



NYU-ECNU Institute of Mathematical Sciences at NYU Shanghai

WEEKLY SEMINAR

Topic: Statistical Mechanics and the Riemann Hypothesis

Speaker: Prof. Chuck Newman

Time: 14:30-16:30, 6 November 2013

Venue: Room 153, Geography Building, 3663 Zhongshan Road North, Shanghai
(华东师范大学中山北路校区, 地理楼 153 室)

ABSTRACT OF THE TALK

In this talk we review a number of old results concerning certain statistical mechanics models and their possible connections to the Riemann Hypothesis. A standard reformulation of the Riemann Hypothesis (RH) is: The (two-sided) Laplace transform of a certain specific function Ψ on the real line is automatically an entire function on the complex plane; the RH is equivalent to this transform having only pure imaginary zeros. Also Ψ is a positive integrable function, so (modulo a multiplicative constant C) is a probability density function. A (finite) Ising model is a specific type of probability measure P on the points $S = (S_1, \dots, S_N)$ with each $S_j = +1$ or -1 . The Lee-Yang theorem implies that for non-negative a_1, \dots, a_N , the Laplace transform of the induced probability distribution of $a_1 S_1 + \dots + a_N S_N$ has only pure imaginary zeros. The big question here is whether it's possible to find a sequence of Ising models so that the limit as N tends to ∞ of such distributions has density exactly $C\Psi$. We'll discuss some hints as to how one might try to do this.

BIOGRAPHY

Chuck Newman is a mathematician at the Courant Institute of Mathematical Sciences of New York University. He works in the fields of mathematical physics, statistical mechanics, and probability theory. He is a member of the National Academy of Sciences since 2004, and of the American Academy of Arts and Sciences since 2006. In 2012 he became a fellow of the American Mathematical Society. Newman graduated from MIT in 1966 with degrees in both mathematics and physics. He completed his PhD at Princeton University in 1971 with advisor Arthur Wightman.