Integrable Geometric Flows in Diverse Geometries

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Integrable geometric evolution equations (GEEs) for curves crop up in surprisingly diverse geometric contexts. (Our working definition of integrability is that the induced system of evolution equations for the invariants is bi-Hamiltonian, and ideally equivalent to a known integrable PDE system.) In this talk we discuss new examples of integrable hierarchies of GEEs for curves in three distinct geometries: a realization of the Boussinesq hierarchy for nondegenerate curves in centroaffine 3-space, an seemingly unrelated realization of the Kaup-Kuperschmidt hierarchy for contact curves in the pseudoconformal 3-sphere, and finallya hierarchy of flows for generic curves in Euclidean 3-space (so far unidentified with a known integrable PDE). In several cases, we observe that the bi-Hamiltonian structure appears to be closely related to the "invariantization" operator that takes a geometric velocity field to the time derivatives of the invariants.

This talk is based on joint work with Annalisa Calini, Gloria Mari Beffa and Emilio Musso.