Electrons in Unusual Flatlands

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The high-mobility two-dimensional electron system at a GaAs/AlGaAs interface has provided the testing ground for some of the most exciting phenomena in solid state physics. Cooled to low temperatures and subjected to a perpendicular magnetic field, this system has led to the observation of exotic, often completely unexpected, electronic states. My presentation will focus on two-dimensional electrons in unusual flatlands where the electrons have an extra degree of freedom. These include electron systems confined to either AlAs quantum wells or to wide GaAs wells where the electrons occupy multiple conduction band valleys or two electric subbands. I will discuss the unusual consequences, and some potential uses, of these additional (valley or subband) degrees of freedom.

Bio-sketch:

Mansour Shayegan received his B.S. (1979), M.S. and E.E. (1981), and Ph.D. (1983) degrees in Electrical Engineering from the Massachusetts Institute of Technology. Since 1985 he has been a faculty member in the Department of Electrical Engineering at Princeton University where he teaches physics and electrical engineering courses. Shayegan’s research is in solid state physics with an emphasis on the fabrication of low-dimensional semiconductor structures and measurements of their electronic properties and collective phenomena.