

The kicked rotor: from KAM to integer quantum Hall effect

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The discovery of integer quantum Hall effect (IQHE), a transport quantization phenomenon, heralded a revolution in condensed matter physics. This notwithstanding, IQHE is commonly conceived as being unrelated to chaos ubiquitous in Nature. Indeed, the salient characteristic of chaos – the sensitivity of system's behavior to disturbances – is conceptually incompatible with the robustness of transport quantization in IQHE. Moreover, while chaos occurs even in simple one-body systems, IQHE is known to be a ground-state property of many-electron systems. Surprisingly, we discover in a canonical chaotic one-body system a Planck's quantum-driven phenomenon bearing a firm analogy to IQHE but of chaotic origin. Our finding indicates that rich topological quantum phenomena can emerge from chaos.

Reference

1. Y. Chen and C. Tian, Physical Review Letters 113 (Editors' Suggestion), 216802 (2014).