Small, finely ground portions of these samples (approximately 150 μ g) were weighed on a microbalance, and after being mounted on 0.001″ aluminum, the beta-rays were counted in a low absorption, windowless counter. The geometry of the counter was determined by using aliquots of solutions of $UX_{1,2}$, the UX_1 having been quantitatively separated from old uranium solutions by coprecipitation with lanthanum. The UX samples were mounted on films of zapon (<0.1 mg/cm^2), for which the backscattering is negligible. Since the carbon (14) was mounted on 0.001″ aluminum, a backscattering correction was obtained by mounting samples of the carbon on zapon film, counting, and then recounting after inserting 0.001″ aluminum behind the zapon film, less than 0.5 mm from it. This amounted to 21 percent in this counting arrangement. Other scattering has been assumed to be negligible, and self-absorption corrections have been neglected because the amounts contained less than 0.2 mg/cm^2 of the sample. As the counter had no window, the only other correction to be made concerns the weight of the counting mixture between the sample and the active portion of the counter tube (0.8 mg/cm^2).

A very rough preliminary value of 6100 years was announced at the June meeting of the American Physical Society. A number of mounts have now been prepared from both of the analyzed samples and a half-life of 5300 years obtained, which is appreciably below the previously accepted values. The uncertainty in this value is no more than 15 percent.

Penetrating Cosmic-Ray Bursts

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In order to see whether ionization bursts contain a penetrating component, we have recently performed measurements with the set shown schematically in Fig. 1. B is a small ionization chamber of 1.5 liters capacity, filled with pure argon to a pressure of 40 atmospheres. Under the chamber was placed a fourfold counter set C, and the bottom counters of this set were screened in all directions with lead to a thickness of 15 cm. The burst pulses from B were amplified and recorded photographically in a normal manner. Similarly, the fourfold counter coincidences were recorded in the usual way. Finally, in the event of a fourfold counter coincidence occurring simultaneously with a burst pulse, a small lamp was energized and was registered on the film recording the bursts.

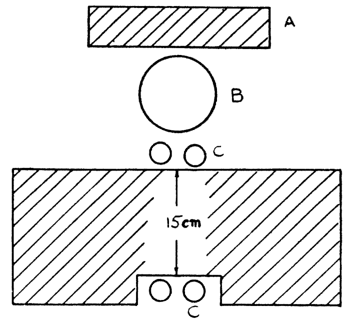

Fig. 1. Counter arrangement for burst measurements.

Table I. Observed burst rate.

Thickness of lead at A	No. of bursts with 4-fold coincidences	Time	Rate	Rate of 4-fold coincidences	Rate of bursts of size >20
7 cm	18	36	0.5 ± 0.1 (0.02) per day	45.5 ± 1 per day	8.5 per hour
0	2	12.5 days	0.16 ± 0.1 (0.004) per day	30.0 ± 1.6 per day	2.7 per hour

The minimum size of burst recorded was one of 20 rays through the chamber B.

The results of our measurements are given in Table I. In the fourth column of Table I, we show in parentheses the accidental rates of burst-shower coincidences, evaluated from the known resolving time of the circuits involved. The accidental rates are seen to be negligible.

It may be shown that the coincidences with 7-cm Pb at A cannot be caused by cascades, or to double knock-ons by mesons. The following processes may be thought of to account for the results: (a) the initial collision that forms the pinnacle of a cascade in the lead, also produces several mesons at the same time, (b) a small percentage of bursts is composed entirely of mesons, (c) all bursts are normal cascades which produce mesons during their development.

The size distribution of penetrating bursts

$$B(>N)=a \log (400/N),\ a=0.78/\text{day} \quad (1)$$

shows that (b) is unlikely.

A fuller account of the experiment will be published shortly.

Measurements of Nuclear Quadrupole Moment Interactions†

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The molecular beam magnetic resonance method[1–4] has been applied in the present work to a study of the resonance minima associated with the sodium nucleus in NaBr, NaCl, and NaI. Comparison of the results with the theory of Lamb and Feld[4] indicates that the predominant observed phenomena are caused by the interaction of the electrical quadrupole moment of the sodium nucleus with the inhomogeneous electric field of the molecule and provides a measurement of this interaction energy.

Previous measurements in this laboratory[3] of the deuteron quadrupole moment were made with D_2 and HD in the first rotational state in which case the resonance minima from the different orientation states were separately resolved enabling a very direct determination of