

Special APPLIED MATHEMATICS COLLOQUIUM

CLASSICAL ENSEMBLES OF RANDOM MATRICES: GAUSSIAN, WISHART, MANOVA. FROM THE THREEFOLD WAY TO A CONTINUOUS β FUTURE

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ABSTRACT:

In classical probability, the Gaussian, Chi-square, and Beta are three of the most studied distributions, with wide applicability. In the last century, matrix equivalents to these three distributions have emerged from nuclear physics (Gaussian ensembles) and multivariate statistics (Wishart and MANOVA ensembles). Their eigenvalue statistics (many of which exhibit "universal" properties) have been studied in depth for three values of a parameter ($\beta = 1, 2, 4$) which defines the "threefold way" and can be thought of as a counting tool for their real, complex, or quaternion entries.

The re-examination of the Selberg integral formula, in the late '80s, has brought the advent of general β -ensembles, which subsume the classical cases, and for which the Boltzmann parameter β acts as an inverse temperature. Their eigenvalue statistics interpolate between the isolated instances 1, 2, and 4, offering a complete, unified perspective.

With the discovery of matrix models for the general β -ensembles in the early 00's, we have entered a new stage in the understanding of the complex phenomena that lie beneath the threefold way. While the $\beta = 1, 2, 4$ cases will always be special, we believe that the future of random matrix theory and its applications is written in terms of a continuous β parameter.

FRIDAY, FEBRUARY 17, 2006
4:00 PM
Building 4, Room 237

*Reception at 3:30 PM in Building 4, Room 174.
(Math Majors Lounge)*

Applied Math Colloquium: <http://www-math.mit.edu/amc/spring06>
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