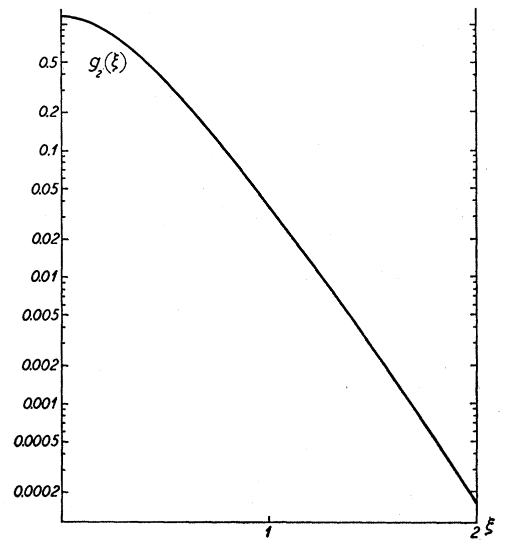

FIG. 1. The function $g_2(\xi)$ plotted on a logarithmic scale, for $0<\xi<2$.

with respect to the incident particles, one obtains an angular distribution which is very similar to the angular correlation between two γ's in cascade. It turns out that the distribution function is

$$W(\theta)=1+B_2a_2(\xi)P_2(\cos\theta)+B_4a_4(\xi)P_4(\cos\theta), \quad (8)$$

which should be compared with the angular correlation in the $\gamma-\gamma$ cascade,

$$I_i \xrightarrow{E2} I_f \xrightarrow{\gamma} I_{ff},$$

given by

$$W'(\theta)=1+B_2P_2(\cos\theta)+B_4P_4(\cos\theta). \quad (9)$$

The I's are the spins of the target nucleus, the Coulomb excited state, and the final state after the γ-emission, respectively. The first γ-transition, being an electric quadrupole radiation, corresponds to the electric quadrupole excitation. The coefficients B_K are given, e.g., by Biedenharn and Rose.[5]

The energy-dependent coefficients a_k are determined by

$$a_2(\xi)=\int_1^\infty \left[S_2^2-S_0^2+S_{-2}^2+\sqrt{6}S_0(S_2+S_{-2})\left(1-\frac{2}{\epsilon^2}\right)\right]\epsilon d\epsilon \times\left\{\int_1^\infty[S_2^2+S_0^2+S_{-2}^2]\epsilon d\epsilon\right\}^{-1},$$

$$a_4(\xi)=\int_1^\infty \left[\frac{3}{32}S_2^2+\frac{9}{16}S_0^2+\frac{3}{32}S_{-2}^2+\frac{5\sqrt{6}}{16}S_0(S_2+S_{-2})\left(1-\frac{2}{\epsilon^2}\right)+\frac{35}{16}S_2S_{-2}\left(1-\frac{8}{\epsilon^2}+\frac{8}{\epsilon^4}\right)\right]\epsilon d\epsilon\times\left\{\int_1^\infty[S_2^2+S_0^2+S_{-2}^2]\epsilon d\epsilon\right\}^{-1}.$$

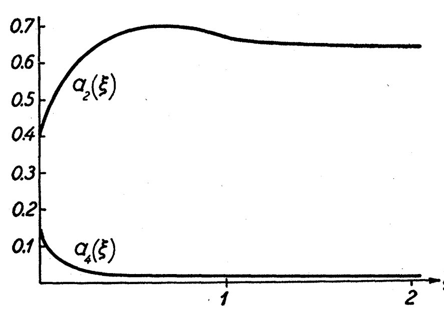

FIG. 2. The angular distribution coefficients $a_2(\xi)$ and $a_4(\xi)$ in the region $0<\xi<2$.

The result of a numerical calculation of these functions is shown in Fig. 2.

As it is seen from this figure, a_4 is so small that P_4 will give almost no contribution. The P_2 term may however be quite big. In the important case of the excitation of the lowest state in even-even nuclei, where $I_i=I_{ff}=0$ and $I_f=2$, the anisotropy amounts to 30 percent. In the case of Ta^{181}, studied by Huus and Zupančič,[3] where $I_i=I_{ff}=7/2$ and $I_f=9/2$, the anisotropy is however only about 0.5 percent.

A more detailed discussion of the theory of Coulomb excitation is being prepared.

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1 K. A. Ter-Martirosyan, J. Exptl. Theor. Phys. (U.S.S.R.) **22**, 284 (1952).

2 We have followed the notation used in a review of reference 1 given by A. Bohr and B. Mottelson, Kgl. Danske Videnskab. Selskab, Mat.-fys. Medd. **27**, No. 16 (1953).

3 T. Huus and C. Zupančič, Kgl. Danske Videnskab. Selskab, Mat.-fys. Medd. **28**, No. 1 (1953); C. McClelland and C. Goodman, Phys. Rev. **91**, 760 (1953).

