LETTERS TO THE EDITOR

Prompt publication of brief reports of important discoveries in physics may be secured by addressing them to this department. Closing dates for this department are, for the first issue of the month, the eighteenth of the preceding month, for the second issue, the third of the month. Because of the late closing dates for the section no proof can be shown to authors. The Board of Editors does not hold itself responsible for the opinions expressed by the correspondents.

Communications should not in general exceed 600 words in length.

On the Origin of Cosmic Radiation

In a recent letter[1] to this Journal, E. R. Sabato has criticized the "Cosmic cyclotron" process,[2] which I once suggested might account for the generation of cosmic radiation. The discrepancy between our opinions seems mainly to be due to the fact that Mr. Sabato has not decided—which is necessary—whether to treat the problem in a fixed coordinate system (as I have done) or in a system following the rotation. In the latter case he must take into account the polarization of the stars due to their axial rotation, which I have supposed to be small in a fixed system. If he does this he will no doubt arrive at the same result as I.

I think that when criticizing this old model Mr. Sabato ought to have mentioned that already two years ago I abandoned it in favor of a much more powerful (and simple) one, where the acceleration takes place mainly in the axial direction of the double star.[3] In this case the accelerated particles are hurled out directly into the surrounding space so that the objection (3)—the only correct one of Mr. Sabato's—does not apply to this case.

Since the discovery of cosmic radiation a multitude of hypotheses about its origin has been made. In general the idea is that such an unexpected and remarkable phenomenon must derive its origin from some very extraordinary processes. But before we regard the radiation as an indication of new natural laws, we ought to investigate if it is not possible to explain it in terms of the laws we know already. This is what I have tried to do, and the result is that classical electrodynamics applied to stellar motions and stellar magnetic fields can very well account for the generation of the cosmic rays. In spite of the fact that the theory has need of no assumptions more drastic than that the magnetic moments of some stars surpass that of our sun by some powers of ten, it is able to account for most of the experimental facts and is in conflict with none. It is clearly understood that it is not possible as yet to decide with certainty how the radiation is generated, but as long as there is no evidence against an explanation according to classical laws, there is little need to invent new laws, more or less arbitrary and fantastic.

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[1] E. R. Sabato, Phys. Rev. **55**, 1272 (1939).
[2] E. R. Sabato, Zeits. f. Physik **105**, 319 (1937).
[3] E. R. Sabato, Zeits. f. Physik **107**, 579 (1937).

Evidence for Incorrect Assignment of the Supposed Si²⁷ Radioactivity of 6.7-Minute Half-Life

It has been reported[1] that three different radioactive substances are produced by the bombardment of Mg with natural α-particles. One of these, of 2.36-min. half-life, emits negative electrons, and was interpreted as Al^{28}, produced by the reaction Mg^{25} (α, n). This assignment was subsequently proved correct when the same activity was produced from the reactions Al^{27} (d, p); Al^{27} (n, γ); Si^{28} (n, p) and P^{31} (n, α). The second period of 11-min. half-life which was originally assigned to Al^{29} is probably due to an impurity.[2] The third period (6.7 min.) was supposed to be a positron activity and was therefore assigned to Si^{27}, produced by a reaction Mg^{24} (α, n). This assignment meets with several serious difficulties in the light of more recent evidence. (See below.) We have therefore repeated the experiment with the 16-Mev α-particles furnished by the Purdue cyclotron. The result is that there is *no positron activity*, but only negative electrons. This proves that the previous assignment was incorrect and *that the 6.7-min. period is almost certainly* Al^{29}, formed by the reaction Mg^{26} (α, p).

The arguments which led us to suspect the previous assignment as incorrect are the following.

(1) Si^{27} should be produced in the reaction Al^{27} (p, n). Aluminum was bombarded with protons of more than 7 Mev in Rochester, but not a trace of the 6.7-min. activity was obtained although the energy of the protons must have been sufficient to produce the reaction.

(2) The reported positron energy (2.0 Mev) is much too low and the lifetime (6.7 min.) much too long to fall in line with the analogous nuclei which form a very regular sequence in both of these respects.[3] Extrapolating the experimental results obtained with lighter nuclei we should expect about 3.5-Mev positron energy and 4 seconds half-life for Si^{27}. Similar values are obtained from a theoretical estimate of the Coulomb energy.

(3) From the reported positron energy[4] of 2.0 Mev and the known reaction energy[5] of Mg^{24} (α, p) Al^{27}, viz. -1.6 Mev, it follows that Si^{27} can only be produced by α-particles of more than 6.2 Mev, whereas Ellis and Henderson report it for 5.4 Mev.

(4) Bothe and Gentner[6] failed to find the activity when irradiating Si with 17-Mev γ-rays. 14.5 Mev should have been sufficient to produce the photoelectric effect, and there is no case known in which a well-established radioactive period could not be obtained by a $\gamma - n$ reaction.