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Tuning the Hofstadter butterfly in graphene with interlayer separation MATTHEW YANKOWITZ, Columbia University, K. WATANABE, T. TANIGUCHI, National Institute for Materials Science, DAVID GRAF, National High Magnetic Field Laboratory, CORY DEAN, Columbia University — The electronic properties of many van der Waals (vdW) heterostructures depend critically on the strength of interactions between the constituent layers. While little work has been done to tune the interlayer separation in vdW heterostructures, this may act as an important new experimental knob for controlling the overall device properties. Aligned- or nearly-aligned graphene on boron nitride represents a particularly interesting case study for the importance of interlayer interactions, as a long wavelength moiré pattern emerges resulting in a sizable graphene band gap at zero magnetic field, and the Hofstadter butterfly magnetotransport at high field. We demonstrate global control over the interlayer separation in these devices by applying hydrostatic pressure up to 2.5 GPa in a piston cylinder cell. We find that by compressing the graphene towards the boron nitride substrate, pressure both enhances the zero-field graphene band gap by as much as 40% and results in a number of subtle changes in the magnetotransport response.

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