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Atomtronics and basic logic: Constructing AND and OR gates from atomtronic transistors RONALD PEPINO, JOHN COOPER, DANA ANDERSON, MURRAY HOLLAND, JILA — Our atomtronics research focuses on creating an analogy of electronic devices and circuits with ultracold atoms. Such an analogy arises from the highly tunable band structure of ultracold neutral atoms trapped in optical lattices. In previous work it has been demonstrated that the electronic behavior of a diode, field effect transistor (FET), and bipolar junction transistor (BJT) can all be realized in systems composed of optical lattices connected to reservoirs of neutral, ultracold atoms. We demonstrate that the behavior of simple logic gates namely, the AND and OR gates, can be realized by connecting the BJTs in the traditional electronic manner.

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