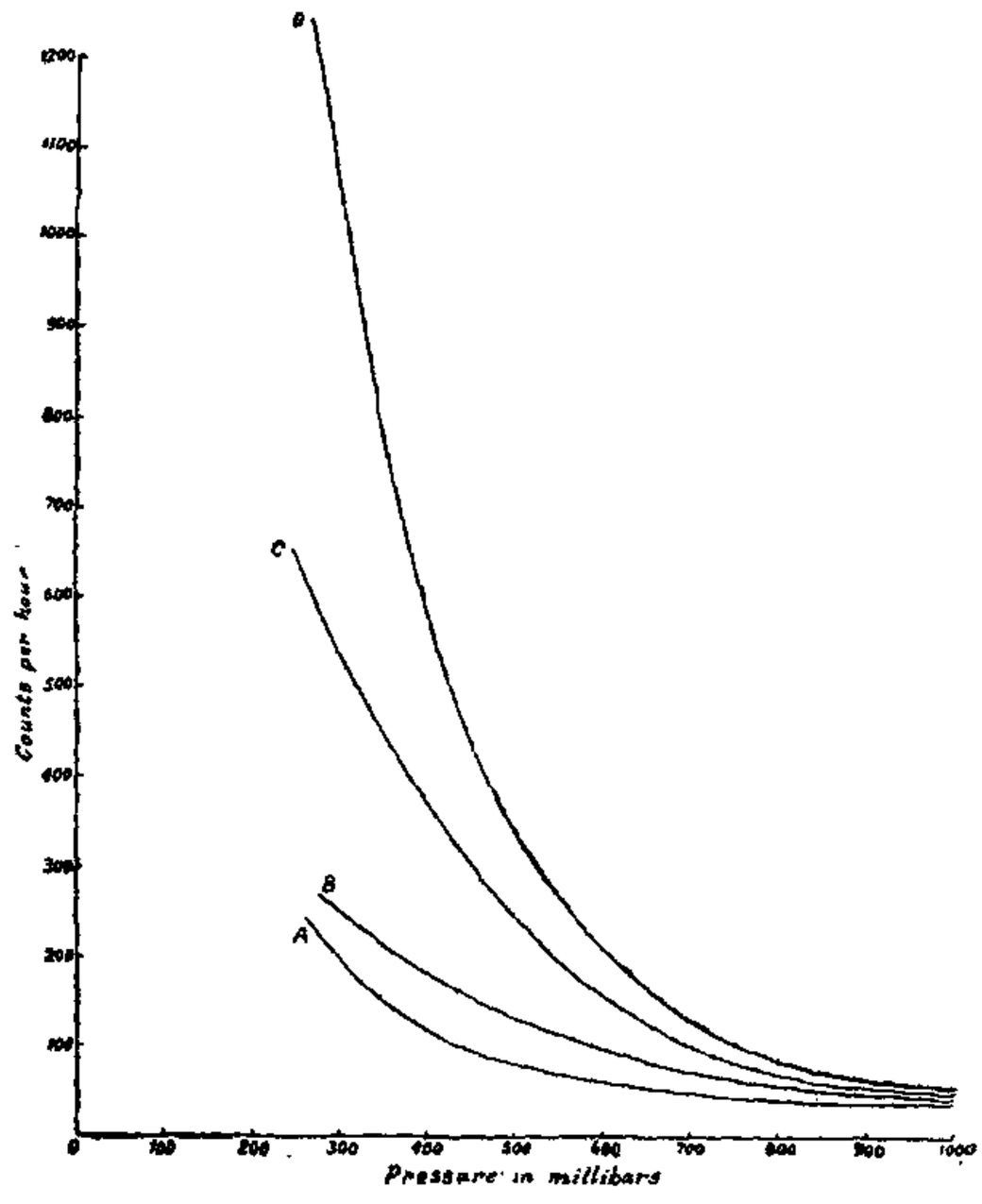
LETTERS TO THE EDITOR

LATITUDE EFFECT FOR MESONS

Schein, Jesse and Wollan,[1,2] and Schein, Jesse and Grötzinger[3] have measured the variation with altitude of the vertical intensity of mesons penetrating 10 cms. of lead at Chicago, magnetic latitude 52·5° N. Similar measurements were made earlier by Dymond[4] at Edinburgh, magnetic latitude 59° N, but the work was interrupted by the war and only a preliminary note has been published. No such measurements have yet been made near the geomagnetic equator. We have, therefore, measured in an airplane the vertical intensity of mesons penetrating a 20 cms. block of lead absorber at Bangalore, magnetic latitude 3·3° N, up to a height corresponding to a pressure of 275 millibars 32,000 ft., with a quadruple coincidence counter telescope in which the extreme counters were 35 cms. apart. The counters were 15 cms. long and 3½ cms. in diameter. The geometry of the telescope was, therefore, such that a particle recorded at the maximum allowed angle of 22° would travel a thickness of the atmosphere and absorber only 8 per cent. greater than a particle arriving vertically.

In the figure we have plotted our results giving the intensity of mesons penetrating 20 cms. of lead at 3·3° N as curve A and, for comparison, the latest results of Schein, Jesse and Wollan[2] for the intensity of mesons at 52·5° N as curve B. The two curves have been fitted at sea-level to allow for the known latitude and longitude effect[5] of 12 per cent. In the same figure we have plotted the variation of the total vertical intensity with altitude at 3·3° N as given by Neher and Pickering[6] for a triple coincidence counter telescope as curve C, this curve being fitted to our curve so as to show a ratio of vertical meson intensity to total vertical intensity of 80 per cent. as observed at ground-level at Bangalore. Curve D gives the variation of the total vertical intensity with altitude as measured by Pfotzer[7] at a magnetic latitude of 49° N. The four