Developments in Algebraic Geometry

In directions initiated by David Mumford

June 2, 2007, Providence, RI

Abstracts

10:00–11:00 **Vyacheslav Shokurov**, Johns Hopkins Univ.

Title: *Mumford's legacy in birational geometry.*

Abstract: Survey of current progress in the solution of two major problems in 3-dimensional birational geometry: a rationality criterion and deformation invariance of nonrationality.

11:20–12:20 **Ulrike Tillmann**, Oxford Univ.

Title: *Mumford's conjecture: A topological outlook.*

Abstract: Twenty-five years ago, Mumford defined certain canonical classes in the cohomology of the moduli space of Riemann surfaces, and asked whether these generate the rational cohomology in low dimensions (relative to the genus of the underlying curve). This conjecture has been proved by Madsen and Weiss. In this colloquium-style lecture, I will explain some of the main ideas that went into another proof subsequently given in joint work with Galatius, Madsen, and Weiss.

2:10–3:10 **Valery Alexeev**, Univ. Georgia

Title: *Compactification of the Torelli map: from Mumford to tropical geometry.*

Abstract: Can the Torelli map from $\mathcal{M}_g$ to $\mathcal{A}_g$ be extended to a functorially meaningful map between two compact moduli spaces? I will review the developments starting from the original work of Mumford and up to the recent reincarnation of his ideas in the tropical geometry.

3:40-4:40 **Igor Krichever**, Columbia Univ.

Title: *Integrable linear equations and Riemann-Schottky type problems.*

Abstract: A connection discovered by Mumford of the celebrated Fay trisecant formula with a theory of soliton equations eventually had led Welters to his remarkable conjecture: an indecomposable principally polarized abelian variety X is the Jacobian of a curve if and only if there exists a trisecant of its Kummer variety $K(X)$. It was motivated by Gunning's theorem and by another famous conjecture: the Jacobians of curves are exactly the indecomposable principally polarized abelian varieties whose theta-functions provide explicit solutions of the so-called KP equation. The latter was proposed earlier by Novikov and was unsettled at the time of the Welter's work. It was proved later by T. Shiota and until recently has remained the most effective solution of the classical Riemann-Schottky problem.

The characterization of the Jacobians proposed by the trisecant conjecture is much stronger. The proof of this conjecture based on a notion of integrable linear equations and a new type of cubic identities for the theta-functions valid for the case of Jacobians on the theta-divisor will be presented. We will also discuss applications of integrable equations of the soliton theory for the characterization problem of Prym varieties.

5:00-6:00 **Michael Rapoport**, Univ. Bonn

Title: *Non-archimedean uniformization from Mumford to the present.*