Centro di Ricerca Matematica "Ennio De Giorgi"
Intensive research period
Configuration Spaces: Geometry, Combinatorics and Topology

Weekly seminars
May-June, 2010

List of talks:

(This list is still provisional. We plan to schedule at least two talks each week, usually on Wednesday.)

☞ Every week, before the 17:30 seminar there will always be a <u>coffee break</u> starting at <u>17:00</u>.

Anders Björner: *A correlation inequality with applications in algebraic combinatorics*
MAY 5TH, 16:00 - 17:00, SALA CONFERENZE

Ryan Budney: *A universal algebra for (spaces of) knots*
MAY 12TH, 16:00 - 17:00, SALA CONFERENZE

Ivan Marin: *Residual nilpotence for the fundamental group of reflection arrangements*
MAY 19TH, 17:30 - 18:30, SALA CONFERENZE

Fred Cohen: *The space of commuting n-tuples in a topogical group*
JUNE 1ST, 16:00 - 17:00, AULA DINI

Tony Bahri: *On the KO-theory of toric spaces*
JUNE 9TH, 16:00 - 17:00, AULA DINI

Tadeusz Januszkiewicz: *Cohomology with coefficients in $\mathbb{Z}G$ or $I^2(G)$ of some spaces related to hyperplane arrangements*
JUNE 9TH, 17:30 - 18:30, AULA DINI

Paolo Salvatore: *Configuration spaces and the Levitt conjecture*
JUNE 16TH, 16:00 - 17:00, AULA DINI

Stefan Papadima: *From a conjecture of Lang to finiteness properties of Torelli groups*
JUNE 16TH, 17:30 - 18:30, AULA DINI

last update: June 7, 2010

Abstracts:

Anders Björner   List of talks

Royal Institute of Technology (KTH) and Mittag-Leffler Institute, Stockholm
A correlation inequality with applications in algebraic combinatorics
(May 5th, 16:00 - 17:00, Sala Conferenze)

The FKG inequality of Fortuin, Kasteleyn and Ginibre (1971) originated as a correlation inequality in statistical mechanics. It has many applications in discrete probability and extremal combinatorics.

In this talk we present a polynomial coefficient-wise inequality that refines the original FKG inequality. This polynomial FKG inequality has applications to f-vectors of joins of simplicial complexes, to Betti numbers of intersection of certain Schubert varieties, and to power series weighted by Young tableaux. The latter case includes a correlation inequality for Plancherel measure on integer partitions, and for its poissonization.

The talk will mostly be quite elementary and no previous familiarity with these topics will be assumed.

Ryan Budney

University of Victoria
A universal algebra for (spaces of) knots
(May 12th, 16:00 - 17:00, Sala Conferenze)

In 1949 Schubert gave the connect-sum decomposition for knots. One way to say this is that oriented smooth embeddings of S^1 in S^3 taken up to ambient isotopy form a free commutative monoid under the connect-sum operation. Alternatively, let $K_{3,1}$ denote the space of smooth embeddings of $\mathbb{R}$ in $\mathbb{R}^3$ which agree with a fixed linear embedding outside of a ball. Then $\pi_0 K_{3,1}$ is a free commutative monoid with respect to connect-sum. There is a homotopy-associative "space-level" connect-sum mapping $K_{3,1} \times K_{3,1} \to K_{3,1}$. This mapping can be enhanced to an action of the operad of 2-cubes on $K_{3,1}$ and in 2006 I showed that $K_{3,1}$ is a free object over the 2-cubes operad, with free generating subspace the space of prime knots $P \subset K_{3,1}$, i.e. an operadic space-level analogue of Schubert's theorem. In 1953 Schubert generalized the connect-sum operation, creating what are known as 'satellite knots', but unlike the connect-sum operation Schubert noticed satellite knots do not decompose in a unique way. In 1979 Larry Siebenmann noticed that Schubert's satellite constructions fit with the JSJ-decomposition of 3-manifolds, giving the appropriate uniquess statement for Schubert's satellite operation thought of as a decomposition of knots. In this talk I will describe a new operad, 'the splicing operad' which encodes splicing for knots at the 'spaces of knots' level. The main theorem is that $K_{3,1}$ is free with respect to the splicing operad's action, and the free generating subspace is the subspace of $K_{3,1}$ consisting of torus and hyperbolic knots. The splicing operad itself also has a pleasant structure as an operad, although it's not quite free.
The slides of this talk are available here.

