BEIJING PROGRAM ON ALGEBRAIC TOPOLOGY 2009

May 18–30, 2009

FANG FUQUAN

TITLE: Topology of complete intersections

GRBIC

TITLE: The homotopy theory of moment-angle complexes 5

ABSTRACT:

In recent years, toric topology has been recognised as an area of topology which has deep connections with combinatorics, algebraic and symplectic geometry, and homological algebra. The moment-angle complex, an object initially studied in algebraic geometry, has become one of the central objects of toric topology. Thus its homotopy type, stable and unstable, is of great interest. In this talk I'll explain a relation between simplicial complexes and moment-angle complexes and determine the unstable homotopy type of moment-angle complexes related to shifted complexes. In addition, I'll describe how higher Whitehead products arise in the homotopy theory of moment-angle complexes and their relations with the loop homology of Davis-Januszkiewicz spaces.

KAMEKO

TITLE: Finite Chevalley groups and loop groups

ABSTRACT:

Let p, l be distinct primes and let q be a power of p. Let G be a connected compact Lie group. I will talk about the existence of an integer b such that the (mod l) cohomology of the classifying space of a finite Chevalley group $G(F_q)$ is isomorphic to the (mod l) cohomology of the classifying space of the loop group LG for $q = p^{ab}$, $a > 0$.

KOHNO

TITLE: Homology of local systems on configuration spaces and conformal field

theory

ABSTRACT:

The space of conformal blocks is a central object in conformal field theory and is defined as a space of coinvariant tensors of integral representations of affine Lie algebras. In this talk we describe its relation to the homology of local systems on certain configuration spaces and discuss the action of the braid group on it.

LAM

TITLE: Vector fields on sphere bundles over spheres

ABSTRACT:

According to the Bott Periodicity Theorem, the reduced KO theory of the n-dimensional sphere S^n is nonzero cyclic for n congruent to $0, 1, 2$ or $4 \pmod 8$. For such n, let V be a vector bundle of minimal dimension q representing the generator of this cyclic group. For example it can be shown that $q = 6$ for all $n > 8$ congruent to 1 or 2 (mod 8). In this talk we shall address the vector field problem for the associated sphere bundle $sph(V)$, determining, in particular, the maximal number of independent vector fields admissible on such an $(n+q-1)$-dimensional manifold.

Main Contents of the Summer School Lectures:

As for my three talks on cohomology operation in the topology summer school I plan to cover the basics of this topic, starting with the construction of the Steenrod operations Sq^j, and then going on to the Adams operations in K-cohomolgy theory. Emphasis will be on the application of these operations to concrete geometry problems.

LÜ ZHI

TITLE: On the classification of equivariant manifolds

ABSTRACT:

In recent years, a new research field called "Toric Topology" is emerging. Toric Topology is not only related to Toric Geometry but also related to many other fields, such as Symplectic Geometry, Combinatorics, Algebra and so on. This new field is getting active, and can gather many different ideas and theories together. Based upon this, we shall consider the classification of equivariant manifolds; especially for the classification up to (equivariant) homeomorphism and equivariant cobordism. We shall give a necessary and sufficient condition for equivariant homeomorphism, and calculate the equivariant cobordism groups etc.

MASUDA

TITLE: Cohomological rigidity problem in toric topology

ABSTRACT:

The fundamental result in toric geometry says that there is a bijective correspondence between toric varieties and fans, and the classification of toric varieties *as varieties* reduces to that of fans. However not much is known about the topological classification of toric varieties, even for compact smooth toric varieties which we call toric manifolds, and the following problem was posed recently.

Cohomological rigidity problem for toric manifolds. *Are two toric manifolds diffeomorphic (or homeomorphic) if their cohomology rings are isomorphic as graded rings?*

In this talk I will discuss this problem and some related problems.

MURILLO

TITLE: Algebraic models of the rational homotopy type of mapping spaces

ABSTRACT:

In this talk we shall present several features of the rational homotopy type of mapping spaces and spaces of sections through the understanding of their algebraic models in different settings: Lie models, Sullivan models and L-infinity models.

THERIAULT

TITLE: The mod-p homology of the classifying space of certain gauge groups

ABSTRACT:

An interesting problem in the study of gauge groups is to calculate the homology of their classifying spaces. We do this in the case of $SU(n)$-gauge groups over S^4 and mod-p homology, with the restriction that $n <= (p-1)(p-2)$. Similar results are obtained for $Sp(n)$ and $Spin(n)$-gauge groups over S^4. The approach is to first determine appropriate homotopy theoretic properties of the spaces involved.

VIRUEL

TITLE: Massey products and classifying spaces of 2-groups

ABSTRACT:

(joint work with Albert Ruiz) Given a finite group G, it is wellknown that the cohomology algebra $H^*(G;\mathbb{F}_p)$ does not determine the isomorphism type of G, not even when the Steenrod action is taken into account. Therefore, a

cohomological characterization of finite groups needs to consider secondary operations. In this talk we shall show that if G is a maximal class 2-group, then BG (the classifying space of G), and therefore G itself, is completely determined by the cohomology algebra $H^*(G;\mathbb{F}_p)$ and its iterated Massey products. Actually:
Theorem: Let X be a 2-complete space and G be a maximal class 2-group such that there exists an abstract algebra isomorphism $\psi : H^*(G;\mathbb{F}_2) \to H^*(X;\mathbb{F}_2)$ which is compatible with iterated Massey products. Then $X \simeq BG$.

WU JIE

TITLE: Brunnian braids on Surfaces

ABSTRACT:

A Brunnian braid means a braid that becomes trivial after removing any one of its strands. In this talk, we describe a set of generators for Brunnian braids over a general surface. The general Brunnian braid groups on the sphere or projective plane are given as extension groups of certain symmetric iterated commutator subgroups of the pure braid groups and the general homotopy groups of a 2-sphere. In all rest cases, the Brunnian braid groups can be determined as certain symmetric iterated commutator subgroups and hence one can determine a set of generators for Brunnian braids in these cases. This is a joint work with V. G. Bardakov, R. Mikhailov and V. V. Vershinin.

ZHAO XUEZHI

TITLE: Uniformed treatment to periodic points and fixed points

ABSTRACT:

Any self map $f\colon X \to X$ on a topological space X induces naturally a self map $SP_n(f)$ on the symmetric product space SP_nX of X. A fixed point of $SP_n(f)$ can be decomposed into some fixed points and periodic points of f. In this way, we find a uniformed treatment to the fixed points and periodic points of any given maps. Some relations amongst them are illustrated.