Dresden University of Technology

Faculty of Physics

PHYSICS COLLOQUIUM

Speaker: **Prof. Alexander Altland**
Professor of Physics
Institute for theoretical physics,
Universität Köln

Topic: **The Ergodic Paradigm in Quantum Circuits**

Time and place: Tuesday, November 10, 2026, **2:50 pm** – hybrid event
The colloquium will be held in REC/C213.
Online participation possible:
Zoom-Meeting: Meeting-ID: 642 8554 1414 / passcode: w8$nSJjy
https://tu-dresden.zoom-x.de/j/64285541414?pwd=6UOwTkSBlWvNv16PgF2K1qZtoUC8cS.1

Host: Prof. Gesche Pospiech

Abstract: The ergodic regime of quantum chaos defines a powerful universality paradigm, establishing connections between otherwise disparate areas of physics. In the first part of this talk, we review this almost century-old concept in a language adapted to modern applications in many-body quantum chaos, condensed matter physics, and holography.

In the second part, we turn to applications in synthetic quantum matter and quantum circuits, where the late-time chaotic regime features in different roles: as a nuisance, destabilizing the operation of quantum computing devices; as a resource for engineering quantum states and demonstrating quantum advantage; and as a general dynamical principle governing the evolution of non-integrable unitary circuit networks. We discuss how these seemingly different manifestations of quantum chaos originate from common physical principles of irreversible quantum-state evolution and entanglement generation.

Bio: Alexander Altland studied physics in Marburg and Heidelberg and received his doctorate in 1991. Following postdoctoral appointments at the Weizmann Institute and Cambridge, he held positions in Bochum before becoming professor of theoretical physics in Cologne in 2001. He has led two Collaborative Research Centres and currently serves as spokesperson of the Cluster of Excellence ML4Q.

His research explores randomness and chaos as sources of universality, with a focus on phenomena governed by symmetry, conservation laws, dimensionality, or topology. His group's work spans mesoscopic systems, topological quantum matter, holography, and quantum circuits.

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