

MATHEMATISCHES FORSCHUNGSINSTITUT OBERWOLFACH

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Mini-Workshop: Localising and Tilting in Categories

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ABSTRACT. The workshop brought together experts on localisation theory and tilting theory from different parts of mathematics with the aim of fully exploiting the power of some recent developments in so far rather independent contexts. The intensive exchange during the workshop is expected to lead to new and strengthened synergies and to new applications.

Mathematics Subject Classification (2010): primary 16xx, 18xx, secondary 13xx, 55xx, 79xx.

Introduction by the Organisers

The workshop *Localising and tilting in abelian and triangulated categories*, organised by Lidia Angeleri Hügel (Verona), Steffen Koenig (Stuttgart) and Changchang Xi (Beijing) was attended by 17 participants with a broad mathematical and geographical background. The aim was to bring together researchers from different branches of mathematics to discuss and compare recent results on localisation theory and tilting theory. In order to optimise interaction between different areas and techniques, the organisers gave the programme a precise structure and ordering to emphasize connections and point out applicability of the new results.

Historically, localisation theory has its origin in commutative algebra with the classical notions of a quotient field and of localisation of rings at prime ideals. Later on, these ring theoretic constructions were generalised to non-commutative rings and studied from a more categorical point of view, leading to a theory of localisation, first for abelian, and, more recently, for triangulated categories. Here the relevant notions are *t-structures* and *recollements*.

Localisation in abelian and triangulated categories plays an important role in many parts of mathematics. Commutative and non-commutative algebra, algebraic topology and homotopy theory, homological algebra and category theory have contributed in different and so far rather unrelated ways to better understanding localisations and to extending the scope of these methods. There are also close relations to microlocal analysis and to the study of \mathcal{D} -modules, which in turn relates to representation theory through Kazhdan-Lusztig conjectures/theorems.

Recent exciting developments link localisation theory with *tilting theory* - a fundamental branch of representation theory which allows to compare different categories of representations both in abstract and in combinatorial ways. In fact, tilting theory is undergoing a major change due to new and unexpected applications of localisation techniques. For example, localisation methods have turned out to be very useful in establishing *classification results* for tilting modules, both in commutative and in non-commutative situations.

The rapid progress in the theory during the last few years makes an exchange between researchers from different areas more necessary than ever. In fact, we believe that the impact of some of the recent developments has not been completely understood yet and can be strengthened much by combining and applying different techniques. A first step in this direction was done during the week in Oberwolfach.

A lot of attention has been devoted to the interplay between the topological and the algebraic perspective on localisation. New results in commutative algebra and algebraic geometry were intensively discussed also from the point of view of non-commutative ring theory. Recent developments in a more categorical algebraic setting were explored together with explicit and often combinatorial applications. The active and promising exchange during the workshop lays the foundation for new projects.

The positive outcome of the workshop is also due to the pleasant and well organised environment at the institute in Oberwolfach. In particular, the concept of bringing together such a small number of researchers in a mini-workshop creates an intense and almost private atmosphere, which turned out to be very productive. Finally, the active and helpful interaction between the different mini-workshops during the week should not remain unmentioned. Having parallel mini-workshops with a potential common interest proved to be a good idea.

Mini-Workshop: Localising and Tilting in Categories**Table of Contents**

Stefan Schwede	
<i>Morita theory for ring spectra</i>	1537
Bernhard Keller (joint with Sarah Scherotzke)	
<i>On Frobenius models for derived categories of Dynkin quivers</i>	1538
Jorge Vitória (joint with Frederik Marks, Alice Pavarin)	
<i>Ring epimorphisms and universal localisations</i>	1538
Frederik Marks	
<i>Universal localisations and tilting modules for finite dimensional algebras</i>	1540
Hongxing Chen and Changchang Xi	
<i>Localizations applied to tilting modules and algebraic K-theory I, II</i>	1541
Silvana Bazzoni (joint with Alice Pavarin)	
<i>Recollements of derived categories of dg algebras induced by partial tilting dg-modules</i>	1542
Pedro Nicolás (joint with Manuel Saorín)	
<i>Bimodules and triangle equivalences</i>	1543
Manuel Saorín (joint with Pedro Nicolás)	
<i>Bimodules and triangle equivalences</i>	1544
Hiroyuki Minamoto	
<i>Derived bi-duality via homotopy limit</i>	1545
Leovigildo Alonso Tarrío (joint with Ana Jeremías López, Joseph Lipman, María José Souto Salorio)	
<i>Localization and t-structures in algebraic geometry and beyond</i>	1546
Ana Jeremías López (joint with Leovigildo Alonso Tarrío, Manuel Saorín)	
<i>On t-structures associated to filtrations in schemes</i>	1548
Andrew Ranicki	
<i>Noncommutative localization from a topologist's point of view</i>	1549
Ryo Takahashi	
<i>Thick subcategories generated by Serre subcategories</i>	1550
Xiao-Wu Chen (joint with Dong Yang)	
<i>The derived category of a Leavitt path algebra</i>	1551
Manuel Saorín (joint with Lidia Angeleri-Hügel)	
<i>Resolving subcategories and t-structures over a commutative Noetherian ring</i>	1552

Jorge Vitória (joint with Chrysostomos Psaroudakis)	
<i>Recollements of module categories</i>	1553
Lidia Angeleri Hügel (joint with Steffen Koenig, Qunhua Liu, Dong Yang)	
<i>The Jordan-Hölder Theorem for derived categories</i>	1554
Steffen Koenig (joint with Lidia Angeleri Hügel, Qunhua Liu, Dong Yang)	
<i>Comparing recollements - yoga on ladders</i>	1556
Andrew Ranicki	
<i>The universal localization of triangular matrix rings</i>	1557
Ryo Takahashi (joint with Srikanth Iyengar)	
<i>Annihilation of Ext modules and generation of derived categories</i>	1557
Frederik Marks (joint with Lidia Angeleri Hügel, Jorge Vitória)	
<i>Tilting modules arising from universal localisation for hereditary rings</i> .	1558
Silvana Bazzoni (joint with Jan Stovicek)	
<i>Smashing subcategories of derived categories of rings of weak global dimension one</i>	1559