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A Journey through Projective and Birational Geometry.

Together with Marco Andreatta

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Scientific Committee:

Edoardo Ballico (Università di Trento)
Claudio Fontanari (Università di Trento)
Roberto Pignatelli (Università di Trento)
Luis E. Solá Conde (Università di Trento)

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BOOK OF ABSTRACTS

LECTURES

Fano 4-folds with rational fibrations

Cinzia Casagrande

Università di Torino

Smooth, complex Fano 4-folds are not classified, and we still lack a good understanding of their general properties. We will focus on Fano 4-folds with large second Betti number b_2, studied via birational geometry and the detailed study of their contractions and flips. In the first part of the talk we will give an overview of the background and techniques, and we will present the following result: let X be a Fano 4-fold having a rational contraction $X --> Y$ of fiber type (with $dim Y > 0$). Then either $b_2(X)$ is at most 18 (with equality only if X is product of surfaces), or Y is P^1 or P^2. In the second part of the talk we will explain the strategy and the tools used in the proof.

Minimal Model Program for foliations

Paolo Cascini

Imperial College London

I will discuss some recent results on the study of the birational geometry of foliations over complex projective threefolds.

Joint work with C. Spicer.

Hypersurfaces in Abelian Varieties : Moduli spaces and canonical maps

Fabrizio Catanese

Universität Bayreuth

I shall mostly consider in my talk ample and smooth hypersurfaces X contained in an Abelian variety A, and investigate the open set of the moduli space of compact complex manifolds X' with ample canonical bundle which are topologically equivalent to X (this case is a special one of the more general investigation of Inoue type Varieties, initiated in joint work with Ingrid Bauer).

I shall show how recent joint work with Yongnam Lee on deformation to hypersurface embeddings, describes a connected component of the moduli space.

The classical theorem of Lefschetz gives sufficient conditions for the very ampleness of the linear system $|X|$ on A, e.g. that the polarization is divisible by 3. Since the canonical divisor K_X of X is X restricted to X, we obtain very ampleness of the canonical system in the Lefschetz range.

As a consequence of the embedding obstructions (given by Severis double point formulae), K_X cannot be very ample unless its dimension is at least $2n + 1$, where $n = dimX$. This can be translated into an inequality for the Pfaffian p of the Chern form of the divisor X, $p >= n + 2$.

By a theorem of Ran, the canonical map of X is a finite map, and I will present several steps towards the proof of the

Conjecture 1: Unless we have a principal polarization, then for general (A, X) the canonical map is birational onto its image.

Cesarano, in his Ph D Thesis, proved the very ampleness for a general (A, X) in case of a polarization of type $(1, 2, 2)$. His results motivates the following

Conjecture 2: if $p >= n + 2$, then for general (A, X) the canonical map is an embedding.

Curves on Enriques surfaces

CIRO CILIBERTO

Università di Roma "Tor Vergata"

In this talk I will discuss some irreducibility and some moduli problems for families of curves on Enriques surfaces. This is related with the existence of so called Enriques-Fano 3-folds, i.e., 3-folds with general hyperplane section an Enriques surface. This is work in progress in collaboration with Th. Dedieu, C. Galati, A. Knutsen.

Kobayashi and Green-Griffiths conjectures for hyperbolic algebraic varieties

JEAN-PIERRE DEMAILLY

Université Grenoble Alpes

We will discuss a few results around the Kobayashi and Green-Griffiths conjectures. Especially, we will present recent results providing improved degree bounds for the solution of the Kobayashi conjecture on generic algebraic hypersurfaces of projective space.

On the Cremona equivalence

MASSIMILIANO MELLA

Università di Ferrara

Two birational subvarieties of P^n are called Cremona equivalent if there is a Cremona modification of P^n mapping one to the other. In the lecture I will introduce the topic and report the state of the art together with examples and connections with rationality conjectures. I will then concentrate on the case of surfaces in P^3 studying general projections of smooth surfaces in the projective space.

Uniform bundles

GIANLUCA OCCHETTA

Università di Trento

In the first part of the talk I will review classical results concerning uniform vector bundles on the projective space and their extension to other Fano manifolds. I will then introduce the notion of flag bundle and uniform flag bundle, and discuss some results and conjectures on the splitting of such bundles. This is part of a joint work with Roberto Munoz and Luis E. Solá Conde.

The distance function from a real algebraic variety

GIORGIO MARIA OTTAVIANI

Università di Firenze

The Euclidean distance function from a real algebraic variety X can be computed as the smallest positive real root of an algebraic function. Cayley computed this function for smooth conics, the general case is far more challenging. When X is the hypersurface given by the symmetric determinant, the function is the characteristic polynomial. Having in mind applications to the spectral theory of tensors, we show a duality property of this function and we describe its lowest and highest coefficient. the main properties depend on transversality with the isotropic quadric.

