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Patterning Atomic Flatland: Electronic Lattices Crafted Atom by Atom

Abstract: ‘Ultimately - in the great future - we can arrange the atoms the way we want; the very atoms, all the way down.’ [1] Sixty years after Feynman posed his vision, we use this principle to realize human-made artificial electronic lattices in a scanning tunneling microscope. One possible route to create and characterize electronic lattices 'on demand' is by controlled patterning of the 2D electron gas at the Cu(111) surface with adsorbed CO molecules, and investigate the lattice by scanning tunneling spectroscopy and wave-function mapping [2]. In this colloquium, I will present *s*- and *p*-orbital bands in a Lieb and honeycomb lattice, demonstrate that the electronic wave functions inherit a dimension of ~1.58 in a Sierpinski fractal, and discuss corner modes in a breathing Kagome lattice [3-6]. I will thus show that the platform of CO on Cu(111) is a versatile electronic quantum simulator, in which the lattice geometry, the orbital degree of freedom and the dimension can be tailored.

Bio: Marlou Slot is a Rubicon postdoctoral fellow working with Dr. Joseph Stroscio at the National Institute of Standards and Technology. She obtained her PhD from Utrecht University working with Prof. Daniel Vanmaekelbergh and Prof. Ingmar Swart. The work that will be presented in this colloquium was carried out at Utrecht University. Prior to that, she obtained her undergraduate degree from RWTH Aachen University and EPFL Lausanne and she was a research assistant at Forschungszentrum Jülich. Her research interests focus on designer quantum matter realized and/or measured using scanning probe microscopy, including van der Waals heterostructures and *in-situ* patterned surfaces.

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