

undescribed porphyrin. The methyl ester crystallizes in rectangular or rhomboidal prisms, resembling protoporphyrin ester, has m.p. 233–38° and a spectrum closely similar to that of coproporphyrin. The quantity obtained is as yet insufficient for analysis.

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Disintegration Processes by Cosmic Rays with the Simultaneous Emission of Several Heavy Particles

ON photographic plates which had been exposed to cosmic radiation on the Hafelekar (2,300 m. above sea-level) near Innsbruck for five months, we found, apart from the very long tracks (up to 1,200 cm. in length) which have been reported recently in a note in the Wiener Akademie-Berichte, evidence of several processes described below.

From a single point within the emulsion several tracks, some of them having a considerable length, take their departure. We observed four cases with three particles, four with four and 'stars' with six, seven, eight and nine particles, one of each kind.

The longest track corresponded to a range in air (15°, 760 mm. Hg) of 176 cm. The ionization produced by the particles is different in the different cases. Most of the tracks show much larger mean grain-distances than α -particles and slow protons.

In Fig. 1 a 'star' with eight tracks is reproduced. On account of the rather steep angles at which some of the particles cross the emulsion-layer (approximately 70 μ thick) it is not possible to have all the tracks of a 'star' in focus simultaneously. Fig. 2 shows a sketch of the same 'star'. Measurement of the tracks gives the results in the accompanying table.

Track	Length in cm. of air (15°, 760 mm.)	Number of grains	Position of the end of the track
A	30.0 cm.	113	Within the emulsion
B	11.0 "	15	" " "
C	44.6 "	71	Glass " "
D	6.2 "	11	" " "
E	7.0 "	22	" " "
F	1.2 "	5	Within the emulsion
G	13.6 "	67	Surface of the emulsion
H	23.9 "	58	Glass

Centre of the 'star' 25 μ under the surface of the emulsion.

We believe that the process in question is a disintegration of an atom in the emulsion (probably Ag or Br) by a cosmic ray. The striking feature

about it is the simultaneous emission of so many heavy particles with such long ranges, which excludes any confusion with 'stars' due to radioactive contamination. A similar configuration of tracks by chance is equally out of question. Brode and others¹

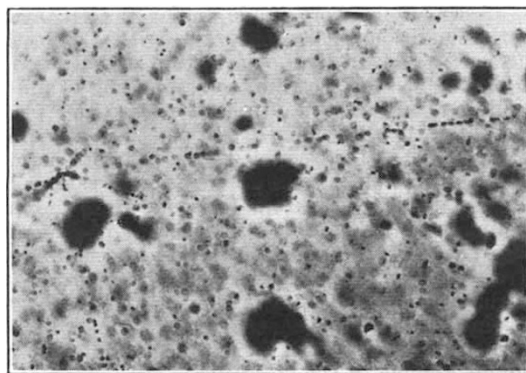


FIG. 1.

observed a single case of a disintegration with three heavy particles in a Wilson cloud chamber. The phenomenon which Wilkins believes was a shower of protons is perhaps a similar process, but he did not observe a centre².

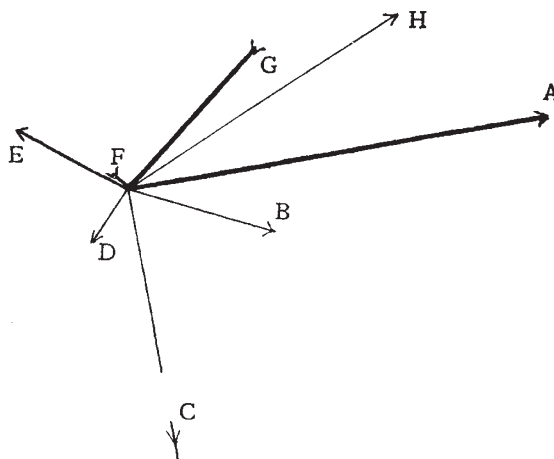


FIG. 2.

THICK LINES INDICATE A COMPARATIVELY LARGE NUMBER OF GRAINS PER UNIT OF LENGTH OF THE TRACK. AN INTERRUPTED LINE MEANS THAT THE TRACK IS TOO LONG TO BE REPRODUCED ON THE SAME SCALE. THE ARROWS INDICATE THE DIRECTION FROM THE SURFACE OF THE EMULSION TO THE GLASS.

The total energy involved in the process cannot as yet be calculated as most of the particles do not end in the emulsion.

We hope to give further details before long in the Wiener Akademie-Berichte.

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¹ Brode, R. L., and others, *Phys. Rev.*, **50**, 581 (October, 1936).
² Wilkins, *Nat. Geog. Soc.*, Stratosphere Series, No. 2, 37 (1936).