Fractal Structures in sandpiles and their dynamics

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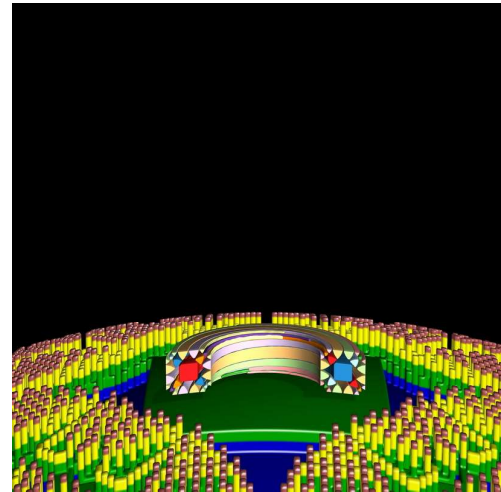
As sand drops slowly onto a table, little mountains of sand evolve and eventually become unstable, resulting in avalanches. The Abelian sandpile is an abstract mathematical model of this process. In it, the table is divided into a grid of squares, each of which can carry up to three grains of sand. If, due to the random addition of sand, one square exceeds this number, it becomes unstable and "topples", decreasing its grain number by four and increasing the grain number of each of its neighbors by one. After a certain addition of sand, known as "the identity", the board returns to its original state; when plotting where sand is added during this process, a beautiful fractal pattern (above) emerges. We seek to understand these fractal patterns and other aspects of the sandpile model by inducing regular periodic dynamics with the help of harmonic potentials. Though simple, many areas of mathematics meet in the sandpile model, and their work could thus have implications in a numerous contexts.

Refreshments will be served at the end.

30th November, 2018

4pm
Raiffeisen Lecture Hall