

Debashis Ghoshal

Research Summary:

The $p \rightarrow 1$ limit of p -adic string theory was revisited from the perspective of the worldsheet. It was argued that string theory based on the p -adic field provides a discretisation of the bosonic string worldsheet. Those based on its algebraic extensions of increasing degree make this approximation better leading to a continuum limit in the sense of the renormalisation group.

A q -deformation of the arithmetic analogue of Veneziano amplitude was proposed using the q -extended p -adic gamma function. This provides a one parameter deformation of the arithmetic Veneziano amplitude. Difficulties with generalising this construction to higher amplitudes were discussed.

The notion of generalised hyperKähler structure in the context of string theory was discussed. An explicit example was provided and a sketch towards further generalisation was outlined.

Publications:

1. D. Ghoshal, *p-Adic string theories provide discretization to the ordinary string worldsheet*, Phys. Rev. Lett. **97**, 151601, (2006).
2. B. Ezhuthachan and D. Ghoshal, *Generalised HyperKähler Manifolds in String Theory*, J. High Energy Phys. **04**, 083, (2007).
3. D. Ghoshal, *p-Strings vs. strings*, in *Mathematical Physics: Proceedings of the 12th Regional Conference*, Islamabad, Pakistan, 2006, Eds. M. Jamil Aslam *et al*, World Scientific (2007).

Preprints:

1. D. Ghoshal, *Quantum extended arithmetic Veneziano amplitude*, HRI-P-0604001, AEI-2006-036, math-ph/0606003.

Conference/Workshops Attended:

1. *12th Regional Conference in Mathematical Physics*, Islamabad, Pakistan, April 2006.
2. *Indian String Meeting (ISM 06)*, Puri, India, December 2006.
3. *From Strings to LHC*, Goa, India, January 2007.

Visits to other Institutes:

1. Albert Einstein Institute, Potsdam, Germany, April–June 2006,
2. Tata Institute of Fundamental Research, Mumbai, India, November 2006 – February 2007.

Invited Lectures/Seminars:

1. *p-Strings vs. strings*, 12th Regional Conference in Mathematical Physics, National Centre for Physics, Quaid-e-Azam University, Islamabad, Pakistan, April 2006.
2. *p-Toying with strings*, seminars at the Delhi University, Delhi, Jawaharlal Nehru University, New Delhi and University of Hyderabad, Hyderabad, October & November 2006.
3. *p-String theory as discretisation of the string worldsheet*, Theoretical Physics Colloquium, Tata Institute of Fundamental Research, Mumbai, February 2007.

Other Activities:

1. Supervised the projects of two visiting students, July–August 2006.
2. *Mathematical aspects of compactification*, a special topics course (of half-semester duration) in the Graduate School Curriculum at HRI, August–October 2006.
3. Member of the Planning Committee of the SERC Schools in Theoretical High Energy Physics.
4. Associate Editor, *General Relativity & Gravitation*, since January 2007