Abstract: Understanding the behavior of interacting electrons in solids or liquids is at the heart of modern quantum science and necessary for technological advances. However, the complexity of their interactions generally prevents us from coming up with an exact mathematical description of their behavior. Precisely engineered ultracold gases are emerging as a powerful tool for unraveling these challenging physical problems. In this talk, I will present recent developments at JILA on using atoms in crystals of light for the investigation of complex many-body phenomena and magnetism. I will also discuss a new research direction of using atomic clocks not only as precise time keepers but also as unique quantum laboratories for the investigation of new forms of matter with no known counterpart in nature.
Her research is on how to control and manipulate ultra-cold atoms, molecules and trapped ions for use as quantum simulators of solid state materials and for entanglement generation, quantum information and precision measurements. She has initiated a new direction of studies that involves the use of alkaline earth atoms. Rey received in 2013 the HENAAC Award and a MacArthur fellowship, and in 2014 the Maria Goeppert Mayer award, the PECASE award and the MOSI's Early Career National Hispanic Scientist of the Year Award.