

# Program of the Mathematische Arbeitstagung 2015

## Fri, 26 Jun 2015

- 14:00 - 15:30      *Registration/Mathematische Arbeitstagung 2015*
- 15:30 - 16:15      MPIM Lecture Hall  
*Opening and first program discussion*
- 16:15 - 17:00      MPIM Tea Room  
*Tea*
- 17:00 - 18:00      MPIM Lecture Hall  
RICHARD THOMAS  
*The MNOP conjecture*

## Sat, 27 Jun 2015

- 09:30 - 10:30      MPIM Lecture Hall  
ANTON ZORICH  
*Volumes of moduli spaces in counting simple closed geodesics on flat surfaces, and in measuring diffusion in periodic billiards. Part 1*
- 10:30 - 11:00      MPIM Tea Room  
*Tea*
- 11:00 - 12:00      MPIM Lecture Hall  
MOTOHICO MULASE  
*The topological recursion – an inductive mechanism of counting on the moduli of curves. Part 1*
- 12:00 - 14:30      *Lunch break*
- 14:30 - 15:30      MPIM Lecture Hall  
GAVRIL FARKAS  
*The uniformization of  $\mathcal{A}_6$*
- 15:30 - 16:00      MPIM Tea Room  
*Tea*
- 16:00 - 17:00      MPIM Lecture Hall  
BENJAMIN MATSCHKE  
*S-unit and Mordell equations via modularity*

## Sun, 28 Jun 2015

- 09:30 - 10:30 MPIM Lecture Hall  
RAHUL PANDHARIPANDE  
*Cycles on the moduli space of curves. Part 1*
- 10:30 - 11:00 MPIM Tea Room  
*Tea*
- 11:00 - 12:00 MPIM Lecture Hall  
HANNAH MARKWIG  
*Tropical counting problems on moduli spaces*
- 12:00 - 14:30 *Lunch break*
- 14:30 - 15:30 MPIM Lecture Hall  
ANTON ZORICH  
*Volumes of moduli spaces in counting simple closed geodesics on flat surfaces, and in measuring diffusion in periodic billiards. Part 2*
- 15:30 - 16:00 MPIM Tea Room  
*Tea*
- 16:00 - 17:00 MPIM Lecture Hall  
VASILY GOLYSHEV  
*Mirror symmetry out of Fano varieties*
- 19:00 - 22:00 University Club Bonn  
*Rector's reception, Universitätsclub, Konviktstraße 9*

## Mon, 29 Jun 2015

- 09:30 - 10:30 MPIM Lecture Hall  
RAHU PANDHARIPANDE  
*Cycles on the moduli space of curves. Part 2*
- 10:30 - 11:00 MPIM Tea Room  
*Tea*
- 11:00 - 11:15 MPIM Lecture Hall  
*Second program discussion*
- 11:15 - 12:15 MPIM Lecture Hall  
ANTON ZORICH  
*Volumes of moduli spaces in counting simple closed geodesics on flat surfaces, and in measuring diffusion in periodic billiards. Part 3*
- 12:15 - 14:30 *Lunch break*
- 14:30 - 15:30 MPIM Lecture Hall  
MARTIN WESTERHOLT-RAUM  
*Jacobi forms and topological strings*
- 15:30 - 16:00 MPIM Tea Room  
*Tea*
- 16:00 - 17:00 MPIM Lecture Hall  
MOTOHICO MULASE  
*The topological recursion – an inductive mechanism of counting on the moduli of curves. Part 2*

## **Tue, 30 Jun 2015**

- 09:30 - 10:30 MPIM Lecture Hall  
ALEX ESKIN  
*Covers of elliptic curves and quasimodular forms. Part 1*
- 10:30 - 11:00 MPIM Tea Room  
*Tea*
- 11:00 - 12:00 MPIM Lecture Hall  
SIMION FILIP  
*Geometry of Teichmüller space*
- 13:00 - 19:00 *Boat trip*

## **Wed, 01 Jul 2015**

- 09:30 - 10:30 MPIM Lecture Hall  
GAETAN BOROT  
*Modular functors, cohomological field theories, and topological recursion*
- 10:30 - 11:00 MPIM Tea Room  
*Tea*
- 11:00 - 11:15 MPIM Lecture Hall  
*Third program discussion*
- 11:15 - 12:15 MPIM Lecture Hall  
ALEX ESKIN  
*Covers of elliptic curves and quasimodular forms. Part 2*
- 12:15 - 14:30 *Lunch break*
- 14:30 - 15:30 MPIM Lecture Hall  
MISHA VERBITSKY  
*Ergodic actions on the moduli of complex structures*
- 15:30 - 16:00 MPIM Tea Room  
*Tea*
- 16:00 - 17:00 MPIM Lecture Hall  
GREGOR MASBAUM  
*Quantum representations of mapping class groups*

