

Future Projects

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FUTURE PLAN:

1) **Quantum Grassmannian and exact wave function for interacting systems**

The project is motivated by the idea that in analogy with the Slater determinant as the wave-function of free fermions, the wave functions of interacting quantum systems must be represented also by some determinant structure. For this the aim is to develop a systematic theory by formulating a novel quantum generalization of the Grassmannian and linking it to a new type of *generalized determinant* related to the wave functions of exactly solvable quantum models.

(Collaborator: Yuji Kodama (Maths, Ohio State Univ))

2) **Analysis of Bethe equations through theory of symmetric functions**

The Bethe ansatz equations, though immensely important in solvable models, are difficult to handle due to their high nonlinearity. The aim of the project is to

attack this problem by noticing a crucial symmetry of these equations and applying therefore the well developed theory of symmetric functions.

3) Tsunami as nonlinear phenomena

This important project is motivated by the fact that, some significant observations of the recent Indian Ocean Tsunami, like 1) switching of the Tsunami wave intensities as well as their 2) stability and the 3) variation of the time-period during their long-distance propagation from the epicentre, can not be explained through the traditional linear Tsunami theory. On the other hand, the KdV type nonlinear equation seems to explain these events quite satisfactorily.