$T_3+\frac{3}{2}$ is the charge of the nucleus, φ the orbital part of the ground state eigenfunction, $z^{AB}=z^A-z^B$, $r_{AB}=|z^{AB}|$, $(f\mu)$ the dimensionless coupling constant of the meson field: $(f\mu)^2\cong\frac{1}{10}$, and $\mu=\mathrm{Mc}/\hbar$.) A rough evaluation of $M^{(1)}$ has been made with the help of gauss functions $\varphi\sim\exp(-\alpha r^2)$, $r^2=\frac{1}{2}(r_{12}^2+r_{13}^2+r_{23}^2)$, with the following result (J is the volume integral in M).

μ^2/α	1.0	1.5	2.0	2.5	0.75
J	−0.14	−0.21	−0.23	−0.23	−0.058
M	+0.18	+0.28	+0.31	+0.31	+0.077

Thus, with reasonable values of γ, $(f\mu)$, and μ^2/α we obtain both the right sign and right order of magnitude of the correction to be added.

It should be noted that for He^3 the correction is equal in magnitude but opposite in sign. We would, therefore, expect for He^3 a total magnetic moment $\mu\cong\mu(N)-M\cong-2.1$ n.m. Experimental evidence would be very interesting.

[1] F. Bloch, A. C. Graves, M. Packard, and R. W. Spence, Phys. Rev. **71**, 373 and 551 (1947); H. L. Anderson and A. Novick, Phys. Rev. **71**, 372 (1947).
[2] R. G. Sachs and J. Schwinger, Phys. Rev. **70**, 41 (1946).
[3] R. G. Sachs, Phys. Rev. **71**, 457 (1947).
[4] E. Gerjuoy and J. Schwinger, Phys. Rev. **61**, 138 (1942).
[5] S. T. Ma and F. C. Yu, Phys. Rev. **62**, 118 (1942); C. Møller and L. Rosenfeld, Kungl. Danske Vidensk. Selsk. **20**, No. 12 (1943); W. Pauli and S. Kusaka, Phys. Rev. **63**, 400 (1943).

Errata: Theory of Dipole Interaction in Crystals

[Phys. Rev. **70**, 954 (1946)]

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SEVERAL misprints have been noticed in the above paper. These are the following:

P. 956, line 7 should read p_x^ν, p_y^ν, p_z^ν, $\nu=1,\cdots,8$.

P. 956, Eq. 7 should read

$$U=-\frac{1}{16}\sum_{\mu,\nu=1}^{8}\sum_{xy}F_{\mu\nu}{}^{xy}p_x{}^\mu p_y{}^\nu. \quad (7)$$

P. 957, Eq. 12 should read

$$Z_i=(-)^{\alpha_i l_1+\beta_i l_2+\gamma_i l_3} \quad i=1,\cdots,8. \quad (12)$$

P. 960, last equation. The denominator should be raised to the 5/2 power.

P. 960, Table II, first line should read

$$f_2=-\tfrac{1}{2}[S_z(0,\tfrac{1}{2},\tfrac{1}{2})-S_z(\tfrac{1}{2},0,0)].$$

P. 960. The small table under Table II contains several inversions and a sign error. It is correctly given by:

$$S_z(\tfrac{1}{2}\ 0\ 0)=-15.040 \quad S_y(0\ \tfrac{1}{4}\ \tfrac{1}{4})=31.521$$
$$S_z(0\ \tfrac{1}{2}\ \tfrac{1}{2})=4.334 \quad S_y(\tfrac{1}{2}\ \tfrac{1}{4}\ \tfrac{1}{4})=2.599$$
$$S_y(\tfrac{1}{4}\ \tfrac{1}{4}\ \tfrac{1}{4})=10.620 \quad S_z(0\ \tfrac{1}{4}\ \tfrac{1}{4})=12.329$$

Lastly, in Table V, p. 963, lines 4 and 5 should be exchanged (which moves a minus sign down one line), and line 12 should read $-2\mathbf{X}_8-\mathbf{Y}_8+\mathbf{Z}_8$.

The authors would like to thank Professor L. W. McKeehan for having pointed out several of the above misprints.

Burst Production by Penetrating Cosmic-Ray Particles*

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A TRAY of Geiger-Mueller tubes, G, and an ionization chamber, C, were arranged, respectively, above and below a lead block 6 in. thick, as shown in Fig. 1. The

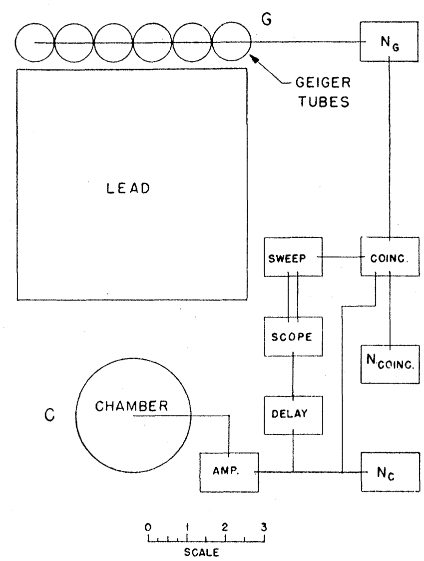

FIG. 1. Schematic arrangement of equipment.

