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The role of C-algebra K-theory in the study of the Hofstadter spectrum*

The famous Hofstadter butterfly is in fact, when viewed as a vertically moving horizontal section, a moving picture—not only of the spectrum of the Peierls operator from solid state physics, as the parameter, the magnetic field strength, varies, but also of the ordered K_0-group of the continuously varying C*-algebra naturally containing this operator. This C*-algebra, known, variously, as the rotation algebra and as the non-commutative torus, underlies the result, based on over thirty years of work—beginning with Hofstadter's discovery of the phenomenon in 1979, and ending with the recent Annals paper of Avila and Jitomirskaya—, that for all irrational values of the parameter the spectrum is a Cantor set. A very brief survey of this work will be attempted.