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Why Condensed Matter Physicists Should Pay Attention to Atomic Physics

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Atomic and molecular (AMO) physics has been revolutionized by the advent of ultracold atomic gases, including quantum degenerate Bose and Fermi gases. Much of the activity with cold atoms brings AMO physics into close contact with condensed matter (CM). Atoms in optical lattices (externally imposed periodic potentials) can mimic the behavior of electrons in crystals, Bose-Einstein condensed gases or Cooper-paired degenerate Fermi gases can mimic superfluid helium or superconducting materials, and atomic gases can exhibit phase transitions that are traditionally studied in solids. These and other atomic phenomena offer possibilities for measurement and control that can be quite different from those available in materials. This talk will explore some of the current intersections of AMO and CM physics and speculate about the future of this relationship.