Ivan Marin

Institut de Mathématiques de Jussieu, Université Paris 7
Residual nilpotence for the fundamental group of reflection arrangements
(May 19th, 17:30 - 18:30, Sala Conferenze)

Residual torsion-free nilpotence is the strongest of the usual residual properties which can be expected to hold for the fundamental group of the complement of an arbitrary hyperplane arrangement. Is is known to hold for supersolvable or fiber-type arrangements thanks to the work of Falk and Randell. This case includes the most standard reflection arrangements, but leaves open the case of many others. I will present advances and evidences toward a positive answer to the general problem, in the case of reflection arrangements.

Fred Cohen
University of Rochester
The space of commuting n-tuples in a topogical group
(June 1st, 16:00 - 17:00, Aula Dini)

The space of commuting n-tuples in a topogical group G for all n are assembled into a single topogical space analogous to the classifying space of the group G. Features of these spaces, similar to arrangements, as well as elementary questions about their homology are developed. One problem is to find the first homology group in case G is finite and of odd order (a hard homework problem). This talk is based on joint work with A. Adem, E. Torres-Giese, and J. Gomez.

Tony Bahri
Rider University, Lawrenceville, NJ, USA
On the KO-theory of toric spaces
(June 9th, 16:00 - 17:00, Aula Dini)

Central in toric geometry and topology are several important spaces which include moment-angle complexes, the Davis-Januszkiewicz space and toric manifolds. In any complex-oriented cohomology theory, the cohomology rings of many of these spaces have elegant descriptions in terms of the underlying combinatorics. For KO-theory however the situation is more complex. Even so, a surprising amount of the structure does survive from the complex-oriented case. A report of recent joint work with:Luis Astey, Martin Bendersky, Fred Cohen, Don Davis, Sam Gitler, Mark Mahowald, Nigel Ray and Reg Wood.

Tadeusz Januszkiewicz
The Ohio State University
Cohomology with coefficients in $\mathbb{Z}G$ or $I^2(G)$ of some spaces related to hyperplane arrangements
(June 9th, 17:30 - 18:30, Aula Dini)

I will show how to compute groups in the title for hyperplane arrangement complex and related spaces groups Artin, Bestvina-Brady graph products, and time permitting buildings. This last class is closely related to moment-angle complexes. The talk is based on a paper of M.Davis and B.Okun and related joint-work with D., O., Dymara, Leary and Meier.

Paolo Salvatore
Università di Roma 2 - Tor Vergata
Configuration spaces and the Levitt conjecture
(June 16th, 16:00 - 17:00, Aula Dini)

Stefan Papadima
Institute of Mathematics "Simion Stoilow" of the Romanian Academy, Bucharest
From a conjecture of Lang to finiteness properties of Torelli groups
(June 16th, 17:30 - 18:30, Aula Dini)

I will discuss several surprising finiteness properties for various subgroups of the Torelli groups, in relation with a conjecture of S. Lang in diophantine geometry, proved by M. Laurent in 1984 (joint work with Alex Dimca).

Location

All the seminars will take place in Sala Conferenze, inside Collegio Puteano (number 2 in the map below) or in Aula Dini, inside Palazzo del Castelletto (number 1 in the map below). Look also at `http://www.crm.sns.it/hpp/practical/maps.html`.

Table 1: Map with the location of Palazzo del Castelletto (number 1) and Collegio Puteano (number 2)