LETTERS TO THE EDITORS

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Connexion between the Penetrating Non-ionizing Component of Cosmic Radiation and Penetrating Showers

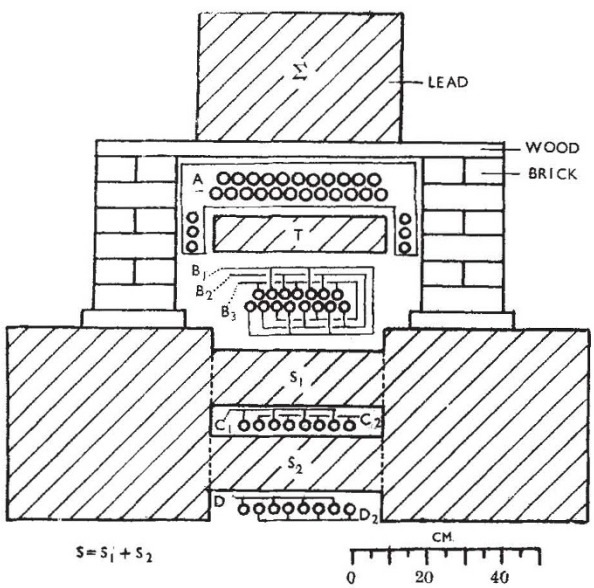
In a recent publication[1] we suggested that there is a connexion between penetrating showers produced at sea-level and the penetrating non-ionizing radiation discovered by Rossi and Regener[2] on Mt. Evans and by us at sea-level. The present investigation was undertaken with the object of establishing such a connexion. The results show that a considerable fraction of the penetrating showers are produced by a penetrating non-ionizing radiation, but that only a small fraction of this radiation produces penetrating showers.

The experimental arrangement, illustrated diagrammatically herewith, was a combination of the arrangement by which penetrating showers were originally observed[3] and the arrangement used to observe the non-ionizing radiation[1].

Sevenfold coincidences $B_1-B_2-B_3-C_1-C_2-D_1-D_2$ involving counters out of each of the three trays, B, C and D, were recorded; one of us has shown for a similar arrangement[3] that such coincidences are mainly due to penetrating showers.

If the absorbers T and Σ were removed, only penetrating showers coming from the air were recorded. On placing an absorber T above the counter tray B, the coincidence rate increased by $0{\cdot}289 \pm 0{\cdot}062$ coincidences per hour, the increase being due to the showers produced in T. To show that a considerable fraction of these showers were due to non-ionizing agents the following method was used.

The absorber T was covered on five sides by a set of anti-coincidence counters consisting of thirty-five counters in parallel. Thus a non-ionizing particle producing a penetrating shower in T could give rise to an anti-coincidence, that is, a sevenfold coincidence not accompanied by the discharge of any



Absorbers		Time	Coincidences		Anti-coincidences	
T (cm. Pb)	Σ (cm. Pb)	hr.	Total No.	Rate per hr.	Total No.	Rate per hr.*
0	0	306 : 15	162	0·529 ±0·042	5	0·023 ±0·010
10	0	380 : 30	311	0·818 ±0·046	24	0·086 ±0·018
10	5	1289 : 56	1100	0·853 ±0·026	59	0·063 ±0·008
10	35	1344 : 20	924	0·688 ±0·023	33	0·033 ±0·006

* Corrected for random coincidences.

of the counters A. With $T = 10$ cm. of lead, $0{\cdot}086 \pm 0{\cdot}018$ anti-coincidences per hour were recorded. All these anti-coincidences might have been due to non-ionizing particles, but to show that at least part were, in fact, due to non-ionizing rays and not to some spurious effect, observations were carried out with a variable absorber Σ placed above the anti-coincidence set. It was expected that some of the non-ionizing particles moving towards T would be absorbed in Σ. Thus the decrease of the rate of anti-coincidences with increasing thickness of Σ was a measure of the rate of anti-coincidences due to non-ionizing particles.

It is clear from the data given in the accompanying table that the anti-coincidence rate falls considerably as Σ is increased from 0 to 35 cm. of lead. We conclude, therefore, that some of the showers produced in T are produced by non-ionizing particles.

The non-ionizing radiation does not seem to consist of photons, as photons would be almost entirely absorbed in 5 cm. lead, while our observations show a marked absorption as Σ is increased from 5 cm. to 35 cm. of lead. It is not unreasonable to assume that this radiation is part of the penetrating non-ionizing radiation reported previously[1,2].

As the range of the non-ionizing radiation cannot be determined accurately from our data, it is difficult to estimate its rate of incidence. Rough calculations, which will be given elsewhere, indicate (1) that the rate of incidence is about 1 per cent of the rate of non-ionizing radiation observed with our previous arrangement[1], and (2) that one third of the penetrating showers produced near sea-level are produced by the penetrating non-ionizing radiation.

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[1] Janossy, L., and Rochester, G. D., Nature, **148**, 531 (1941); and *Proc. Roy. Soc.*, A, in the Press.
[2] Rossi, B., and Regener, V. H., *Phys. Rev.*, **58**, 837 (1940).
[3] Jánossy, L., *Proc. Roy. Soc.*, A, **179**, 361 (1942).

Purification and Chemistry of Penicillin

The lability of penicillin is such as to preclude most of the ordinary chemical manipulations. Attempts by us to purify the material by the procedure of E. P. Abraham and E. Chain[1] had little success, perhaps for reasons which appear below. After a lengthy search, we have developed a new chromatographic technique involving a chemical reaction which for the first time provides a rapid means of concentrating penicillin to a high degree with the minimum risk of chemical change.

Penicillin is chromatographed from an organic solvent such as ether or amyl acetate on a column consisting of a water-retentive support such as silica-gel