1077-35-2011 **Marcel Filoche*** (marcel.filoche@polytechnique.edu), Physique de la Matière Condensée, Ecole Polytechnique, CNRS, 91128 Palaiseau, France, and **Svitlana Mayboroda** (svitlana@math.umn.edu), School of Mathematics, University of Minnesota, 127 Vincent Hall, 206 Church St. SE, Minneapolis, MN 55455. *The landscape of Anderson localization in a disordered medium.*

Wave localization occurs in all types of vibrating systems, in acoustics, mechanics, optics, or quantum physics. It arises either in systems of irregular geometry (weak localization) or in disordered systems (Anderson localization). We present here a general theory that explains how the system geometry and the wave operator interplay to give rise to a "landscape" whose valleys split the system into weakly coupled subregions. Very generally, the valley system of the localization landscape, that are the boundaries of the subregions, consists in a network of interconnected surfaces of codimension 1. It is shown that not only the subregions predict the spatial distribution of the vibrational eigenmodes, but also that the valley system allows one to understand the transition from localized to delocalized modes when the frequency increases.

This theory holds in any dimension, for any domain shape, and for all operators deriving from an energy form. In particular, Anderson localization is shown to be explained by this same mathematical frame. It can be understood as a special case of weak localization in a very rough landscape and a highly complex, possibly fractal, valley network. (Received September 21, 2011)