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Prospects for ultracold dipolar physics, microscopy, and QIP with dysprosium BENJAMIN LEV, SEO HO YOUN, MINGWU LU, USHNISH RAY, University of Illinois at Urbana-Champaign — Highly magnetic atoms such as dysprosium offer the ability to create strongly correlated matter in both atomic physics and quantum optics settings. In addition, these atoms will form the key ingredient in novel devices possessing unsurpassed sensitivity and resolution for the microscopy of condensed matter materials. We discuss prospects for laser cooling and trapping dysprosium on chips and in optical lattices. Such progress will lead to three research projects: the investigation of quantum liquid crystal physics in fermionic dipolar lattices; the exploration of non-equilibrium quantum phase transitions in many body cavity QED; and the development of atom chip microscopy at the greater than 10^{-7} magnetic flux quantum level.

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