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Manipulating Graphene ALEXANDER RUYACK, Materials Science and Engineering, Cornell University, MELINA BLEES, SAMANTHA ROBERTS, CHRIS MARTIN, ARTHUR BARNARD, Laboratory of Atomic and Solid State Physics, Cornell University, PAUL L. MCEUEN, Laboratory of Atomic and Solid State Physics, Kavli Institute at Cornell for Nanoscale Science, Cornell University — Graphene is both strong and flexible, making it a promising material for nanoscale hinges and other three-dimensional structures. Using sacrificial layers and surfactants, we are able to demonstrate control over the adhesion of monolayer graphene to a substrate. By patterning gold on the surface of the graphene, we created arrays of rigid pads bridged by graphene strips that can be decoupled from the surface in an aqueous environment. The pads allow us to manipulate the graphene both on and off the surface using lasers or micromanipulators. Our methods yield fundamental material data on graphene such as the macroscopic bending stiffness, and demonstrate the feasibility of a graphene hinge. We are currently exploring the use of magnetic control as a method for applying forces to stretch and fold graphene. We have already created micron-sized permanent magnets made of iron and successfully released them from the substrate, and are now integrating them into graphene devices.

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