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**UNIVERSITÄT
BERN**

Philosophisch-
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Departement Mathematik und Statistik
Mathematisches Institut

Mathematical Colloquia

Monday, 25 March 2019

17:15 h, Lecture Room 119

Prof. Dr. Tobias Hartnick, University of Giessen

Charting out the world of aperiodic order

Abstract:

The idea of symmetry plays a central role in the arts and sciences of all cultures. Modern physics is almost entirely based on invariance principles with respect to symmetries, and chemists and crystallographers have long since learned to organize materials according to their internal symmetries. Mathematically, symmetries are described by group actions. In his famous Erlangen Programme, Felix Klein went so far as to define geometry as the study of “properties, which remain unchanged under the transformations of a given symmetry group”.

Mathematicians have made themselves comfortable in the paradise of perfect symmetry. Outside this paradise, chaos is lurking. In the second half of the 20th century, some brave mathematical pioneers discovered a small habitable strip between the world of symmetry and the world of chaos, the realm of “aperiodic order”. This talk is an invitation to visit this largely uncharted territory.

In the footsteps of Yves Meyer we will visit the world of aperiodic structures in abelian Lie groups and explain the role it played in the discovery of quasi-crystals. We will find bizarre creatures, like donuts of a fractal nature, and move on to the wild world of aperiodic structures in non-abelian Lie groups, following recent work of Michael Björklund and the speaker. Our main compass will be the idea that aperiodic order can be modelled by approximate groups (in the sense of Terry Tao) in very much the same way that symmetry can be modelled by groups.

The talk is intended for a general mathematical audience. No previous knowledge of aperiodic order is assumed.