The agreement between these values and those of earlier investigations is good. The most probable means of the corresponding earlier Q-values are -1.28, 0.00, and 2.30 Mev. Furthermore, the lowest Q-value, -1.24 Mev, is in very good agreement with the highest Q-value of -1.27 Mev found by Brolley, Sampson, and Mitchell,[1] who used 22-Mev cyclotron α-particles.

For the boron reaction, we studied 200 tracks and found the Q-values -1.75, -0.55, -0.00, and 0.63 Mev.

The most reliable earlier investigation seems to be the second one of Creagan.[2] There is, however, a difference of about 0.63 Mev between his and our corresponding Q-values. If Creagan's Q-values are diminished by 0.21 Mev, we get the values shown in Fig. 3.

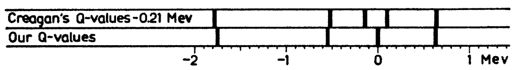

FIG. 3. Comparison between our Q-values for the $B(\alpha, p)C$ reaction and the corresponding Creagan values, reduced by 0.21 Mev.

Our 0.00-Mev group seems to be the unresolved mean of two of Creagan's groups. Apart from this, the agreement between the groups is good.

A further description of our investigations and a possible explanation of the discrepancy noted above will appear in *Arkiv för Fysik.*

[1] Brolley, Sampson, and Mitchell, Phys. Rev. 76, 624 (1949).
[2] R. J. Creagan, Phys. Rev. 76, 1769 (1949).

Low Intensity Radiations in I^{131} Decay*

H. ZELDES, A. R. BROSI, AND B. H. KETELLE
Chemistry Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee
December 18, 1950

IN a search for previously unobserved transitions in I^{131} decay an essentially weightless, electrically conducting, 10-mc source was prepared by electrodeposition of iodine onto a 0.02-mg/cm² evaporated silver film supported by a 0.02-mg/cm² Formvar film. This source was used in a thin magnetic lens spectrometer with an anthracene crystal scintillation spectrometer[1] as the detector. The data shown in curve A of Fig. 1 were taken with the thin lens spectrometer using the scintillation spectrometer to discriminate against scattered electrons with energies less than 350 kev. All points on this curve decayed with a 8-day half-life of I^{131} for a period of two weeks.

Kurie plots of the data corrected for instrument resolution[2] are shown in Fig. 2. The K-conversion line of the 364-kev gamma-ray was used as an internal standard for energy calibration. In addition to the main beta-group with a maximum energy of 606 ± 4 kev this analysis indicates a low intensity beta-group with a maximum energy of 810 ± 5 kev. This beta-group has been postulated[3,4] as a transition from the ground state in I^{131} to the 12-day metastable level in Xe^{131}. Since only a small region of the 810-kev beta-energy distribution could be measured, the relative intensity and the shape are uncertain. Assuming either an allowed or a first-forbidden shape, the 810-kev beta-transition occurs in somewhat less than 1 percent of the I^{131} disintegrations. This is in reasonable agreement with the fraction[5] of I^{131} atoms decaying to the 12-day metastable level of Xe^{131}, indicating that most of the transitions to this level are through the 810-kev beta-group.

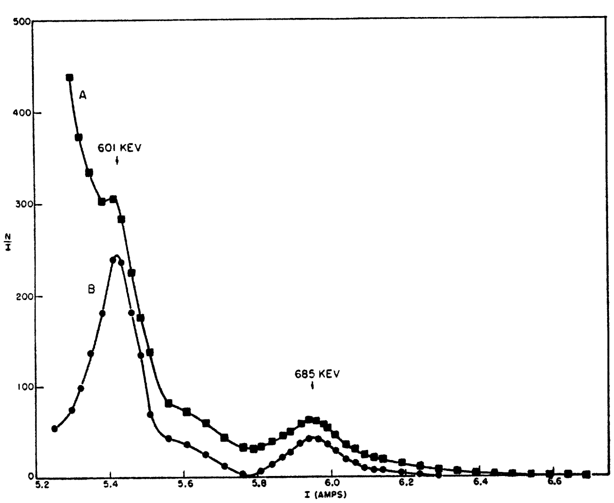

FIG. 1. Momentum distribution of I^{131} electrons at energies greater than 564-kev. (A) Original data. (B) After subtraction of beta-distributions.

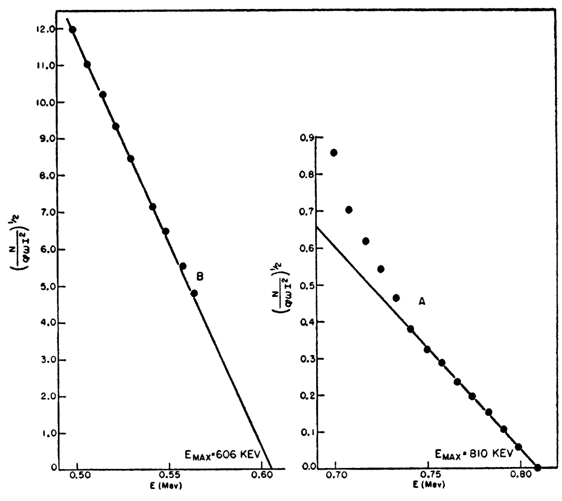

FIG. 2. Kurie plots of two I^{131} beta-groups.

