of the impurities but it is about 3-5 times greater for Ge than for Si.* If it is possible to overcome the somewhat worse mechanical characteristics of Ge it may be worth while to use this substance as a rectifier in view of the higher mobility of its electrons. However, it will probably be necessary to produce purer Ge before this substance can be used.

An improvement would obviously be obtained if we could reduce the number of donators in the boundary layer of the crystal without reducing the number of conduction electrons in the bulk material. This would require a removal of donators from the surface layer to the interior of the crystal. It seems very difficult to do this by chemical means although this possibility should not be entirely disregarded. An indication of an interesting possibility may be found in the results of Lawson** of the University of Pennsylvania who is at present studying the burn-out of crystals. He has found that the crystals apparently become better rectifiers upon application of a forward voltage equal to about $\frac{2}{3}$ of the voltage required for burn-out. A tentative explanation of this phenomenon is as follows. The voltage applied will raise the temperature high enough to cause diffusion of atoms in the boundary layer. At the same time, the direction of the applied voltage is such that it will move electrons from the semiconductor into the metal (we speak, for simplicity, of an N-type crystal). It will therefore accelerate charge donators into the interior of the semiconductor and will therefore make the surface layer poorer in donators. This will cause an increase of the thickness of the boundary layer and therefore is likely to improve the rectifying characteristic both for D.C. and R.F. This point will have to be studied in more detail; if it is correct, then an equally large backward voltage must make the rectifier worse.

An actual theory of the R.F. rectification as a function of the local oscillator voltage will be developed in the near future. Also a theory of the noise

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*Reports from Purdue and Pennsylvania Universities.

**Private Communication