



FAKULTÄT FÜR  
NATURWISSENSCHAFTEN

# Physikalisches Kolloquium

Dienstag, 16:30 Uhr, G 16/Raum 215

**15. Mai 2018**      **Prof. Dr. Christopher Moore**  
**Santa Fe Institute (USA)**

## “Phase Transitions in Inference and Community Detection in Networks”

### Synopsis

There is a deep analogy between statistical inference and statistical physics. Just as a block of iron suddenly loses its magnetic field when it reaches a critical temperature, data can suddenly become impossible to analyze if it becomes too noisy or too incomplete. I'll focus on the case of finding communities in social and biological networks, and the “detectability transition” beyond which we cannot classify nodes better than chance, or even tell whether community structure really exists. We'll see how physics both helps us locate these phase transitions, and gives us optimal algorithms that succeed all the way up to this point. Along the way, I will visit ideas from computational complexity, random graphs, and spin glass theory.

Bio: Christopher Moore received his B.A. in Physics, Mathematics, and Integrated Science from Northwestern University, and his Ph.D. in Physics from Cornell. From 2000 to 2012 he was a professor at the University of New Mexico, with joint appointments in Computer Science and Physics. Since 2012, Moore has been a resident professor at the Santa Fe Institute; he has also held visiting positions at École Normale Supérieure, École Polytechnique, Université Paris 7, the Niels Bohr Institute, Northeastern University, and the University of Michigan. He has published over 150 papers at the boundary between physics and computer science, ranging from quantum computing, to phase transitions in NP-complete problems, to the theory of social networks and efficient algorithms for analyzing their structure. He is an elected Fellow of the American Physical Society, the American Mathematical Society, and the American Association for the Advancement of Science. With Stephan Mertens, he is the author of *The Nature of Computation* from Oxford University Press.