$r_0=1.22\times10^{-13}$ cm, the curves as shown there correspond to electron energies of 150 and 224 Mev for gold and copper, respectively. (The choice of r_0, and consequently of k, affects the cross sections by a constant factor only. For instance, if $r_0=1.45\times10^{-13}$ cm, the energies are 126 and 188 Mev, respectively.) As is expected, the cross section for copper agrees more closely with the Born approximation than does the cross section for gold. The first minimum predicted by the Born approximation appears in gold as a point of inflection only. The shift of the maxima and minima to smaller angles can be understood qualitatively as due to an increase in wave number as the electron enters the attractive potential of the nucleus. This also makes plausible the increase in slope of the cross section for the exponential distribution compared with the Born approximation, as shown in Fig. 2, and permits the experimental data to be fitted with a smaller a than is required in Born approximation.[1,2]

Further calculations are in progress with charge distributions of intermediate shape.

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Energy Levels of Be^8

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THERE is conflicting evidence [1–10] on the spectrum of low states of Be^8, some observations suggesting rather great complexity and other investigations, by failure to observe some of the reported states, suggesting that the array is as simple as seems fitting[2] for so simple a nucleus. It is questionable whether the failure to observe the states in some cases (always with limited resolution and statistical accuracy) may arise from the reaction matrix element being small under these conditions or whether the apparent observation in the other cases arises from statistical illusions. Further observations on a variety of reactions at various angles and bombarding energies will help settle the question. The literature is summarized in Table I, the various states being indicated as (p) present in, (a) absent from, or (o) out of the observed range of, the various observations. The approximate observed width of the ground-state peak is given in Mev, as an indication of resolution. Our present results are also indicated.

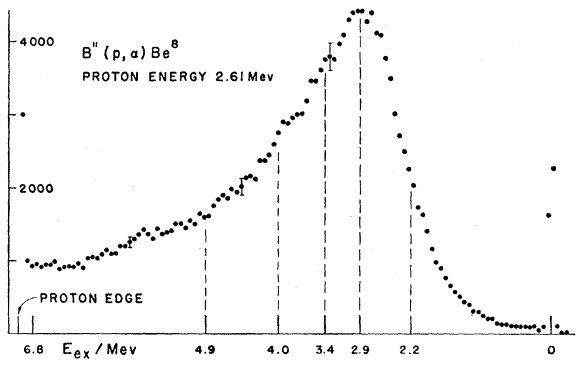

FIG. 1. Alpha spectrum, linear in the magnetic field of the spectrometer.

TABLE I. Presence (p) or absence (a) of peaks corresponding to the states of Be^8. The symbol o signifies "out of the observed range."

E_{ex}/Mev	0 (width)	2.2	2.9 (broad)	3.4	4.05	4.9	7.5 (broad)
Cambridge[a] (1939)	0.6	a	p	a	a	(p)	p
Rice[b] (1941)	0.6	(?)	p	(?)	(?)	p	p
Cambridge[c] (1949)	0.7	(?)	p	(?)	p	(p)	(p)
Zürich[d] (1953)	0.5	p	p	p	p	p	(6.8)
Hopkins[e] (1953)	0.10	a	p	(?)	o	o	o
Canberra[f] (1953)	0.3	a	p	a	a	a	(a)
Oak Ridge[g] (1953)	0.6	a	p	a	a	a	a
Copenhagen[h] (1953)	0.1	a	p	a	a	o	o
Present work	0.06	a	p	a	a	a	o

[a] See reference 3. [b] See reference 4. [c] See reference 5. [d] See reference 6. [e] See reference 7. [f] See reference 8. [g] See reference 9. [h] See reference 10.

We have observed the alpha groups from the $B^{11}(p,\alpha)Be^8$ reaction in a 16-inch, two-dimensional focusing magnetic spectrometer at 90° using a proportional counter for detection. The excitation function for the ground-state alphas is found to show resonances for proton energies of 1.98 and 2.61 Mev, corresponding to excited states of the C^{12} nucleus at 17.94 and 18.56 Mev. For each of these proton energies, the region of excitation energy E_{ex} of Be^8 from 0 to 7 Mev has been investigated and only the sharp ground-state peak and the broad 2.9-Mev state peak appear, as shown for the higher resonance in Fig. 1. In spite of the limited statistical accuracy, it is believed that any groups having a peak height greater than about 10 percent of the ground-state group would have been observed.

The statistical basis for the published observations[5,6] of the levels at 2.2, 3.4, and 4.05 Mev is not so good, but it appears at present rather likely that these states do not exist though surely more evidence on this point is desired. Evidence for the 4.9-Mev state rests mainly on an early report[4] of the gamma ray (which may be open to some doubt) and on the (n,γ) coincidence more recently reported[11] too briefly to permit critical judgement, leaving the existence of this state in sufficient doubt that it appears desirable to improve on those data and on our resolution and statistics at least in this region.

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The Mechanism of Stripping Reactions

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THE cross section for the reaction[1] $\mathfrak{N}_1(d,p)\mathfrak{N}_2$ is given rigorously by

$$\sigma(d\to p)=2\pi|\langle p|V+P|\Phi\rangle|^2\rho_E, \qquad (1)$$

where V is the $n-p$ potential in the deuteron, P the interaction $p-\mathfrak{N}_1$, ρ_E the statistical factor, $\langle p|$ the product of a proton plane-wave function by the wave function $\psi_2(\mathbf{r}_n,\rho)$ of the residual nucleus, $|\Phi\rangle$ the wave function describing the whole stationary state of collision initiated by the incident deuteron; we take $\hbar=1$ and denote by ρ, $\mathbf{r}_n$, $\mathbf{r}_p$ the dynamical variables of the nucleons in $\mathfrak{N}_1$ and the neutron and proton coordinates, respectively.

The Born approximation, in the sense of Daitch and French,[2,3] consists in neglecting P throughout and replacing Φ by Φ_d,