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HIGH-RESISTANCE STATE AT HIGH MAGNETIC FIELD IN STRESSED, DEGENERATE Ge:As

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We have produced a high-resistance state at milliKelvin temperatures in several degenerately doped samples of Ge:As by the application of both sufficient [1,1,1] stress to force all of the conduction electrons into a single valley and sufficient magnetic field to exceed significantly the quantum limit. We have driven a sample with electronic density as high as $9 \times 10^{17} cm^{-3}$ into the high-resistance state using fields close to 20 Tesla at the National Magnet Laboratory, and have recorded resistance increases greater than a factor of 10^4. The qualitative behaviors of the longitudinal, transverse, and Hall conductivities are in agreement with results in $Hg_{1-x}Cd_xTe$ which have been interpreted as indicating that the high-resistance state is a three dimensional Wigner crystal. Our samples differ substantially in that they are uncompensated, anisotropic (due to the stress), and of exceptionally high quality (made under conditions which have produced Ge with impurity concentrations as low as $10^{10} cm^{-3}$). Preliminary analyses of the temperature dependence and the extrapolation to zero temperature suggest that the high resistance state is not adequately described by conventional theories of magnetic freeze-out.

[1]Also at AT&T Bell Laboratories, Murray Hill, NJ.

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Abstract Categories: 1.1 &1.2 (transition between extended
and localized bulk states)
9. (transport properties)
Oral Presentation preferred, but Poster Session acceptable

$n = 6 \times 10^{17}\ cm^{-3}$

[111] STRESS $> 10^{9}$ dynes cm^{-2}