Extension: 31304 Email: jlee@math.nctu.edu.tw

Prof. Jong-Eao Lee / Department of Applied Mathematics

Riemann Surface Theory, Theory of Classical Mathematical Functions, Periodic Solitons Theory of nonlinear evolution equations, and the Applications to the waves

We develop the periodic soliton theory of exactly integrable systems (all are universal nonlinear evolution equations) on Riemann surfaces of genus N, and apply it to generic waves.

Three important schemes are involved (each in both theoretical and numerical aspects) :

(a) develop the correct complex analysis and techniques of evaluation of path integrals on Riemann surfaces of genus N with various algebraic structures. This is the most fundamental and important tool in doing research waves.

(b) study the classical mathematics such as the theory of Elliptic functions, the Theta functions, and the Jacobian Elliptic functions. It is the theoretic foundation to the theory of Riemann surfaces and to the wave theory.

(c) Apply the theory and numerical techniques in (a, b) to analyze the exactly integrable systems such as Korteweg-de Vries, sine-Gordon and nonlinear Schrdinger universal partial differential equations which are universal mathematical models for generic waves.

The wave theory need much more different mathematical theory to analyze, and is still a wide-open field. Yet, the periodic soliton theory is already successfully applied to generic wave theory sush as water waves(deep, shallow, long, short), laser light, in acoustics, in plasmas, and network signals, etc.