Mathematisches Forschungsinstitut Oberwolfach

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New Directions in Algebraic K-Theory

Organised by
James F. Davis (Bloomington)
Christian Haesemeyer (Los Angeles)
Andrew Ranicki (Edinburgh)
Marco Schlichting (Baton Rouge/Warwick)

May 15th – May 21st, 2011

Abstract. This meeting brought together algebraic geometers, algebraic topologists and geometric topologists, all of whom use algebraic K-theory. The talks and discussions involved all the participants.

Mathematics Subject Classification (2000): 19xx.

Introduction by the Organisers

There have been dramatic advances in algebraic K-theory recently, especially in the computation and understanding of negative K-groups and of nilpotent phenomena in algebraic K-theory. Parallel advances have used remarkably different methods. Quite complete computations for the algebraic K-theory of commutative algebras over fields have been obtained using algebraic geometric techniques. On the other hand, the Farrell-Jones conjecture implies results on the K-theory for arbitrary rings. Proofs here use controlled topology and differential geometry.

Given the diversity of interests and backgrounds of the 28 participants in our mini-workshop, we encouraged everyone to make their talks accessible to a wide audience and scheduled five expository talks. The opening talk of the conference was an inspiring talk by Charles Weibel, on the work of Daniel Quillen, the creator of higher algebraic K-theory, who died at the end of April. Wolfgang Lück spoke on the Farrell-Jones conjecture. Jim Davis applied the Farrell-Jones conjecture to give a foundational result on algebraic K-theory, showing that geometric techniques have algebraic consequences for the iterated N^pK-groups. Bjorn Dundas gave a survey of trace methods on algebraic K-theory, focusing on topological

cyclic homology and his new integral homotopy cartesian square. Christian Haesemeyer gave a survey of algebraic K-theory of singularities and new techniques for computing negative K-theory and NK-theory for commutative $\mathbb{Q}$-algebras. The idea of the expository talks worked quite well; it was remarkable how many of the speakers relied on them.

The mini-workshop had a full schedule; in addition to the five expository talks there were seventeen research talks. There were computational talks (Teena Gerhardt, Charles Weibel, Daniel-Juan Pineda), foundational talks (Bruce Williams, Lars Hesselholt, Max Karoubi, Guilermo Cortiñas, Jens Hornbostel, Andrew Blumberg, Thomas Geisser), applications of ideas from K-theory to geometric topology (Ib Madsen, Frank Connolly, Qayum Khan, Ian Hambleton, Michael Weiss, Wolfgang Steimle), as well as the proof of the Farrell-Jones Conjecture for the group $SL_n(\mathbb{Z})$ (Holger Reich). The talk of Charles Weibel was notable since the topic was research done at the workshop. Weibel's talk connected and compared two different computations of the N^pK_qR groups, one done by algebraic geometry and one done by geometric topology. This was emblematic of a successful implementation of the original goal of the workshop to compare and contrast two powerful but quite distinct approaches to algebraic K-theory.

Timetable

Monday 16^{th} **May, 2011**

9:00-10:00	Chuck Weibel	*On the work of Daniel Quillen (1940-2011)*
10:15-11:05	Ib Madsen	*On the homological structure of BDiff(M)*
11:25-12:15	Bruce Williams	*K-Theory and Endomorphisms*
16:00-16:50	Teena Gerhardt	*On the algebraic K-theory of truncated polynomials in multiple variables*
17:15-18:05	Wolfgang Lück	*The Farrell-Jones conjecture and its applications*

Tuesday 17^{th} **May, 2011**

9:00-9:50	Jim Davis	*Some remarks on Nil groups in algebraic K-theory*
10:15-11:05	Bjørn Dundas	*A survey of trace methods in algebraic K-theory*
11:25-12:15	Lars Hesselholt	*Algebraic K-theory and reality*
16:00-16:50	Frank Connolly	*An equivariant rigidity theorem for certain discrete groups (Part I)*
17:15-18:05	Qayum Khan	*An equivariant rigidity theorem for certain discrete groups (Part II)*

Wednesday 18^{th} **May, 2011**

9:30-10:20	Christian Haesemeyer	*Algebraic K-theory of singularities, a survey*
11:00-11:50	Michael Weiss	*Smooth maps to the plane and Pontryagin classes*

Thursday 19^{th} **May, 2011**

9:00-10:00	Max Karoubi	*Twisted bundles and twisted K-theory*
10:15-11:05	Holger Reich	*The Farrell-Jones conjecture for $SL(n, \mathbb{Z})$*
11:25-12:15	Andrew Blumberg	*Localisation in THH of Waldhausen categories*
16:00-16:50	Chuck Weibel	*NK and N^pK of commutative algebras*
17:15-18:05	Wolfgang Steimle	*Higher Whitehead torsion and the geometric assembly map*

Friday 20^{th} **May, 2011**

9:00-9:50	Guillermo Cortiñas	*Isomorphism conjectures with proper coefficients*
10:15-11:05	Thomas Geisser	*Rational K-theory in characteristic p*
11:25-12:15	Daniel Juan-Pineda	*Algebraic K-theory of $\mathbb{Z}[\Gamma]$ for Γ the braid group of a surface*
16:00-16:50	Jens Hornbostel	*Preorientations of the derived motivic multiplicative group*
17:15-18:05	Ian Hambleton	*Cocompact discrete group actions and the assembly map*