 volts until the issuing rays had a value of $HR < 6000$. Such rays would be deflected from the electroscope by the magnetic field. No difference was found between the electroscope readings with and without magnetic fields. Allowing for the difficulty of measuring small differences, we estimate that less than one atom in 25,000 emits a β-ray of energy 2,000,000 volts, and possibly none at all.

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Diœcism in *Ranunculus acris*.

MR. R. O. WHYTE'S letter in NATURE of Mar. 16, p. 413, on the cytological aspect of the hitherto little noticed peculiar form of the common acrid buttercup, stimulates me to make some general remarks respecting it.

I first made its acquaintance in the spring of 1923 near my home in Cumberland, and sent specimens to the Linnean Society of London. They were exhibited at the meeting held on June 21 (*Proc. Linn. Soc.*, p. 50, 1923). Through lack of time, I believe, they were not discussed. I then approached a leading authority on the British flora, Dr. Claridge Druce, who kindly replied to the effect that this form was strange to him. He incorporated it in his "Plant Notes" for 1923 (*Report*, Bot. Exchange Club, p. 24, 1923), with an extract from my letter, naming it *Ranunculus acris* L. var.; sub. var., or forma *minutiflorus*, Druce.

Finding that Mr. Marsden-Jones was working on the genetics of the genus *Ranunculus*, I sent specimens to him, and he was not long in reporting to me the occurrence of the same in his own neighbourhood, Potterne, Wilts. I am glad to see that he has not only taken up the genetics of it, but also has prevailed upon Mr. Whyte to work out the cytological side—a piece of research which promises to shed light on the origin of unisexual from hermaphrodite flowers.

It is curious that this 'female' form of *Ranunculus acris* has not excited attention previously. None of the British floras consulted refer to it. Since it came under my notice for the first time in 1923, I have seen it every subsequent season in fair abundance in my own neighbourhood. Apparently it is a general associate of the ordinary form of this buttercup. What exactly is its significance in the bionomics of the species it is difficult to say. One might hazard the view, tempting but not altogether probable, that *Ranunculus acris* is in the incipient stage from hermaphroditism to gynodiœcism.

Though no exact calculation as to the frequency of this 'female' form among the ordinary type in my neighbourhood has been made, one per cent might be a possible estimate; though of the extreme cases with stamens as mere rudiments this might be a considerable overstatement. The extreme form is very noticeable on account of the much smaller size of the petals. Moving such 'female' plants to the garden has not changed the size or character of the flowers in subsequent seasons, so that the reduced nature of the corolla and the abortion of the stamens are apparently not due to poverty of soil or other adverse conditions. No difference in vegetative characters can be detected between the ordinary and the 'female' plants. The latter appear just as vigorous in growth.

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Cumberland, Mar. 20.