The eventual paracanonical map

RITA PARDINI

Università di Pisa

I will describe the construction of the eventual map associated to a line bundle L on a variety X of maximal Albanese dimension and discuss in detail the case when X is of general type an L is (a multiple of) the canonical bundle.

This is joint work with M.A. Barja and L. Stoppino.

On the boundedness of minimal models of general type

LUCA TASIN

Universität Bonn

The question whether a class of varieties with fixed invariants form a bounded family is a crucial problem in algebraic geometry. In this talk I will report on such question from the point of view of Mori theory. In particular, in a joint work with D. Martinelli and S. Schreieder we treated the case of log minimal models of general type. I will also explain related results on the number of minimal models.

Coble cubics, genus 10 Fano threefolds and the theta map

ALESSANDRO VERRA

Università di Roma Tre

The talk deals with the relations between two different moduli spaces. From one side the branch divisor B is considered for the theta map of the moduli of semistable rank r vector bundles with trivial determinant on a genus 2 curve C. Special attention is payed to the case $r = 3$. Then B is the sextic dual to the Coble cubic, the unique cubic hypersurface singular along the Jacobian JC embedded by its 3-theta linear system. From the other side the moduli space of Fano threefolds X of genus 10 is considered. Since the intermediate Jacobian of X is JC, for a given genus 2 curve C, the assignement $X --- > C$ defines a rational map $f : F --- > M$, M being the moduli space of genus 2 curves. Relying on a suitable description of the ramification divisor of the theta map, a description of f and of its fibres is outlined. The main result is that the fibres of f are naturally birational to the Coble cubic defined by JC.

This is a joint work in progress with Daniele Faenzi.

Manifolds with torus action: AM vs FM technology

JAROSLAW A. WISNIEWSKI

University of Warsaw

Amplitude Modulation (AM) and Frequency Modulation (FM) are two different technologies of broadcasting radio signals. AM works by modulating the amplitude of the signal with constant frequency. In FM technology the information is encoded by varying the frequency of the wave with amplitude being constant. Given a complex projective variety X with an ample line bundle L and an action of an algebraic torus we can study it in two complementary ways: (1) by examining amplitude of L on curves on X (AM technology) and (2) by understanding weights of a linearization of L on fixed point components of the action of the torus (FM technology).

LIST OF PARTICIPANTS

Marco ANDREATTA, Dipartimento di Matematica, Università di Trento, Via Sommarive 14, Povo, 38123 TRENTO, (Italy). marco.andreatta@unitn.it

Martina ANELLI, Dipartimento di Matematica e Informatica, Università della Calabria, Via P. Bucci Cubo 30B, 87036 ARCAVACATA DI RENDE (CS), (Italy). anelli@mat.unical.it

Edoardo BALLICO, Dipartimento di Matematica, Università di Trento, Via Sommarive 14, Povo, 38123 TRENTO, (Italy). edoardo.ballico@unitn.it

Ingrid BAUER, Mathematisches Institut, Universität Bayreuth, Universitätsstrasse 30, D-95447 BAYREUTH, (Germany). ingrid.bauer@uni-bayreuth.de

Alessandra BERNARDI, Dipartimento di Matematica, Università di Trento, Via Sommarive 14, Povo, 38123 TRENTO, (Italy). alessandra.bernardi@unitn.it

Ada BORALEVI, Dipartimento di Scienze Matematiche, Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129 TORINO, (Italy). ada.boralevi@polito.it

Ugo BRUZZO, SISSA, Via Bonomea 265, 34136 TRIESTE, (Italy). bruzzo@sissa.it

Nicola CANCIAN, Dipartimento di Matematica, Università di Trento, Via Sommarive 14, Povo, 38123 TRENTO, (Italy). nicola.cancian@unitn.it

Cinzia CASAGRANDE, Dipartimento di Matematica, Università di Torino, Via Carlo Alberto 10, 10123 TORINO, (Italy). cinzia.casagrande@unito.it

Paolo CASCINI, Mathematics Department, Imperial College London, Huxley Building, LONDON SW7 2AZ (UK). p.cascini@imperial.ac.uk

Gianfranco CASNATI, Dipartimento di Scienze Matematiche, Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129 TORINO, (Italy). gianfranco.casnati@gmail.com