curves together show at a glance the striking fact that whereas the latitude effect between 3·3° N and 49° N of the total intensity shows a pronounced increase with altitude, the penetrating component shows practically no such increase of latitude effect even to heights corresponding to a pressure of 275 millibars. Our results give at least qualitative support to the theory of Hamilton, Heitler and Peng[8] according to which the penetrating component



Curve A—Vertical meson intensity at 3·3° N (Bhabha, Aiya, Hoteko and Saxena). *Curve B*—Vertical meson intensity at 52·5° N (Schein, Jesse and Wollan 1941). *Curve C*—Vertical total intensity at 3·3° N (Neher and Pickering). *Curve D*—Vertical total intensity at 49° N (Pfotzer).

should show only a slightly greater latitude effect than at sea-level up to the heights corresponding to a pressure of 100 millibars. The difference in the geometry of the counter telescopes used by the different authors and the statistical accuracy of the results do not yet permit a quantitative comparison.

A detailed report of this work together with other results will be published shortly elsewhere.

It is with pleasure that we express our gratitude to Col. M. C. Robinson, Commanding Officer of the 84th Air Depot of the U.S.A. Air Force, for giving the permission for the flight, and also to Major G. Denis, Capt. J. Claunch, Lt. Mack, and Sgt. Beaver, under him, for their whole-hearted co-operation.

H. J. Bhabha.
S. V. Chandrashekhar Aiya.
H. E. Hoteko.
R. C. Saxena.

Cosmic Ray Research Unit,
Indian Institute of Science,
Bangalore,
April 10, 1945.

---

1. Schein, Jesse and Wollan, *Phys. Rev.*, 1940, **57**, 847. 2. —, —, —, *Ibid.*, 1941, **59**, 615. 3. —, — and Grötzinger, *Ibid.*, 1940, **58**, 1027. 4. Dymond, *Nature*, 1939, **144**, 782. 5. Millikan, Neher and Pickering, *Phys. Rev.*, 1942, **61**, 397. 6. Neher and Pickering, *Ibid.*, 1942, **61**, 407. 7. Pfotzer, *Zeits. f. Physik*, 1936, **23**, 102: 8. Hamilton, Heitler and Peng, *Phys. Rev.*, 1943, **64**, 78.