

BENJAMIN PEIRCE CENTENNIAL CONFERENCE PROGRAM JUNE 10-JUNE 12, 2016

FRIDAY, JUNE 10

2:30-3:15 Refreshments

3:15-3:30 WELCOME AND INTRODUCTORY REMARKS

3:30-4:30 SHIGEFUMI MORI (RIMS, KYOTO UNIVERSITY)

Title: "Rational Curves on Algebraic Varieties- an encounter at Harvard and its later development"

Abstract: I would like to talk about an existence theorem for rational curves on an algebraic variety, which was the key to my solution of Hartshorne's Conjecture on projective space. It grew into a prototype theory of the cone of curves and extremal rays covering smooth projective threefolds. These were done when I was at Harvard. They were later developed further into a more extensive and powerful theory as well as the so-called Minimal Model Theory, which was finally settled in many practical cases in all dimensions by the paper by C.Birkar, P.Cascini, C.Hacon, and J.McKernan in 2010 and is now a fundamental tool in algebraic geometry. I have been interested in and working on finer classifications in dimension three cases, and will also discuss this in my talk.

4:30-5:00 Break

5:00-6:00 AMIE WILKINSON (UNIVERSITY OF CHICAGO)

Title: "The general case".

Abstract: The celebrated Ergodic Theorems of George Birkhoff and von Neumann in the 1930's gave rise to a mathematical formulation of Boltzmann's Ergodic Hypothesis in thermodynamics. This reformulated hypothesis has been described by a variety of authors as the conjecture that ergodicity -- a form of randomness of orbit distributions -- should be "the general case" in conservative dynamics. I will discuss remarkable discoveries in the intervening century that show why such a hypothesis must be false in its most restrictive formulation but still survives in some contexts. In the end, I will begin to tackle the question, "When is ergodicity and other chaotic behavior the general case?"

SATURDAY, JUNE 11

9:00-9:30 Refreshments

9:30-10:30 DAVID GABAI (PRINCETON UNIVERSITY)

Title: "On slice missing slice discs".

Abstract: *Nearly 60 years ago Barry Mazur proved that smooth 3-spheres in the 4-sphere bound topological 4-balls to each side. (Actually, he proved a much more general result.) Conjecturally such spheres bound smooth 4-balls. Using his remarkable argument we will outline a reduction of this conjecture to one involving slice missing slice discs in certain 4-manifolds.*

10:30-11:00 Break

11:00-12:00 SARAH KOCH (UNIVERSITY OF MICHIGAN)

Title: "Dynamical data: Roots of polynomials and moduli spaces"

Abstract: *In his last paper, Entropy in Dimension One, William Thurston completely characterized which algebraic integers arise as $\exp(\text{entropy}(f))$, where f is a postcritically finite real map of a closed interval. (A map is called "postcritically finite" if all of its critical points are eventually periodic under iteration). On page 1 of this paper, there is a spectacular image of a subset of the complex plane comprised of roots of polynomials which come from entropy values associated to the dynamics of quadratic polynomials. This set displays some amazing fractal structure which can be (somewhat) understood when viewed as a distinguished subset of parameter space for a particular dynamical system. In this talk, we will investigate the structure of other distinguished subsets in moduli spaces arising from dynamically-defined collections of polynomials. These projects (and some others!) were directly inspired by reading Thurston's article in the "reading group" I organized at Harvard as a BP.*

12:00-2:00 Lunch

2:00-3:00 HIRO TANAKA (HARVARD UNIVERSITY)

Title: "How Lagrangian cobordisms should recover Floer Theory"

Abstract: *"Floer theory" is about as important to symplectic geometry as "coherent sheaves" are to algebraic geometry. (The most salient illustration of this principle is Kontsevich's mirror symmetry conjecture.) And in the last couple of decades, many symplectic geometers have come to suspect that a particular class of symplectic manifolds should admit purely topological characterizations of their Floer theory; in particular, the usually complicated data coming from J-holomorphic PDEs should boil down to basic topological ingredients. In this talk, we'll talk about a road map to realizing this suspicion in a somewhat surprising way: through the homotopy theory of Lagrangian cobordisms.*

3:00-3:30 Break

3:30-4:30 WILLIAM STEIN (UNIVERSITY OF WASHINGTON)

Title: "The origins of Sage- a viable open source alternative to Magma, Maple, Mathematica, and Matlab."

Abstract: *As a BP at Harvard in 2005, I created interactive web pages to let my students use Magma to compute with elliptic curves and modular forms. I then received the following email: "This is to formally advise you that your permission to run a general-purpose calculator based on Magma expires on Dec 31." That email changed my life. In my talk, I will describe why I founded Sage, what has happened in the last decade, and where Sage is headed in the future.*

6:00PM Dinner at the Loeb House

SUNDAY, JUNE 12

Refreshments 9:00-9:30

9:30-10:30 MATT BAKER (GEORGIA INSTITUTE OF TECHNOLOGY)

Title: "The secret life of graphs"

Abstract: *While a BP at Harvard, I first learned (from Joe Harris) about Castelnuovo's brilliant insight that one could establish certain properties of a general smooth curve by degenerating to singular curves. I also first heard (from Richard Taylor) about Berkovich's amazing theory of non-Archimedean analytic spaces and (from Laura DeMarco) about the use of potential theory in complex dynamics. All three of these ideas immediately struck me as cool, but I did not realize that they were all related to one another, and certainly had no idea that each would fundamentally change the direction of my mathematical research. I will do my best to tell this story in a quasi-coherent way, with something I learned in high school (Kirchhoff's laws for electrical networks) as a unifying theme.*

10:30-11:00 Break

11:00-12:00 ANDREW WILES (UNIVERSITY OF OXFORD)

Title: "Modular curves and Elliptic curves."

Abstract: *On arriving as a B.P. at Harvard I studied Barry Mazur's paper 'Modular curves and the Eisenstein Ideal' which was in press at the time. I will talk about the influence of this paper both in our subsequent collaboration and in my own work.*