Fabrizio CATANESE, Mathematisches Institut, Universität Bayreuth, Universitätsstrasse 30, D-95447 BAYREUTH, (Germany). fabrizio.catanese@uni-bayreuth.de

Warren CATTANI, Dipartimento di Matematica e Geoscienze, Università di Trieste, Via A. Valerio 12/1, 34127 TRIESTE, (Italy). warren.cattani@gmail.com

Ciro CILIBERTO, Dipartimento di Matematica, Università di Roma "Tor Vergata", Via della Ricerca Scientifica 1, 00133 ROMA, (Italy). cilibert@axp.mat.uniroma2.it

Stephen COUGHLAN, Mathematisches Institut, Universität Bayreuth, Universitätsstrasse 30, D-95447 BAYREUTH, (Germany). stephen.coughlan@uni-bayreuth.de

Thomas DEDIEU, Institut de Mathématiques de Toulouse, Université Paul Sabatier, F-31062 TOULOUSE Cedex 9, (France). thomas.dedieu@math.univ-toulouse.fr

Claudia DE LAZZARI, Dipartimento di Matematica, Università di Trento, Via Sommarive 14, Povo, 38123 TRENTO, (Italy). claudia.delazzari@unitn.it

Jean-Pierre DEMAILLY, Institut Fourier, Laboratoire de Mathématiques, Université Grenoble Alpes, UMR 5582 du CNRS, 100 rue des Maths, 38610 GIERES, (France). jean-pierre.demailly@univ-grenoble-alpes.fr

Filippo FAVALE, Dipartimento di Matematica e Applicazioni, Università di Milano Bicocca, Via Roberto Cozzi 55, 20125 MILANO, (Italy). filippo.favale@gmail.com

Eugenia FERRARI, Department of Mathematics, University of Bergen, Postboks 7800, N-5020 BERGEN, (Norway). eugenia.ferrari@uib.no

Flaminio FLAMINI, Dipartimento di Matematica, Università di Roma "Tor Vergata", Via della Ricerca Scientifica 1, 00133 ROMA, (Italy). flamini@axp.mat.uniroma2.it

Claudio FONTANARI, Dipartimento di Matematica, Università di Trento, Via Sommarive 14, Povo, 38123 TRENTO, (Italy). claudio.fontanari@unitn.it

Mauro FORTUNA, Institut of Algebraic Geometry, Gottfried Wilhelm Leibniz Universität Hannover, Welfengarten 1, 30167 HANNOVER, (Germany). fortuna@math.uni-hannover.de

Davide FRAPPORTI, Mathematisches Institut, Universität Bayreuth, Universitätsstrasse 30, D-95447 BAYREUTH, (Germany). davide.frapporti@uni-bayreuth.de

Paola FREDIANI, Dipartimento di Matematica, Università di Pavia, Via Ferrata 5, 27100 PAVIA, (Italy). paola.frediani@unipv.it

Mattia GALEOTTI, Dipartimento di Matematica, Università di Trento, Via Sommarive 14, Povo, 38123 TRENTO, (Italy). mattia.galeotti@unitn.it

Alessandro GHIGI, Dipartimento di Matematica, Università di Pavia, Via Ferrata 5, 27100 PAVIA, (Italy). alessandro.ghigi@unipv.it

Christian GLEISSNER, Mathematisches Institut, Universität Bayreuth, Universitätsstrasse 30, D-95447 BAYREUTH, (Germany). christian.gleissner@uni-bayreuth.de

Giovanni INCHIOSTRO, Department of Mathematics, Brown University, 019 Kassar House, Box 1917, 151 Thayer Street, PROVIDENCE, RI02912, (USA). giovanni_inchiostro@brown.edu

Antonio LANTERI, Dipartimento di Matematica "F. Enriques", Università di Milano, Via C. Saldini 50, 20133 MILANO, (Italy). antonio.lanteri@unimi.it

Paolo LELLA, Dipartimento di Matematica, Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 MILANO, (Italy). paolo.lella@polimi.it

Michael LÖNNE, Mathematisches Institut, Universität Bayreuth, Universitätsstrasse 30, D-95447 BAYREUTH, (Germany). michael.loenne@uni-bayreuth.de

Pedro MACIAS MARQUES, Departamento de Matemática, Universidade de Évora, Rua Romao Ramalho 59, P-7000-671, ÉVORA, (Portugal). pmm@uevora.pt

Vincenzo MARTELLO, Dipartimento di Matematica e Informatica, Università della Calabria, Via P. Bucci Cubo 30B, 87036 ARCAVACATA DI RENDE (CS), (Italy). v.martello@mat.unical.it