## Thu, 02 Jul 2015

- 09:30 - 10:30 MPIM Lecture Hall  
DAN PETERSEN  
*Tautological vs. non-tautological classes*
- 10:30 - 11:00 MPIM Tea Room  
*Tea*
- 11:00 - 12:00 MPIM Lecture Hall  
CLÉMENT DUPONT  
*Combinatorial Hopf algebras and hyperplane arrangements*
- 12:00 - 14:30 *Lunch break*
- 14:30 - 15:30 MPIM Lecture Hall  
SIMON ROSE  
*Gromov-Witten invariants and quasimodular forms*
- 15:30 - 16:00 MPIM Tea Room  
*Tea*
- 16:00 - 17:00 MPIM Lecture Hall  
SAMUEL GRUSHEVSKY  
*Period maps for cubic 3-folds*

## Fri, 03 Jul 2015

- 09:30 - 10:30 MPIM Lecture Hall  
GRIGORY MIKHALKIN  
*Refined enumeration of real rational curves*
- 10:30 - 11:30 MPIM Tea Room  
*Tea*
- 11:30 - 12:30 MPIM Lecture Hall  
YURI MANIN  
*Iterated integrals of modular forms*

# Mathematische Arbeitstagung 2015

## Titles and abstracts of talks

RICHARD THOMAS

### **The MNOP conjecture**

I will review the Maulik-Nekrasov-Okounkov-Pandharipande conjecture, relating two different ways of counting curves in an algebraic variety  $X$  of dimension 3 or less. The first counts holomorphic maps of curves into  $X$ , or parameterised curves, and gives Gromov-Witten theory. The second counts embedded curves in  $X$  cut out by equations, or unparameterised curves, and is called stable pair theory. The conjecture is that these theories contain the same information, but with a complicated, mysterious transformation between the two sets of invariants. I will describe an application, and the recent proof of MNOP for most Calabi-Yau 3-folds  $X$  by Pandharipande-Pixton.

ANTON ZORICH

### **Volumes of moduli spaces in counting simple closed geodesics on flat surfaces, and in measuring diffusion in periodic billiards. Part 1**

MOTOHICO MULASE

### **The topological recursion – an inductive mechanism of counting on the moduli of curves. Part 1**

In these lectures, the notion of the topological recursion is introduced through enumerative geometry problems, such as counting simple Hurwitz numbers and the number of lattice points on the moduli space of pointed curves.

GAVRIL FARKAS

### **The uniformization of $\mathcal{A}_6$**

BENJAMIN MATSCHKE

### **$S$ -unit and Mordell equations via modularity**

RAHUL PANDHARIPANDE

### **Cycles on the moduli space of curves. Part 1**

I will give two lectures on the intersection theory of the moduli space of curves: tautological classes, relations, integral calculus, and cycle formulas. The role of the virtual fundamental class of the moduli of stable maps will be highlighted. In the second lecture, I will discuss the recent proof of Pixton's formula for double ramification cycles (joint work with Janda, Pixton, and Zvonkine).

HANNAH MARKWIG

### **Tropical counting problems on moduli spaces**

ANTON ZORICH

### **Volumes of moduli spaces in counting simple closed geodesics on flat surfaces, and in measuring diffusion in periodic billiards. Part 2**

VASILY GOLYSHEV

### **Mirror symmetry out of Fano varieties**

RAHU PANDHARIPANDE

**Cycles on the moduli space of curves. Part 2**

I will give two lectures on the intersection theory of the moduli space of curves: tautological classes, relations, integral calculus, and cycle formulas. The role of the virtual fundamental class of the moduli of stable maps will be highlighted. In the second lecture, I will discuss the recent proof of Pixton's formula for double ramification cycles (joint work with Janda, Pixton, and Zvonkine).

ANTON ZORICH

**Volumes of moduli spaces in counting simple closed geodesics on flat surfaces, and in measuring diffusion in periodic billiards. Part 3**

MARTIN WESTERHOLT-RAUM

**Jacobi forms and topological strings**

MOTOHICO MULASE

**The topological recursion – an inductive mechanism of counting on the moduli of curves. Part 2**

In these lectures, the notion of the topological recursion is introduced through enumerative geometry problems, such as counting simple Hurwitz numbers and the number of lattice points on the moduli space of pointed curves.

ALEX ESKIN

**Covers of elliptic curves and quasimodular forms. Part 1**

SIMION FILIP

**Geometry of Teichmüller space**

GAETAN BOROT

**Modular functors, cohomological field theories, and topological recursion**

ALEX ESKIN

**Covers of elliptic curves and quasimodular forms. Part 2**

MISHA VERBITSKY

**Ergodic actions on the moduli of complex structures**

GREGOR MASBAUM

**Quantum representations of mapping class groups**

DAN PETERSEN

**Tautological vs. non-tautological classes**

CLÉMENT DUPONT

**Combinatorial Hopf algebras and hyperplane arrangements**

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**Period maps for cubic 3-folds**

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**Refined enumeration of real rational curves**

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**Iterated integrals of modular forms**