TABLE I. *Experimental values of R_e for neon and R_T values calculated from the Sutherland model.*

Temperature Range	T_m	T_r	R_e(Nier)	R_T at T_m	R_T at T_r
283°–617°K	450°K	407°K	0.71±0.02	0.77	0.75
90°–294°K	192°K	153°K	0.44±0.01	0.54	0.45
90°–195°K	142°K	129°K	0.39±0.03	0.42	0.38

ment with experiment, although this should not be taken too seriously at the present time, for as Jones points out, many difficulties still face the Sutherland model. The important point is that using values calculated at T_m instead of at T_r can lead one to errors of as much as 25 percent.

It is a pleasure to acknowledge the friendly interest of Dr. Robert Dudley Fowler, with whom the writer is engaged on an isotope separation project for which financial aid has been kindly given by Dr. H. A. B. Dunning.

HARRISON BROWN

Chemical Laboratories,
The Johns Hopkins University,
Baltimore, Maryland,
August 8, 1940.

[1] R. C. Jones, Phys. Rev. **58**, 111 (1940), Eq. (43).
[2] Reference 1, Eq. (54).
[3] A. O. Nier, Phys. Rev. **56**, 1009 (1939).
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On the Fine Structure Pattern of Cosmic Rays at Mexico City

In August, 1940, a preliminary survey of directional cosmic-ray intensity was carried out at Mexico City, in search of a fine structure pattern analogous to that found at St. Louis, Missouri, by Ribner[1] and at Columbia, Missouri, by Cooper.[2] As in the Missouri experiments, the procedure here was to explore repeatedly a succession of zenith angles z at a given azimuth φ, and in this manner to determine the zenith angle intensity distribution $I(z, \varphi)$ for a predetermined set of azimuthal orientations φ. In the experiment described here, the four principal azimuths $\varphi=0°$, 90°, 180°, 270° (N, E, S, W) were explored in the zenith angle range $0° \leqq z \leqq 54°$ at angular intervals of 6°. The cosmic-ray telescope employed has been briefly described elsewhere.[3]

Before proceeding to our results, it should first be remarked that the fine structure pattern found in Missouri, $\lambda=50°$N, $h_0=10.6$ meters,[4] may be represented throughout the sky by an intensity surface $I(z, \varphi)$ possessing loci of prominences of very nearly circular form, concentric about the zenith.[2] There appear to be at least three such loci, at zenith angles $z=7°$, 20°, 35°. The possibility had been contemplated by one of us[5] that a pattern of this simple form might arise from the absorption of lines or bands inherent in the cosmic-ray spectra at infinity, provided that such spectral lines or bands were unaffected by the earth's magnetic field. This simple explanation has not been substantiated thus far by direct absorption measurements,[6] and so the possibility remains that the phenomena may have a geomagnetic or other origin. This peculiar circumstance added further incentive to undertake the present experiment at a lower geomagnetic latitude.

TABLE I. *Inner and outer prominences z_1 and z_2 (in degrees) for different azimuths φ.*

φ	z_1	z_2
N	(18)	42
E	18	42
S	12	48
W	12	42

Our present results at Mexico City, $\lambda=29°$N, $h_0=7.5$ meters,[4] are summarized in Fig. 1, where we have plotted $I(z, \varphi)$ directly,[7] in two curves. The top curve shows the variation of $I(z, \varphi)$ (that is, the total number of counts normalized to unity at the zenith) in the western and eastern azimuths; and the bottom curve shows the variation of $I(z, \varphi)$ in the southern and northern azimuths. It may be noted, in passing, that the top curve shows a marked west-east excess and the bottom curve an almost equally pronounced south-north excess, both agreeing well with those established by Johnson[8] at the same locality. The features of the curves which are of primary interest to us are the two prominences in each of the three azimuths E, S, W and the prominence (possibly two) in the N azimuth. Their positions are summarized in Table I. These results suggest, as the simplest hypothesis, that there are two oval loci of prominences, enclosing the zenith but slightly eccentric with respect to it. Whether or not this is the proper connectivity of the prominences remains to be decided by further exploration at smaller intervals of both azimuth and zenith angle. Such further exploration is now being undertaken with this object in view.

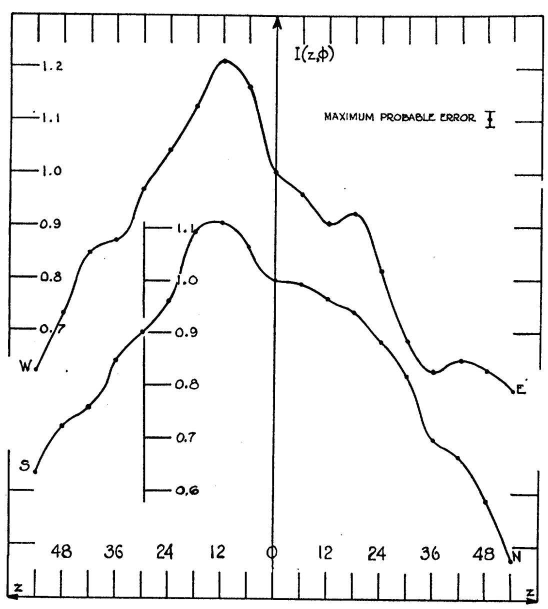

FIG. 1. Normalized directional cosmic-ray intensity $I(z, \varphi)$ at Mexico City, as a function of zenith angle z, for the four azimuths W, E (top curve) and S, N (bottom curve). The maximum probable error is about 1.5 percent, and the average probable error about 1.0 percent, of the zenith intensity.

To what extent the variations between the two patterns at Mexico City and Missouri are due, respectively, to changes of magnetic latitude and of altitude, and to what extent their loci of prominences are due, respectively, to particles of positive and of negative sign, are questions which must await further experimental results. The preliminary results which we have just described are presented at this time as a further confirmation of the existence and detectability of a fine structure pattern of cosmic rays, and of its potential value in the analysis of the primary radiations. A more extensive experimental program is now under way at Mexico City, the results of which we hope to report upon shortly.

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E. J. Schremp

Washington University,
St. Louis, Missouri,

Alfredo Baños, Jr.

Institute of Physics,
National University of Mexico,
Mexico City, Mexico,
September 14, 1940.

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[2] D. M. Cooper, Phys. Rev. **58**, 288 (1940).
[3] E. J. Schremp, Phys. Rev. **57**, 1061A (1940).
[4] Cf. E. J. Schremp and H. S. Ribner, Rev. Mod. Phys. **11**, 149 (1939) for definitions.
[5] Cf. E. J. Schremp and H. S. Ribner, reference 4, p. 150.
[6] Professor N. S. Gingrich and Mr. D. M. Cooper have privately communicated to us that their preliminary attempts at such direct measurements appear to give negative results.
[7] Rather than its deviation $\Delta(z)$ from the $\cos^2 z$ distribution, employed in references 1, 2 and 4.
[8] T. H. Johnson, Phys. Rev. **47**, 91 (1935); **48**, 287 (1935).