



The University of Chicago
Department of Statistics
STATISTICS COLLOQUIUM

SEBASTIEN ROCH

Department of Mathematics
University of California, Los Angeles

**A Phase Transition in Molecular Evolution with
Applications to the Assembly of the Tree of Life**

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110 Eckhart Hall, 5734 S. University Avenue

ABSTRACT

Recent advances in DNA sequencing technology have led to new challenges in the analysis of the massive data sets produced in current evolutionary studies. In particular, the estimation of evolutionary trees on increasingly large scales has prompted the development of novel reconstruction methods. An important issue in this context is the fundamental trade-off between statistical accuracy and computational efficiency. In this talk I will describe a fruitful connection between standard models of molecular evolution and a class of spin systems from probability theory that sheds light on this issue. I will show how this probabilistic perspective produces a finer theoretical understanding of the statistical and computational properties of conventional tree-building methods and how it also suggests potential new approaches. The results rely on the analysis of a phase transition in the spin system and the development of new combinatorial algorithms.

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