Abstract Submitted
for the CUWIP22 Meeting of
The American Physical Society

Determining the Origin of Insulating States in TaS2 with Atomic Adsorbates[1] LIHY BUCHBINDER, University of New Hampshire — Mott insulators are materials that should behave like conductors according to electronic band theory, but act as insulators due to strong electron-electron interactions in the material. These complex interactions, combined with spin-orbit coupling, make them incredibly complicated to describe theoretically. Yet we need such fundamental understanding to utilize these quantum materials in logic devices and other applications. For my project, I tested a direct experimental way, reported by Lee et al. (2021), to distinguish a Mott insulator from a trivial insulator using atomic adsorbates. I studied the origin of the insulating state in tantalum disulfide (TaS2) by depositing gold atoms on the surface and performing scanning tunneling microscopy (STM) and spectroscopy. Based on the chemical response of the surrounding surface to the adsorbates, I determine the type of insulating state. Future work will explore the effect of stacking order in the crystal on the type of insulating state observed. [1] Wang, Y.D., Yao, W.L., Xin, Z.M., Han, T.T., Wang, Z.G., Chen, L., Cai, C., Li, Y., Zhang, Y. (2020). Band insulator to Mott insulator transition in 1T-TaS2. Nature Communications, 11. [2] Lee, J., Jin, K., Yeom, H.W. (2021). Distinguishing a Mott Insulator from a Trivial Insulator with Atomic Adsorbates. Physical review letters, 126 19, 196405.

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Date submitted: 20 Jan 2022 Electronic form version 1.4