is itself dependent on the state so that, by a suitable choice of the A- and B-electric fields, it is possible to refocus a single electric state (quantized orientation of the angular momentum vector for a single rotational state). The effective induced moment of the 1, 0 state is positive at high fields (in the A-field) and negative at low fields (in the B-field). The states 0, 0 and 1, ± 1 do not have this property. Furthermore, the effective induced moment in a given electric field is inversely proportional to R^2 and the higher rotational states, therefore, have small effective moments relative to that for $R=1$. The function of the wire is to stop all molecules of small effective moment, the overwhelming fraction, which are not susceptible to refocusing operations. The relative population of the low rotational states is small and only 0.01 percent of the total beam is refocused at any one time. Relative electric moments for all orientations of the three lowest rotational states were obtained from a relationship derived by Lamb[6] which is good for all values of λ.

Between the refocusing A- and B-fields the beam passes through a homogeneous C-field wherein a superimposed radiofrequency electric field, normal to the d.c. component, induces transitions between electric levels. After this transition the molecules are in a new electric level with a different, indeed reversed effective electric moment in the B-field, and they are no longer refocused. This is observed by a decrease in the beam when the oscillator frequency equals the energy separation of the levels divided by Planck's constant. (Fig. 1.)

Further details will be discussed in a forthcoming article in *The Physical Review*.

This research was proposed to me by Professor I. I. Rabi and executed under his direction. I am also under obligation to several other members of the physics department. In particular, Professor P. Kusch gave me guidance during the last stage of the work and, with Dr. J. Trischka, assisted in the collection and evaluation of the data.

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[1] I. I. Rabi, S. Millman, P. Kusch, and J. R. Zacharias, Phys. Rev. 55, 526 (1939).
[2] See, for example, R. de L. Kronig, Proc. Nat. Acad. Wash. 12, 608 (1926).
[3] Brouwer, Dissertation, Amsterdam, 1930.
[4] 1 debye $=10^{-18}$ e.s.u.
[5] For literature references, consult Fraser, *Molecular Beams* (Chemical Publishing Corporation, New York, 1938), Chap. IV.
[6] Professor W. E. Lamb, private communication.

Secondary Emission from Germanium, Boron, and Silicon

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MEASUREMENTS of secondary emission were made on the semi-conductors germanium, boron, and silicon. No previous measurements on germanium or boron are given in the literature.

The silicon and germanium were cut from very pure vacuum melts which had been prepared in the laboratory for crystal rectifier studies. The boron was deposited on an iron disk by thermal decomposition of boron hydride.

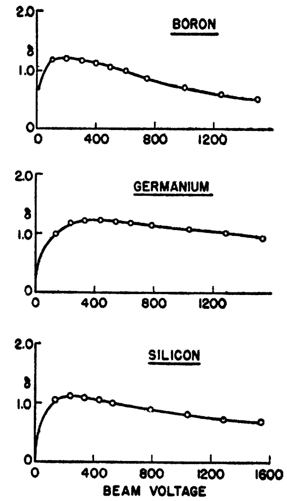

FIG. 1. Secondary emission from boron, germanium, and silicon.

The measurements were made in an electron gun type of tube. The electron beam was focused on the target through a hole in a cylindrical collector surrounding the target. The primary velocity was varied from 100 volts to 1500 volts. The beam current was 10^{-5} amp. and the spot diameter approximately 1 mm. The collector was held at +40 volts with respect to the target.

The measurements were made in tubes while on the pump at a pressure of 10^{-6} to 10^{-7} mm. The germanium and silicon were heated by high frequency to dull red before making measurements. The boron only received a 425°C bake out as at higher temperatures there was a possibility of interdiffusion of the iron and boron.

The maximum values of δ (the secondary to primary ratio) and the primary voltage at which they occur are as follows:

	S	V
Boron	1.2	150
Germanium	1.2	400
Silicon	1.1	250

The relation between δ and primary voltage for the three surfaces is given in Fig. 1.

Conductivity of Metal-Amine Solutions

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IT has been reported recently by Ogg[1] that when a solution of sodium in liquid ammonia, in the concentration range which yields two liquid phases, is rapidly frozen, a large decrease in resistance occurs. The writer has observed this decrease in resistance by a current-potential method, and has found in agreement with the work of Daunt, Désirant, Mendelssohn, and Birch[2] that the small resistance of the frozen solution resided in the solid itself and not in the solid-electrode contact. It is still possible that this resistance is a property of the contacts between