Diletta MARTINELLI, School of Mathematics, University of Edinburgh, EDINBURGH EH9 3FD, (Scotland). diletta.martinelli@ed.ac.uk

Massimiliano MELLA, Dipartimento di Matematica e Informatica, Università di Ferrara, Via Machiavelli 30, 44121 FERRARA, (Italy). mll@unife.it

Giacomo MEZZEDIMI, Institut of Algebraic Geometry, Gottfried Wilhelm Leibniz Universität Hannover, Welfengarten 1, 30167 HANNOVER, (Germany). mezzedimi@math.uni-hannover.de

Emilia MEZZETTI, Dipartimento di Matematica e Geoscienze, Università di Trieste, Via A. Valerio 12/1, 34127 TRIESTE, (Italy). mezzette@units.it

Gianluca OCCHETTA, Dipartimento di Matematica, Università di Trento, Via Sommarive 14, Povo, 38123 TRENTO, (Italy). gianluca.occhetta@unitn.it

Giorgio OTTAVIANI, Dipartimento di Matematica e Informatica "U. Dini", Università di Firenze, Viale Morgagni 67/A, 50134 FIRENZE, (Italy). ottavian@math.unifi.it

Rita PARDINI, Dipartimento di Matematica, Università di Pisa, Largo B. Pontecorvo 5, 56127 PISA, (Italy). rita.pardini@unipi.it

Roberto PIGNATELLI, Dipartimento di Matematica, Università di Trento, Via Sommarive 14, Povo, 38123 TRENTO, (Italy). roberto.pignatelli@unitn.it

Gian Pietro PIROLA, Dipartimento di Matematica, Università di Pavia, Via Ferrata 5, 27100 PAVIA, (Italy). gianpietro.pirola@unipv.it

Eleonora Anna ROMANO, Institute of Mathematics, University of Warsaw, 02-097 Warsaw, (Poland). eleonoraanna.romano@unito.it

Michele ROSSI, Dipartimento di Matematica, Università di Torino, Via Carlo Alberto 10, 10123 TORINO, (Italy). michele.rossi@unito.it

Pierpaola SANTARSIERO, Dipartimento di Matematica, Università di Trento, Via Sommarive 14, Povo, 38123 TRENTO, (Italy). p.santarsiero-1@unitn.it

Enrico SCHLESINGER, Dipartimento di Matematica, Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133 MILANO, (Italy). enrico.schlesinger@polimi.it

Edoardo SERNESI, Dipartimento di Matematica e Fisica, Università di Roma Tre, Largo San Leonardo Murialdo 1, 00146 ROMA, (Italy). sernesi@gmail.com

Robert SMIECH, Institute of Mathematics, University of Warsaw, 02-097 WARSAW, (Poland). r.smiech@mimuw.edu.pl

Luis E. SOLA' CONDE, Dipartimento di Matematica, Università di Trento, Via Sommarive 14, Povo, 38123 TRENTO, (Italy). eduardo.solaconde@unitn.it

Paola SUPINO, Dipartimento di Matematica e Fisica, Università di Roma Tre, Largo San Leonardo Murialdo 1, 00146 ROMA, (Italy). paola.supino@uniroma3.it

Roberto SVALDI, DPMMS, Centre for Mathematical Sciences, University of Cambridge, Wilberforce Road, CAMBRIDGE CB3 0WB, (UK). rsvaldi@dpmms.cam.ac.uk

Luca TASIN, Mathematisches Institut, Universität Bonn, Endenicher Allee 60, D-53115 BONN, (Germany). luca.tasin@gmail.com

Daniele TAUFER, Dipartimento di Matematica, Università di Trento, Via Sommarive 14, Povo, 38123 TRENTO, (Italy). daniele.taufer@unitn.it

Cristina TURRINI, Dipartimento di Matematica "F. Enriques", Università di Milano, Via C. Saldini 50, 20133 MILANO, (Italy). cristina.turrini@unimi.it

Alessandro VERRA, Dipartimento di Matematica e Fisica, Università di Roma Tre, Largo San Leonardo Murialdo 1, 00146 ROMA, (Italy). sandro.verra@gmail.com

Jaroslaw A. WISNIEWSKI, Institute of Mathematics, University of Warsaw, 02-097 WARSAW, (Poland). jarekw@mimuw.edu.pl

Natascia ZANGANI, Dipartimento di Matematica, Università di Trento, Via Sommarive 14, Povo, 38123 TRENTO, (Italy). natasciazangani@gmail.com

Angelina ZHENG, Dipartimento di Matematica, Università di Padova, Via Trieste 63, 35121 PADOVA, (Italy). zheng@math.unipd.it