Algebro-geometric aspects of the classification of integrable systems

Eyal Markman
Department of Mathematics
University of Massachusetts at Amherst

Abstract

Moduli spaces of certain physical theories (of supersymmetric gauge theories, of Calabi-Yau 3-folds in String theory) come equipped with an extra structure: that of a special-Kahler-manifold. One then attempts to compute this special-Kahler structure. Special-Kahler-manifolds arise also from completely integrable hamiltonian systems. In that case, the special-Kahler structure can be easily computed via period integrals. In mirror symmetry and in Seiberg-Witten theory the "solution" is obtained by a conjectural identification of the integrable system which gives rise to the same special-Kahler structure. The guess-work involved is facilitated by a (partial) classification of integrable systems.

We will start with a brief survey of some of the ideas mentioned above. We will then compare two classification schemes:

- The representation theoretic method of Affine Lie algebras, - The algebro-geometric method of Generalized Hitchin and Mukai systems (see math.AG/9804059)

with emphasis on the latter.