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**Atomtronics: Ultracold atom analogs of electronic circuits and devices** RONALD PEPINO, BRIAN SEAMAN, MURRAY HOLLAND, JILA, NIST, CU Boulder — Atomtronics focuses on creating an analogy between electronic devices and circuits with ultracold atoms. Such an analogy can come from the Mott-insulator characteristic of ultracold gases trapped in optical lattices. The highly tunable parameters of optical lattices allow one to construct and precisely manipulate them. This lets one to create conditions that cause atoms in lattices to exhibit the same behavior as electrons moving through solid state media. We present our model and show how the atomtronic diode and the field effect transistor can be realized. These fundamental components can lead to the construction of other atomtronic devices such as the bipolar junction transistor and possibly amplifiers and switches. Besides the similarities to condensed matter systems, there are also differences that can be explored: atomtronic current carriers can be either bosons or fermions having spin not equal to  $1/2$ . Also, there are no thermal fluctuations or phonon modes associated with the lattice itself.

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