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Ultracold Molecular Assembly NICHOLAS HUTZLER, LEE LIU, YICHAO YU, JESSIE ZHANG, JONATHAN HOOD, KANG-KUEN NI, Harvard University — Studies of quantum many-body physics and information rely on the ability to coherently control strongly-interacting quantum objects. Ultracold polar molecules in optical traps are very promising candidates due to their many long-lived internal states and strong, long-range, anisotropic, and highly tunable interactions. A powerful and successful method is to start with ultracold atoms and coherently associate them into ultracold molecules. We take the approach of forming these molecules one-by-one via combining pairs of ultracold atoms in optical tweezers with complete and dynamic control over geometry. The flexibility of this approach allows us to work with NaCs, which has a very large dipole moment of 4.6 D. In this talk, we discuss progress trapping and cooling single atoms, and schemes for molecule formation [arxiv:1701.03121].

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