Geiger-Mueller tubes were connected in parallel. Each was 1 in. in diameter and 20 in. long. The chamber was cylindrical in shape, 3 in. in diameter, 20 in. long, and was filled to 7.3 atmospheres with highly purified argon so that "fast" electron pulses would be recorded quantitatively. The pulses of the ion chamber were applied to the vertical deflecting plates of a cathode-ray oscilloscope through a linear amplifier and a delay line. The oscilloscope was provided with a fast horizontal sweep (5 microseconds per inch) which was triggered by the coincidences between the (undelayed) pulses of the ionization chamber and the pulses of the Geiger-Mueller tubes. The oscilloscope screen was photographed on a moving film. The individual counting rates of the chamber (N_c) and of the Geiger-Mueller tubes (N_g) were also recorded.

A polonium source of α-particles was placed on the wall of the chamber for the purpose of calibration. The resolving time $(\tau_1+\tau_2)$ for the selection of coincident pulses was determined both by direct observation of the pulses on the oscilloscope screen and by counting chance coincidences between pulses in the Geiger-Mueller tubes and α-particle pulses in the ionization chamber. Its value was found to be 50 microseconds.

For the main experiments, the circuits were adjusted so as to record only pulses greater than 1.1 times a Po

α-particle pulse. (The α-particle pulse corresponds to about 35 fast particles incident on the chamber from the vertical direction.) Measurements were taken at sea level in a light wooden building, and at 30,000 feet in the rear cabin of a B-29. The results are as shown in Table I.

TABLE I. Results of measurements.

Altitude (feet)	Time of observation (hours)	N_c (Counts in the chamber, per hour)	N_g (Counts in the G. M. counter tray, per hour)	Coincidence (per hour)	Chance coincidence (per hour) $N_cN_g(\tau_1+\tau_2)$
0	292	1.94	0.72×10^5	0.25	0.002
30,000	1.6	500	14.7×10^5	96	10

At both elevations only a small fraction of the coincident records obtained is accounted for by chance coincidences. We also believe that air showers have a negligible effect on our results because of the small number of showers with a particle density high enough to be recorded in these measurements, and thus conclude that most of the coincidences observed are caused by ionizing particles capable of producing a burst in the ionization chamber after traversing 6 in. of lead.

It does not seem possible to assume that these particles are electrons since an electron capable of producing a sufficiently large shower under 6 in. of lead must have an energy in excess of 10^{12} ev. Hence they must be of the "penetrating" type. On the other hand, the total number of penetrating cosmic-ray particles only increases by a factor of about 6 from sea level to 30,000 feet, while the observed effect increases by a factor of several hundreds. We are thus led to the conclusion that the penetrating component at 30,000 feet contains particles which are much more effective in producing bursts than are ordinary mesons.

As has been shown by one of us,[1] the shape of the pulse from an ionization chamber enables one to decide in most cases whether the pulse is caused by heavily ionizing particles from a disintegration or by an electron shower. Classification of our records according to pulse shape gives the results shown in Table II.

TABLE II. Classification of records according to pulse shape.

Altitude (feet)	Percent of pulses from: Showers	Heavily ionizing particles	Uncertain origin
0	78	—	22
30,000	57	30	13

It is likely that most of the showers observed at sea level are initiated by collision or radiation processes of ordinary mesons. These processes can only account for a very small fraction of the showers observed at 30,000 feet. It is natural to assume that the majority of the showers at this altitude are produced by electrons or photons generated by primary cosmic-ray particles (protons?) either directly or through the intermediary of short-lived mesons.

At 30,000 feet our data show evidence for nuclear disintegrations produced by penetrating ionizing rays. It is likely that most of the particles responsible for this effect are also primary "protons" (even though some of them may be negative mesons undergoing nuclear capture after being brought to rest).

The shower production by primary cosmic-ray particles, for which evidence is found in the present experiments, may account for that part of the soft component which cannot be explained by the disintegration of ordinary mesons.[2]

* The research described in this letter was supported partially by Contract N5 ORI-78, U. S. Navy Department, Office of Naval Research. The B-29 used for the measurements at high altitude was provided by the U. S. Army Air Force.
[1] H. Bridge, Phys. Rev. **72**, 172(A) (1947).
[2] H. Bridge and B. Rossi, Phys. Rev. **71**, 379 (1947).

Erratum: The Band Theory of Graphite

[Phys. Rev. **71**, 622 (1947)]

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Figure 13, the plot of the trend of $\rho\perp/\rho\|$ (ratio of resistivity *across* graphite planes to that *in* the planes), appeared in the paper in incorrect form. The corrected graph is as follows:

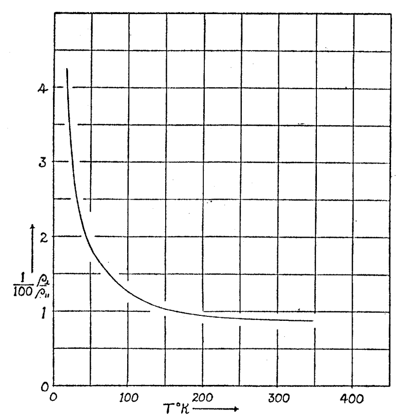

FIG. 1.

Nuclear Moments of the Bromine Isotopes*

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June 13, 1947

THE molecular beam[1] resonance method has been used to study the radiofrequency spectrum[2] of Br^{79} and Br^{81} in CsBr and LiBr. Typical results are shown in Fig. 1.

The positions of the resonance minima are the same in CsBr and LiBr, indicating that the minima are due to the bromine isotopes. The positions of the resonance minima shift proportionately to the magnetic field. This is the usual criterion[1] for assuming that the observed resonance frequency is at the Larmor frequency of the nucleus in the external magnetic field, which gives for the gyromagnetic