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Anderson localization for weak disorder[1] DAVID THOULESS, University of Washington, ADAM ANDERSON, University of Chicago — More than 25 years ago the correctness of Anderson's original argument for localization of states of noninteracting particles in a strongly disordered lattice potential was proved, but arguments for diffusive states in weak disorder are less compelling. A barrier to treating the disorder as a perturbation is the extreme sensitivity of extended states to boundary conditions in the absence of disorder. We find that a promising approach, which avoids boundary conditions, is to consider an infinite, homogeneously but weakly disordered, lattice. The Hamiltonian on the lattice is converted from configuration space to tridiagonal form by using the Lanczos transformation, and the disorder is treated perturbatively. We argue that the effect of disordering a two dimensional lattice may, in the tridiagonal representation, fall off like the inverse square root of the distance from the origin, and this can lead to an initial power law localization. In three dimensions the effect of disorder falls off like the inverse distance from the origin of the tridiagonal representation, and that this should lead to diffusive behavior except near the band edges.

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