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Atomtronics

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We explore the analogy between ultracold atoms in optical lattices and electrons in crystal lattices. Of particular interest is atomtronics, where the analogy is extended to include electrical circuits and doped semiconductor materials. Lattice "defects" achieve behaviors similar to P-type and N-type semiconductor materials. Naturally the interest is to adjoin P-type and N-type atoms lattices to produce an atom diode, and then an NPN or PNP lattice "sandwich" to achieve bipolar transistor-like behavior for ultracold atoms.