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A Talk at the 2nd ISNMP Conference

Bad Ems, 28 June to 4 July 2026

Regular Session:

Speaker: Anup Anand Singh (Loughborough University, UK)

Collaborators: V. Caudrelier, M. Dell'Atti, D. Harland, B. Vicedo

Title: *Geometric Lagrangian one-forms and Hitchin systems*

Abstract: The theory of Lagrangian multiforms provides a variational description of integrable hierarchies using a generalised variational principle applied to an appropriate generalisation of a classical action. The case of Lagrangian one-forms covers finite-dimensional integrable systems.

In the first part of the talk, I will present an overview of geometric Lagrangian one-forms: a novel variational framework formulated in phase space. I will also briefly discuss its connection with the more traditional Hamiltonian approach to integrability by showing how the closure relation for Lagrangian one-forms serves as the variational analogue of the Poisson involutivity of Hamiltonians.

The second part of the talk concerns the construction of geometric Lagrangian one-forms for Hitchin systems, a large class of integrable systems of algebro-geometric origin. I will show how adapting Hitchin's construction to the variational setting of Lagrangian multiforms produces a multiform version of the action of the 3d holomorphic-topological BF theory with defects. Moving to a holomorphic local trivialisation of principal G -bundles yields a simple 1d action which unifies several well-known integrable hierarchies — including those of rational and elliptic Gaudin models and a spin generalisation of the elliptic spin Calogero-Moser model — within a single variational framework.

The talk is based on joint works with V. Caudrelier, M. Dell'Atti, D. Harland, and B. Vicedo.