ferro- and para- Curie point. The Lorentz factor L is 3 ± 0.2.

(b) Near the Curie point the susceptibility κ is a function of the applied field. The observed values of $\kappa(E)$ agree with the theory.

(c) Above 35° the Kerr effect approaches a quadratic dependence upon the applied field and gives a Kerr constant of the same order of magnitude as that of most liquids.

(d) Near the Curie point the Kerr effect is proportional to the 2/3 power of the applied field. This agrees with the assumption that the Kerr effect is proportional to the square of the inner field $F=E+LP$.

(e) The Kerr effect is different in the b and c axis of the crystal. There exists a longitudinal Kerr effect.

(f) The theory explains the observed size and shape of the hysteresis loops.

(g) Small crystals act as a single elementary Weiss region. They show a real pyroelectric effect. The pyroelectric moment is identical with the permanent moment calculated from the theory. It vanishes above the upper and below the lower Curie point.

(h) Large crystals consist of a limited number of Weiss regions. The Weiss regions in Rochelle salt have a cross section of about 2 cm^2. They can be made visible with electrified powder (analogy to Bitter's experiment).

(i) Large crystals have a very pronounced Barkhausen effect. This effect exists only on the steep part of the hysteresis loop. It disappears above the Curie point.

(j) Points (g) and (h) explain the asymmetries observed in small crystals.

(k) The Kerr effect below the Curie point shows a quadratic hysteresis loop and follows the theory even for large fields. For large fields the effect is nearly proportional to the absolute value of the applied field.

(l) The temperature variation of the natural birefringence shows a sharp discontinuity at both Curie points. This change of double refraction agrees quantitatively with the assumption that it is due to the Kerr effect of the permanent Weiss field. The Weiss field can be measured. It has a maximum value of 200 kv per cm at 0°.

(m) Measurements of the reversible susceptibility as a function of the applied field gives a curve which is the derivative of a hysteresis loop.

(n) The susceptibility for $E=0$ follows a Weiss law below the upper Curie point $1/\kappa_0 = C(T_c - T)$.

(o) A similar Weiss law holds below and above the lower Curie point. All these results refer to fields in the a direction.

(p) The dielectric constants in the b and c direction increase with temperature. This is a consequence of the liberation of the dipoles at higher temperatures.

A complete account of the experiments and of the theory will appear soon.

HANS MÜLLER
Massachusetts Institute of Technology,
Cambridge, Massachusetts,
October 26, 1933.

Azimuthal Asymmetry of the Cosmic Radiation in Colorado

An investigation of the azimuthal asymmetry of the cosmic radiation near Fulford, Colorado, geomagnetic latitude 48°N, elevation 9500 feet, shows a difference between the west and east intensities of about two percent for angles of 30° and 40° from the vertical. The measurements were made with the same apparatus and in the same manner as at Swarthmore.[1] The results are summarized in Table I and are in accord with those found at Swarthmore.[1] Also there is agreement with Korff[2] who set an upper limit of 3 percent for the west-east difference with an indication of a slightly greater west intensity. The dispersion of the points on the curves of Stearns and Bennett[3] indicates that their probable errors were too great to detect such a small asymmetry as exists at these latitudes.

TABLE I.

Angle from vertical	Total time T (min.)	Total counts C	Counting rate C/T	Number of data n	Probable error from residuals R	Probable error from total counts R'	West-East difference (Counts/min.)
0°	1432	16,552	11.56	20	0.064	0.061	0
30° east	3951	30,463	7.71	25	0.031	0.026	0.17±0.045
west	4169	32,843	7.88	28	0.032	0.029	
45° east	4186	19,867	4.74	26	0.026	0.023	0.11±0.034
west	4801	23,295	4.85	25	0.022	0.022	

This investigation was made possible by the invitation of Dr. A. J. Allen to spend a few weeks at his cabin in the mountains and use the facilities of his hydroelectric plant.

E. C. STEVENSON
Bartol Research Foundation
of The Franklin Institute,
October 23, 1933.

---

[1] Thomas H. Johnson and E. C. Stevenson, Phys. Rev. **44**, 125 (1933).

[2] S. A. Korff, Phys. Rev. **44**, 515 (1933). Phys. Rev. **44**, 130 (1933).

[3] J. C. Stearns and R. D. Bennett, Phys. Rev. **43**, 1039 (1933).

Scattering Processes Produced by Electrons in Negative Energy States

Recent calculations[1] of the changes in the absorption-coefficient of hard gamma-rays due to the formation of electron-positron pairs have lent strong support to Dirac's picture of holes of negative energy. Still, the almost insurmountable difficulties which the infinite charge-density without field offers to our physical understanding make it desirable to seek further tests of the theory. Here purely

---

[1] J. R. Oppenheimer and M. S. Plesset, Phys. Rev. **44**, 53 (1933).