

Abstract Submitted  
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**Wannier-Stark Ladders in Torsional Waves** GUILLERMO MONSIVAIS, Instituto de física, UNAM, RAFAEL MÉNDEZ-SÁNCHEZ, ALFREDO DIAZ-DE-ANDA, JORGE FLORES<sup>1</sup>, Centro de Ciencias Físicas, UNAM, LUIS GUTIÉRREZ, ALEJANDRO MORALES, Centro de Ciencias Físicas UNAM — We study the normal modes of torsional waves in an elastic rod consisting of a set of  $n$  circular cylinders of varying length determined by a parameter  $\gamma$ . We present experimental, theoretical, and numerical results. It is shown that some analogies to the Wannier-Stark ladders, originally introduced by Wannier (1960), are exhibited by this classical system. The ladders consist of a series of equidistant energy levels for the electrons in a crystal in the presence of a static external electric field, the nearest-neighbor spacing being proportional to the intensity of the external field. For the case of torsional waves in the rod, we have observed a similar behavior: the vibrations of the rod show resonances of equidistant frequencies, the nearest neighbor spacing being proportional to  $\gamma$ , associated with the geometry of the rod. One should point out, however, that the analogy is not perfect.

References:

Wannier G. H. (1960) Wave Functions and Effective Hamiltonian for Bloch Electrons in an Electric Field, Phys. Rev. **117**, 432-439; Wannier G. H.

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