4 A. Bohr and B. Mottelson, Phys. Rev. **89**, 316 (1953); Phys. Rev. **90**, 717 (1953).

5 L. C. Biedenharn and M. E. Rose, Revs. Modern Phys. (to be published).

$Li^7(\gamma,p)He^6$ Cross Section*

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(Received June 15, 1953)

THE (γ,p) reaction in Li^7 produces β-active He^6. This activity gives a convenient measure of the photonuclear reaction. The β half-life of 0.9 sec allows a typical yield curve to be obtained by a scintillation counter gated to operate during the betatron's dead time. Normalization of the curve was made by direct comparison with copper under the same geometry. The cross section was derived from the yield curve by the photon-difference method.

Figure 1 shows the experimental setup. Stilbene was adopted as a scintillator to avoid a troublesome neutron-capture activity in the NaI crystal previously employed. The discriminator was set on the 625-kev cesium conversion line. Identical geometry with

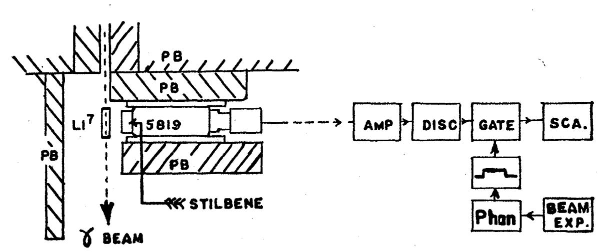

FIG. 1. Experimental arrangement.

comparable self-absorption was obtained by using a laminated copper sample of the same weight as the lithium disk.

The usual self-absorption and discriminator corrections were applied to each yield curve. Then the copper cross section $[Cu^{63}(\gamma,n)Cu^{62}]$ of Katz *et al.*[1] was used to calibrate the absolute scale.

The beam transmission monitor was checked against copper at 13, 15, and 17 Mev and was found to be energy-independent. Under apparently constant betatron trapping conditions, the monitor reading showed no variation with beam energy between 9 and 17 Mev, with only a 5 percent decline at 18 Mev and a 12 percent decline at 19 Mev. These variations were incorporated in the calculated cross section and in the probable errors.

A contaminating neutron-induced 5-min acitivity in the copper was separated by observing the decay of the copper activity over several half-lives.

The only troublesome competing activity in Li^7 would be neutron capture resulting in radioactive Li^8, which has a β decay

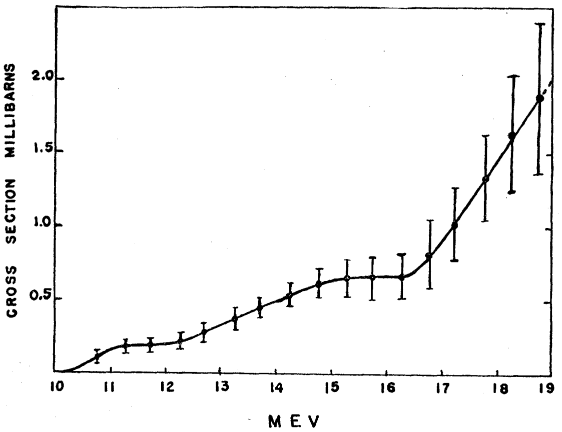

FIG. 2. Cross section *vs* photon energy for $Li^7(\gamma,p)He^6$.

with the same half-life as He^6. However, the neutron-capture cross section of Li^7 is sufficiently low to be negligible.

The indicated probable errors in Fig. 2 do not include a possible 15 percent error in the absolute scale depending upon the error in the Saskatchewan values.[2]

The cross-section curve shown in Fig. 2 is in essential disagreement with the values of Titterton and Brinkley.[3] Using Illford emulsions they observed 118 complete (γ,p) events and obtained a cross section rising to a sharp symmetrical maximum at 15.7 Mev.

* This work was performed under the auspices of the U. S. Atomic Energy Commission.

[1] L. Katz and A. G. W. Cameron, Can. J. Research **29**, 518 (1951).
[2] R. N. H. Haslam *et al.*, Can. J. Phys. **31**, 216 (1953).
[3] E. W. Titterton and T. A. Brinkley, Proc. Phys. Soc. (London) **A66**, 194 (1953).