Curve B in Fig. 1 shows the electron momentum distribution after subtraction of the two beta-groups. This curve shows the presence of conversion lines of 635 ± 6-kev and 720 ± 4-kev gamma-rays. The intensity of the 720-kev gamma-K conversion peak was found to be $\frac{1}{5}$ that of the 635-kev gamma-K conversion peak. The intensity of the 635-kev gamma-K conversion peak was 4×10^{-4} times the intensity of the 606-kev beta-group. A very rough measurement of the relative intensities of the unconverted gamma-rays with a Tl activated NaI scintillation spectrometer indicated that the K-conversion coefficients of the 635-kev and 720-kev gamma-rays were equal within a factor of two.

The 720-kev gamma-ray is probably a transition to the ground state from the 717-kev level[6] in Xe^{131}. The presence of this gamma-ray lends support to the value[7] of 250 kev for the end point of the low energy beta-group of I^{131}.

* This document is based on work performed for the Atomic Energy Commission at Oak Ridge National Laboratory.
[1] W. H. Jordan and P. R. Bell, Nucleonics 5, 30 (1949).
[2] G. E. Owen and H. Primakoff, Phys. Rev. 74, 1406 (1948).
[3] Way, Fano, Scott, and Thew, Nat. Bur. Standards (U. S.) Circ. No. 499 (1950).
[4] I. Bergström, Phys. Rev. 80, 114 (1950).
[5] Brosi, DeWitt, and Zeldes 75, 1615 (1949).
[6] A. C. G. Mitchell, Revs. Modern Phys. 22, 36 (1950).
[7] Kern, Mitchell, and Zaffarano, Phys. Rev. 76, 94 (1949).

The High Energy Gamma Radiation† from Ta^{181}

J. M. CORK, W. J. CHILDS, C. E. BRANYAN, W. C. RUTLEDGE, AND A. E. STODDARD
University of Michigan, Ann Arbor, Michigan
December 14, 1950

SINCE our earlier report[1] on the low energy gamma-emission of Ta^{181}, several investigations have been made of its high energy gamma-spectrum. These measurements have been made with spectrometers using G-M tubes, and the results are not in close agreement. To check the reported values, both conversion and photoelectrons for each gamma-ray have been observed in magnetic photographic spectrometers. The K electron lines are clearly resolved, being separated by several millimeters with the resolving power used. The relative intensities of the three K lines appear to be approximately 10, 5, and 7, for the 1.121, 1.189, and 1.219 Mev gamma-rays, respectively. The various results are summarized in Table I, with the initials of the authors at the top of the vertical column that contains their respective data. It is believed that the uncertainty in the presently reported values is not greater than 2 kev for each of the three gamma-energies.

TABLE I. Gamma-rays from Ta^{181}.

R. W.[a]	B. P. W.[b]	G. C.[c]	Present
1.13 Mev	1.133 Mev	1.12 Mev	1.121 Mev
...	1.219	1.19	1.189
1.22	1.237	1.23	1.219

[a] W. Rall and R. Wilkinson, Phys. Rev. **71**, 321 (1947).
[b] Beach, Peacock, and Wilkinson, Phys. Rev. **75**, 211 (1949).
[c] C. Goddard and C. Cook, Phys. Rev. **76**, 1419 (1949).

† This project was supported jointly by the AEC and ONR.

[1] J. Cork, Phys. Rev. **72**, 581 (1947). Cork, Keller, Rutledge, and Stoddard, Phys. Rev. **78**, 95 (1950).

Calculations on the Number of Neutrons in the Atmosphere

S. LATTIMORE
Department of Physics, Imperial College, London, England
December 26, 1950

THERE have been many experiments over the last few years designed to measure the rate of production of neutrons by cosmic rays. In all cases, the number of thermal neutrons was measured. The experiments are of two types: (a) measurements made in the free atmosphere, and (b) measurements made inside a large bulk of solid material.

Now it is interesting to note that the experiments of the first type appear to give results which are very much lower than those of the second type. We would like to point out that this probably arises from errors in the calculations. Bethe[1] has shown that the number, n, of counts in a BF_3 counter of volume, V, and pressure, p, is related to the rate of production, q (per gram), by the formula

$$q=(n/V)(\sigma_A/\sigma_D)(780/p), \quad (1)$$

where σ_A is the capture cross section per molecule of the surrounding material and σ_D is the capture cross section per molecule of the BF_3 detector.

