

Abstract Submitted  
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**Quantum Isospectral Nanostructures**<sup>1</sup> CHRISTOPHER R. MOON, HARI C. MANOHARAN, Department of Physics, Stanford University, Stanford, CA 94305 — “Can one hear the shape of a drum?” Recently, the answer to this long-standing puzzle in contemporary mathematics was proven to be “no”: it is possible to construct two entirely different boundaries in which the wave equation possesses exactly the same eigenvalue spectrum. For the first time, we verify this result in the quantum mechanical realm by designing and studying isospectral electron resonators built one molecule at a time. We present scanning tunneling microscopy of pairs of nanostructures with dissimilar spatial structures yet identical electronic properties. We demonstrate that the wavefunctions of one structure can be transplanted onto those of its isospectral complement, but only if the electron phase – which usually has no bearing on proximal probe measurements – is taken into account.

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