**Electron's degree of freedom in 2D flat surface**

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Exploring electron’s degree of freedom in solids has enabled the developments of new electronics with novel functionalities. For example, electron’s charge degree of freedom has led to the development of a variety of electronics around us. Electron’s spin degree of freedom has provided us methods to store information in magnetic materials. More recently, electrons in a 2D periodic crystal are found to possess a new type of degree of freedom that may be useful beyond charge and spin, which is called valley. In this talk, I will introduce electron’s valley degree of freedom in solids and discuss topological phenomena arising from valley in 2D crystals.