Abstract Submitted
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Graphene Origami MELINA BLEES, Department of Physics, Cornell University, ARTHUR BARNARD, School of Applied and Engineering Physics, Cornell University, SAMANTHA ROBERTS, Department of Physics, Cornell University, PEIJIE ONG, Materials Science and Engineering, Cornell University, ALIAKSANDR ZARETSKI, Florida International University, SI PING WANG, School of Electrical and Computer Engineering, Cornell University, PAUL MCEUEN, Department of Physics, Kavli Institute at Cornell for Nanoscale Science, Cornell University — Graphene, which features unparalleled in-plane strength and low out-of-plane bending energy, is an ideal material with which to tackle the challenge of building three-dimensional structures and moving parts at the nanoscale. Here we demonstrate laser-induced folding and scrolling of large-area monolayer graphene in solution. Monolayer graphene is typically well-adhered to its substrate, but we have achieved control of the adhesion using a combination of an aluminum sacrificial layer and surfactants. Once the graphene can move, local heating with an infrared laser and the interfacial tension of laser-nucleated bubbles allow us to lift, fold, and scroll the graphene. We have also formed a regular array of polymer dots on the graphene surface which can be easily imaged in three dimensions, allowing us to optically track the shape of the graphene as it moves. And finally, we establish graphene's viability as a strong but flexible sheet hinge by building and manipulating structures of rigid metallic panels connected by strips of graphene.

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