Errata

The Nuclear Moments of Ta^{181}, B. M. BROWN AND D. H. TOMBOULIAN [Phys. Rev. **88**, 1158 (1952)]. R. E. Trees[1] has been kind enough to call to the author's attention an error in the value of the matrix element $[\Sigma_i\langle 3\cos^2\theta_i-1\rangle_{Av}]_{M=J}$ which was computed in estimating the quadrupole moment of Ta^{181} from hyperfine-structure measurements[2] of the Ta II ground state $^5F_1$. The factor preceding the parenthesis [Eq. (6) of reference 2] should read 4/875. Unfortunately, 8/875 was used in the estimation of the quadrupole moment. With this correction, one arrives at the unusual value $q=11.8\times10^{-24}$ cm^2 for the quadrupole moment. The large discrepancy between this value and that reported by Schmidt[3] forces a re-evaluation of the approximations made in estimating the moment. As yet this has not been carried out. The factors which can be responsible for this discrepancy are (1) the experimentally determined value of B, the quadrupole coupling factor, (2) the angular average mentioned above, and (3) the radial average $\langle 1/r_d^3\rangle$. The worst view of the experimental error in the hyperfine-structure measurement will allow perhaps a spread of ±15 percent in the quadrupole moment. The factors mentioned in (2) and (3) depend upon the coupling in the electronic structure. Russell-Saunders coupling was assumed in making these averages on the evidence of the interval rule agreement shown by the two lowest intervals of the ^5F multiplet and the fact that the level whose hyperfine-structure was measured has the g value expected from Russell-Saunders coupling. The disturbing evidence (besides the discrepancy now evident) is the intermixing of the terms of the three low-lying configurations of Ta II and the ratio $(\zeta_d\text{Ta II}/\zeta_d\text{Ta I})$. ζ_d is the d-electron fine-structure splitting factor. This ratio is approximately 1.3 for Ta. For other elements which ionize from the configuration d^ns^2 to d^ns this ratio deviates only slightly from unity. Among the elements tested are several which show better Russell-Saunders coupling than Ta. Trees[4] gives further evidence in support of deviation from Russell-Saunders coupling as a possible reason for the discrepancy. The author wishes to thank Dr. Trees for calling attention to the error and making his paper available to him in advance of publication.

[1] R. E. Trees (private communication).
[2] B. M. Brown and D. H. Tomboulian, Phys. Rev. **88**, 1158 (1952).
[3] T. Schmidt, Z. Physik **121**, 63 (1943).
[4] R. E. Trees (to be published).

Radioactive Charging through a Dielectric Medium, E. G. LINDER AND P. RAPPAPORT [Phys. Rev. **91**, 202 (1953)]

AND

Two-Particle Potential from the Bethe-Salpeter Equation, WILHELM MACKE [Phys. Rev. **91**, 195 (1953)]. Figure 1 of these two Letters were inadvertently interchanged.

Decay of Re^{188} and the Lifetimes of Os^{186m} and Os^{188m}, C. C. MCMULLEN AND M. W. JOHNS [Phys. Rev. **91**, 418 (1953)]. The authors would like to withdraw the statements made concerning the lifetimes of the excited states in Os^{186} and Os^{188} which subsequent experiments have shown to be unreliable.

Gyromagnetic Ratios of Microcrystalline and Macrocrystalline Materials, S. J. BARNETT [Phys. Rev. **90**, 315 (1953)]. In the second line of the fifth paragraph, "(5–80) Permalloy" should be "(4–79) Permalloy." In the next line, "Permalloy" should be "Permalloy (80 percent Ni, 20 percent Fe)." Also, in Footnote 3, "A. S. Kenny" should be "G. S. Kenny."

Directional Effects in the Electric Breakdown of Ionic Crystals, ELMER L. OFFENBACHER AND HERBERT B. CALLEN [Phys. Rev. **90**, 401 (1953)]. The authors regret the omission of acknowledgment of support of the reported research by the U. S. Office of Naval Research.

Interference Terms of the Electron-Neutrino Angular Correlation, MASATO MORITA [Phys. Rev. **90**, 1005 (1953)]. The following corrections should be made in the equations in the left hand column of page 1006:

In the equation for $\mathfrak{W}_{1ST}$, the end of the first line should be $\{L_1-M_0\}$ instead of $\{L_0-M_0\}$. In the equation for $\mathfrak{W}_{1VT}$, the last term should be $+\{\mathfrak{M}^*(\boldsymbol{\alpha})\mathfrak{M}(\beta\boldsymbol{\alpha})+\text{c.c.}\}L_0^-$ instead of $-\{\mathfrak{M}^*(\boldsymbol{\alpha})\mathfrak{M}(\beta\boldsymbol{\alpha})+\text{c.c.}\}L_0^-$. In the equation for $\mathfrak{W}_{1AP}$, the last term should be $+\{\mathfrak{M}^*(\gamma_5)\mathfrak{M}(\beta\gamma_5)+\text{c.c.}\}L_0^-$ instead of $-\{\mathfrak{M}^*(\gamma_5)\mathfrak{M}(\beta\gamma_5)+\text{c.c.}\}L_0^-$.

In addition, in the third last sentence of the Letter, the phrase "tensor interaction" should be replaced by "allowed tensor interaction."

Calculation of Nuclear Binding Energies with Single-Particle Oscillator Wave Functions, ERWIN H. KRONHEIMER [Phys. Rev. **90**, 1003 (1953)]. In Eq. (4) the lower limit of the integral should be 0. In the fourth line of Eq. (5), "$(2l+1-2g-2s)!!$" should read "$2L+1-2g-2s)!!$". In the expression for $\phi_l\{L_1, L_2, k;\ 1\}$, the term "$(2g-2p+2m)$" should appear as the argument of the C-function, not as a factor.

The β Decay of Li^8, D. STP. BUNBURY [Phys. Rev. **90**, 1121 (1953)]. In this letter it was stated that the author's calculations of the theoretical $(\beta-\alpha)$ angular correlation in the decay of Li^8 were in disagreement with those of J. W. Gardner [Phys. Rev. **82**, 283 (1951)]. An error has since been found in these calculations and the revised results are now in agreement with Gardner's.