

ESI SENIOR RESEARCH FELLOW LECTURES

Summer Term 2011

The Erwin Schrödinger International Institute of Mathematical Physics (ESI) offers the following lectures held by guest speakers of Senior Research Fellows in residence during the summer term 2011. For more information and related literature please visit the ESI home page www.esi.ac.at.

1. **Similar Sublattices of Higher Dimensional Lattices**

Prof. Rudolf Scharlau (Technische Universität Dortmund)

Lecture: Wednesday, June 8 at 14:00 hrs

ESI, Erwin Schrödinger Lecture Hall

Abstract: The similar sublattices (SSLs) of a given lattice in Euclidean d -space are by definition the images of the lattice under similarities (norm-stretching maps). As objects of discrete geometry, they are of interest in their own right, and they have also shown up in various applications: crystallography, material science, digital coding, more precisely "multiple description" vector quantizers. In the 2-dimensional case, a rather complete picture of all SSLs has recently been given by Baake, Zeiner and the speaker. Less complete results exist in dimensions 3 and 4. In higher dimensions, only partial results on the existence of SSLs have been published by Conway, Rains and Sloane. In this talk, I propose a systematic approach to SSLs of integral lattices of (in principle) arbitrary dimension, based on the arithmetic theory of integral quadratic forms. In "good" cases, this not only answers the existence question, but also leads to a precise counting of the number of SSLs of a given index.

2. **The mathematics of coincidence site lattices**

Peter Zeiner (Universität. Bielefeld)

Lecture: Wednesday, June 8 at 15:30 hrs

ESI, Erwin Schrödinger Lecture Hall

Abstract: Given a lattice Γ in Euclidean space and an isometry R , the intersection $\Gamma \cap R\Gamma$ is called a coincidence site lattice (CSL), if it is a full rank lattice. This talk gives an introduction to CSLs – and more general to coincidence site modules – and an overview of the current state of the art. In addition, we discuss the connection to similar sublattices. Finally we present some recent general results on planar lattices that can be viewed as orders in quadratic number fields.

Joachim Schwermer
Scientific Director
ESI