DS 7: Focus Session: Topological Phenomena in Synthetic Matter II (joint session DS/O)

Time: Monday 11:15–12:15 Location: CHE 89

Invited Talk DS 7.1 Mon 11:15 CHE 89

Atom-by-atom engineering of topological states of matter — •Cristiane Morais Smith — ITP Utrecht University, the Netherlands

Feynman's original idea of using one quantum system that can be manipulated at will to simulate the behavior of another more complex one has flourished during the last decades in the field of cold atoms. More recently, this concept started to be developed in nanophotonics and in condensed matter. In this talk, I will discuss a few recent experiments, in which 2D electron lattices were engineered on the nanoscale. The first is the Lieb lattice [1,2], and the second is a Sierpinski gasket [3], which has dimension D = 1.58. The realization of fractal lattices opens up the path to electronics in fractional dimensions. Finally, I will show how to realize topological states of matter using the same procedure. We investigate the robustness of the zero modes in a breathing Kagome lattice, which is the first experimental realization of a designed electronic higher-order topological insulator [4]. Then, we investigate the importance of the sample termination in determining the existence of topological edge modes in crystalline topological insulators. We focus on the breathing Kekule lattice, with two different types of termination [5]. In all cases, we observe an excellent agreement between the theoretical predictions and the experimental results. [1] M.R. Slot et al., Nature Physics 13, 672 (2017). [2] M. R. Slot et al., Phys. Rev. X 9, 011009 (2019). [3] S.N. Kempkes et al, Nature Physics 15, 127(2019). [4] S.N. Kempkes et al., Nature Materials 18, 1292 (2019). [5] S. E. Freeney, ArXiv: 1906.09051. .

Invited Talk DS 7.2 Mon 11:45 CHE 89

Topological Insulator Lasers — •Mordechai Moti Segev — Technion - Israel Institute of Technology

The fundamentals of topological insulator lasers will be explained, based on the foundations of topological physics and challenges of reconciling topologically-protected transport and non-Hermiticity. The applications in lasers physics and the recent progress will be described.