

TITLE:

High-precision physics and chemistry with ultracold diatomic molecules

ABSTRACT:

Simple molecules at ultracold temperatures can now be manipulated with quantum optical techniques that have been developed for atomic gases. The molecules, however, present us with profoundly distinctive properties, many of which arise from their higher density of states. Furthermore, molecules can be sensitive to different aspects of fundamental physical laws than atoms are. Here we show how a combination of molecular spectroscopy in the style of optical atomic clocks and modern quantum chemistry explain many bizarre properties of loosely bound molecules, shed light on the quantum aspects of the most basic chemical reactions, and promise to advance table-top fundamental physics in new directions.