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Probing the Optoelectronic Response of a Monolayer MoS_2 Field-Effect Transistor KATHRYN L. MCGILL, Laboratory of Atomic and Solid State Physics, Cornell University; Kavli Institute at Cornell for Nanoscale Science, KIN FAI MAK, Kavli Institute at Cornell for Nanoscale Science, JOSHUA W. KEVEK, Laboratory of Atomic and Solid State Physics, Cornell University, JIWOONG PARK, Department of Chemistry and Chemical Biology, Cornell University; Kavli Institute at Cornell for Nanoscale Science, PAUL L. MCEUEN, Laboratory of Atomic and Solid State Physics, Cornell University; Kavli Institute at Cornell for Nanoscale Science — Two-dimensional materials contain a wealth of interesting optoelectronic properties. Single-layer molybdenum disulfide (MoS_2), with its broken inversion symmetry, is of particular interest. This broken symmetry results in the formation of direct band gaps at the K and K' valleys in its band structure, allowing long-lived optical excitations. Furthermore, monolayer MoS_2 has valley-dependent electronic properties allowing confinement of charge carriers to a single valley by optical pumping [1]. We have fabricated two- and four-terminal devices based on single layers of MoS_2. We observe an efficient photocurrent response at the two-dimensional semiconductor-metal interface displaying Shottky diode behavior, in which an interfacial field splits excitons at the contacts to produce current. We also find that the photocurrent drastically increases under reverse biasing of the diode. Additionally we are exploring the dependence of this photocurrent response on the polarization state of incident light.

[1] Xiao, D., *et al.*, *Phys. Rev. Lett.* **108**, 196802 (2012).

Kathryn L. McGill
Laboratory of Atomic and Solid State Physics, Cornell University;
Kavli Institute at Cornell for Nanoscale Science

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