

**Meeting:** 1000, Albuquerque, New Mexico, SS 1A, Special Session on Random Matrix Theory and Growth Processes

1000-05-45            **Nicholas M. Ercolani\***, Department of Mathematics, University of Arizona, Tucson, AZ 85721,  
and **Kenneth T.-R. McLaughlin** and **Virgil Pierce**. *Continuum Limits of Toda Lattices*  
*associated to a Random Matrix Partition Function.*

We have been considering the large  $N$  expansion of a random matrix partition function which describes the expectations of matrix observables with respect to a conjugation-invariant measure on the given ensemble of matrices. Here the ensemble is the space of  $N \times N$  Hermitean matrices. The large  $N$  expansion gives asymptotic information about the statistics of invariant quantities, such as eigenvalues, as the size of the matrices becomes large. This has many interesting applications to statistical physics, combinatorics and enumerative geometry. This partition function has a natural interpretation in terms of a tau-function for a Toda Lattice hierarchy.

This talk will principally concern a scaling limit associated to the large  $N$  expansion which may be understood in terms of a continuum limit of the associated Toda lattice hierarchy. We will show how this continuum limit can provide detailed information concerning the fine structure of the large  $N$  expansion of the original partition function. This "fine structure" amounts to detailed information about graphical enumeration on Riemann surfaces of arbitrary finite genus. (Received August 05, 2004)