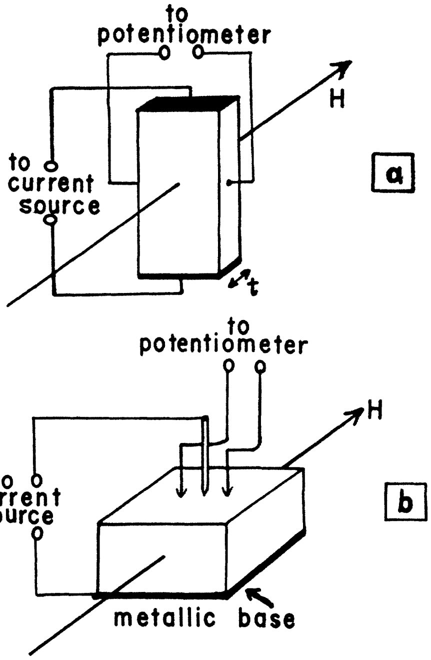

FIG. 1. (a) Conventional arrangement for measuring transverse Hall effect in a bulk semiconductor. (b) Method for determining Hall effect in the neighborhood of a metal-semiconductor point contact.

vs. temperature enable one to separate the electron and hole components.[1]

Information of this type is much needed for an understanding of conduction mechanisms in point contact rectifiers and transistors. It would seem possible, using the configuration illustrated in Fig. 1(b), to perform a Hall effect measurement in a point contact. Two metal probes are placed diametrically opposite from the current-carrying central contact and a magnetic field is applied in a direction perpendicular to the plane made by them. Assuming (1) the semiconductor resistivity is homogeneous, isotropic, and independent of current density and magnetic field, (2) the distance of the probes from the center contact is large compared with the radius of the contact, one can show that an e.m.f. is induced between the probes given by $E=RHI(1/d)$, where d is the distance between the probes. Thus, one may expect to observe a Hall e.m.f. comparable in magnitude to that observed in a plate as in Fig. 1(a). In germanium crystals, most of the assumptions above are generally not correct, especially if one is dealing with contacts showing rectification, photoelectric effects or surface conduction, and a really quantitative study of such Hall effects would be difficult. However, the sign and approximate magnitude of the e.m.f.'s would be of considerable value.

Note that the induced e.m.f. increases as the probes are placed close to the contact. In an arrangement of contacts such as one finds in the transistor, sizable effects may be expected if one measures the e.m.f. induced between the emitter and the collector while current is passed from one of them to the base. In this case, however, there will be a large unbalance voltage before application of the magnetic field which is canceled for the most part when two pick-up probes are used.

Preliminary trials have shown that a Hall e.m.f. is easily observable in germanium and that reversals in sign may occur as the current through the contact is increased.

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[1] For example, detailed analyses for bulk germanium semiconductors have been made by K. Lark-Horovitz *et al.*—N.D.R.C. Report No. 14-585 (1945); Phys. Rev. **69**, 258 (1946).

Nuclear Spin of Fe^{57}

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THE spectrogram of a 29 milligram sample of iron enriched in the isotope Fe^{57} was inspected for hyperfine structure. The spectrographic apparatus consisted of a one-meter, flint glass, three prism spectrograph[1] crossed with a Fabry-Perot interferometer. The light source was a liquid-air cooled Schuler tube.[1]

Many of the iron lines observed in the region λ4000A to λ6800A involved states having J values greater than one-half and involving penetrating s electrons.[2] No structure was observable in any of these lines.

The wave number difference which could be resolved in the region of the line $\lambda 4071.748(3d^7 4s\cdot F_2 - 3d^7 4p\cdot F_2{}^0)$ was estimated to be 0.029 cm^{-1}. To avoid overestimating the resolution, the total apparent width on the plate of the line λ4071.748 was assumed to be the actual half-width. Since the lines were intense the apparent full width was probably greater than the actual half-width.

That Fe^{57} has no measureable magnetic moment is not surprising, when one considers that many of the elements whose atomic mass is odd, but whose nuclear charge is even, give the same result.

The Fe^{57} was obtained from the Manhattan District.

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[1] M. Gurevitch, Phys. Rev. **75**, 767 (1949).

[2] H. N. Russell and C. E. Moore, Trans. Am. Phil. Soc. **34**, 113 (1944).

Infra-Red Absorption by Homonuclear Diatomic Molecules

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WE have recently investigated the absorption spectrum of liquid air in the near infra-red region between 1μ and 12μ. Several absorption bands were observed, the most intense bands being near 4.3μ and 6.4μ. The band near 4.3μ overlaps the atmospheric CO_2 band in this region but is somewhat broader than the CO_2 band. The band near 6.4μ overlaps the atmospheric water-vapor band with center at 6.26μ but is quite different in shape from the water-vapor band and from the bands in the spectrum of liquid water and ice.

It is rather difficult to account for the intense bands in the liquid air spectrum in terms of CO_2 or H_2O dissolved in the liquid air or condensed in the liquid air from atmospheric CO_2 and H_2O, since the observed absorption is more intense than would be expected from CO_2 and H_2O as impurities. However, the observed bands appear at positions where one would expect absorption *if the fundamental vibrations of* N_2 *and* O_2 *were infra-red active.* The vibrations of N_2 and O_2 have not been regarded as infra-red-active since these molecules are non-polar and hence transitions between vibrational levels cannot be produced by processes involving ordinary dipole radiation; infra-red absorption has not been reported for gaseous nitrogen or oxygen. However, Raman lines have been observed for N_2 and O_2; the frequencies of the Raman lines and the corresponding infra-red wave-lengths are as follows:

Molecule	Observed Raman frequency	Corresponding wave-length* in the infra-red
N_2	2330.7 cm^{-1}	4.2905μ
O_2	1554.7	6.4321μ