Since air (nitrogen) is diatomic, σ_A is double the more usually defined atomic cross section. Several investigators[2,3] have omitted to use the molecular cross section, and their results should therefore be multiplied by two. It should be noted that formula (1) applies only when the neutrons are produced and slowed down in air; i.e., only to experiments of type (a).

Furthermore, there would appear to be some doubt as to the value of the ratio, σ_A/σ_D. Korff and Hamermesh use a value of 0.0027. (σ_D refers to natural BF_3, not to enriched $B^{10}F_3$ in this case.) For 100 percent $B^{10}F_3$, Davis uses a value of 0.00048, which is equivalent to the value 0.0024 for normal BF_3. However, Adair[4] gives $\sigma_D=116E^{-\frac{1}{2}}$ per molecule, and Melkonian[5] gives $\sigma_A=0.34E^{-\frac{1}{2}}$ per atom. This gives a true ratio of $(0.0029\times 2)=0.0058$, which should be used in formula (1). Therefore the results of Korff and Hamermesh should be multiplied by 2.15 and those of Davis by 2.4.

These corrected results are plotted in Fig. 1, together with the results of Montgomery and Tobey[6] and of Lattimore[7] who used method (b). As can be seen, the corrected values give considerably better agreement than do the old ones. Yuan[8] has also given results on the number of thermal neutrons in the atmosphere, but he merely states that the counters used were calibrated. Whether the results depend on formula (1) is therefore not clear, although this formula is quoted on the figure given in his letter. However, since his results agree with those of Korff and Hamermesh before correction, it does seem possible that they should be increased also by a factor of 2.15, and these corrected results are shown in Fig. 1.

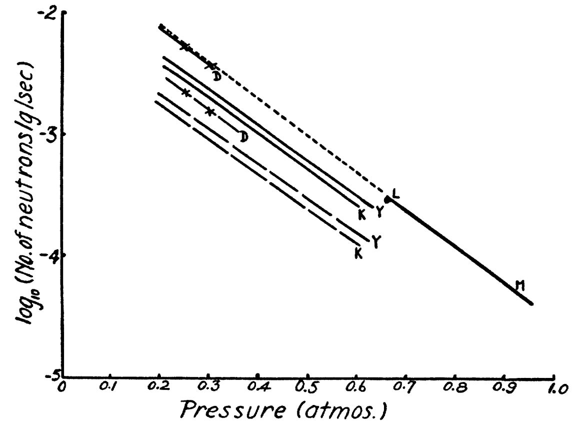

FIG. 1. The dashed and the full lines represent the uncorrected and the corrected results, respectively. The dotted line is an extrapolation of that found by Montgomery and Tobey. (K) Korff and Hamermesh (1946). (Y) Yuan (1946). (D) Davis (1950). (M) Montgomery and Tobey (1949). (L) Lattimore (1950).

In conclusion, it would appear that the various neutron experiments are in much better agreement, and give much more reasonable results, than has been thought hitherto.

[1] Bethe, Korff, and Placzek, Phys. Rev. **57**, 573 (1940).
[2] S. A. Korff and B. Hamermesh, Phys. Rev. **69**, 155 (1946).
[3] W. D. Davis, Phys. Rev. **80**, 150 (1950).
[4] R. K. Adair, Revs. Modern Phys. **22**, 249 (1950).
[5] E. Melkonian, Phys. Rev. **76**, 1750 (1940).
[6] C. G. Montgomery and A. R. Tobey, Phys. Rev. **76**, 1478 (1949).
[7] S. Lattimore, Phil. Mag. (in press).
[8] L. C. L. Yuan, Phys. Rev. **74**, 804 (1948).

The Half-Life of I^{131}

JULES H. SREB
Nucleonics Division, Naval Research Laboratory, Washington, D. C.
December 26, 1950

THE consensus of values for the half-life of I^{131}, as given in Nuclear Data, National Bureau of Standards Circular 499, is 8.0 and 8.1 days. We have made a precise determination of I^{131} decay and arrive at a value of 8.1409 ± 0.0062 days. This falls within the range of some unpublished results of Dr. F. N. D. Kurie, in which he has obtained a value of 8.16 ± 0.04 days using a Lauritsen electroscope and following the activity for about eight half-lives. We appreciate the interest of Dr. Kurie and the permission to quote his results.

Erratum: The Diamagnetic Correction for Protons in Water and Mineral Oil

[Phys. Rev. **80**, 901 (1950)]

H. A. THOMAS
National Bureau of Standards, Washington, D. C.

THROUGH an oversight, the diamagnetic correction was applied to the value of e/m as well as to the value of γ. Since the diamagnetic correction does not affect the value of e/m, the previously reported[1] value of e/m should remain unchanged.

[1] Thomas, Driscoll, and Hipple, Phys. Rev. **78**, 787 (1950).