

HCM Workshop

“Interfaces of Spectral Theory, Operator Algebras and Noncommutative Geometry”

29. June - 3. July 2026

Preliminary schedule, Will be updated regularly

SCHEDULE

	Monday	Tuesday	Wednesday	Thursday	Friday	
8:30 - 9:00	Registration					
9:00 - 9:30	Invited talk: Elmar Schrohe	Invited talk: Magnus Goffeng	Invited talk: Christiane Tretter	Invited talk: Anna Skripka	Lecture series I: Katia Consani	
9:30 - 10:00						
10:00 - 10:30	Coffee/Tea break	Coffee/Tea break	Coffee/Tea break	Coffee/Tea break	Lecture series II: Alain Connes	
10:30 - 11:00	Contributed talk	Contributed talk	Contributed talk	Contributed talk		
11:00 - 11:30	Invited talk: Nadine Große	Invited talk: Batu Güneysu	Invited talk: Walter van Suijlekom	Invited talk: Hermann Schulz-Baldes	Lecture series III: Henri Moscovici	
11:30 - 12:00						
12:00 - 12:30			Contributed Talk			
12:30 - 13:00	Lunch	Lunch	Lunch + Free Afternoon	Lunch	Lunch	
13:00 - 13:30						
13:30 - 14:00						
14:00 - 14:30	Contributed Talk	Contributed Talk			Invited talk: Alexander Strohmaier	Invited talk: Thomas Schick
14:30 - 15:00	Invited talk: Bram Mesland	Celebratory remarks			Contributed talk	
15:00 - 15:30					Coffee/Tea break	
15:30 - 16:00	Contributed talk	Coffee/Tea break				
16:00 - 16:30		Colloquium talk: Walter van Suijlekom			Invited talk: Christian Bär	
16:30 - 17:00						
17:00 - 17:30						
17:30 - 18:00		Reception				
18:00 - 18:30						
18:30 - 19:00						
19:00 - open end			Dinner at Tuscolo			

INVITED TALKS, TITLES AND ABSTRACTS

Christian Bär. Thursday, 16:00–17:00

Spectral flow and the Atiyah-Patodi-Singer index theorem

We establish a formula for the spectral flow of a smooth family of twisted Dirac operators on a closed odd-dimensional Riemannian spin manifold, generalizing a result by Getzler. The spectral flow is expressed in terms of the \hat{A} -form of the manifold, the odd Chern character form of the family of connections, and the ξ -invariants of the initial and final operators. Our proof is based on a reduction to the Atiyah-Patodi-Singer index theorem for manifolds with boundary, which provides a conceptually very simple approach to the problem. As an application, we give a proof of Llarull’s rigidity theorem for scalar curvature of strictly convex hypersurfaces in Euclidean space which works the same in even and odd dimensions.

This is based on joint work with Remo Ziemke.

Alain Connes. Friday, 10:00–11:00

From Spec \mathbb{Z} to Zeta spectral triples

Here comes the abstract text...

Katia Consani. Friday, 9:00–10:00

On the absolute geometry of Spec \mathbb{Z}

Here comes the abstract text...

Magnus Goffeng. [Tuesday, 9:00–10:00](#)

Poisson transforms and the Baum-Connes conjecture

We discuss Poisson transforms for semisimple Lie groups. Our main results concern Knapp-Wallach's Szegő maps from the boundary of a symmetric space to its interior. We prove sharp mapping properties for the Szegő maps and compactness of commutators with functions on the Furstenberg boundary. The results are motivated by Julg's program to prove the Baum-Connes conjecture with coefficients in real rank one and prove the remaining open conjecture of Julg. Based on joint work with Heiko Gimperlein.

Nadine Große. [Monday, 11:00–12:00](#)

On codimension two boundary problems for Dirac operators

This is ongoing joint work with Bernd Ammann (Regensburg) and is motivated by a paper of Portman-Sok-Solovej where the Dirac operator with a magnetic flux supported on a knot in \mathbb{R}^3 was considered and where the authors made sense of this Dirac operator by introducing a boundary condition for the Dirac operator of $\mathbb{R}^3 \setminus S$, S being a Seifert surface with the knot as boundary. We wanted to understand the above as a special case of codimension 2 boundary conditions for Dirac operators. For that we deal in this talk with the special case where the manifold is a normal bundle over the codimension 2 hypersurface and where the spinor bundle has constant monodromy along the codimension 2 submanifold. We construct the right definition of a trace map in this context and classify self-adjoint boundary conditions.

Batu Güneysu. [Thursday, 16:00–17:00](#)

Here comes the title...

Here comes the abstract text...

Bram Mesland. [Thursday, 14:30–15:30](#)

A category of correspondences for spectral triples

In their work on the foliation index theorem, Connes and Skandalis showed that the KK-theory of manifolds can be described entirely by correspondences, and characterised the Kasparov product in KK-theory in terms of connections. In Connes's \mathfrak{K}^{TM} paradigm of noncommutative geometry, manifolds are replaced by spectral triples, and Baa-j-Julg put forward a definition of unbounded cycle for KK-theory. In this talk I will give a definition of correspondence of spectral triples as smooth KK-cycles equipped with a connection. Such correspondences can be composed on the nose (as opposed to up to equivalence) via the constructive unbounded Kasparov product to form a category. This category is flexible enough to accommodate natural geometric and noncommutative examples, yet rigid enough that it comes equipped with a surjective functor onto KK-theory. Matthias Lesch has been involved in various of the analytic aspects that play a role in this construction. The talk reports on unpublished work in progress.

Henri Moscovici. [Friday, 11:00–12:00](#)

Zeta determinants aligned with Zeta

Here comes the abstract text...

Thomas Schick. [Friday, 14:00–15:00](#)*Twisted (equivariant) K-theory: what, why, how*

Twisted K-theory and its equivariant version have seen numerous applications in recent years, e.g. to model certain types of charges and fields in Quantum Field Theories and to implement T-duality isomorphisms.

The talk will give a survey on models for the construction of such groups, test cases for their use, and for computation tools. In the latter case, we will focus on geometric constructions of twisted and equivariant Chern character maps.

The presentation will report among other things on recent work with Ulrich Pennig and Valentin Marr as well as Tom Dove and Mario Velasquez.

Elmar Schrohe. [Monday, 9:00–10:00](#)*Here comes the title...*

Here comes the abstract text...

Hermann Schulz-Baldes. [Thursday, 11:00–12:00](#)*Here comes the title...*

Here comes the abstract text...

Anna Skripka. [Thursday, 9:00–10:00](#)*Positivity in perturbation theory: spectral shift and BMV conjecture.*

Spectral shift theory and the Bessis–Moussa–Villani conjecture provide complementary approaches to the study of spectral variation under perturbations. The former focuses on changes in spectral data, while the latter concerns the completely monotone structure of traces of perturbed operator functions. We will present recent results on the positivity of higher-order spectral shift functions and on the BMV conjecture for operators with essential spectrum. Both rely on the positivity of traces of certain multilinear operator integrals that naturally arise in perturbation theory.

Alexander Strohmaier. [Thursday, 14:00–15:00](#)*Microlocal properties of the scattering map for the wave equation and positivity of energy*

Linear wave-type evolution equations such as the Klein–Gordon equation and the Dirac equation play a fundamental role in the description of elementary particles and are a building block for relativistic quantum field theory. Their interaction with gravity is encoded in the scattering map, that encodes how the solutions of the initial value problem depends on the metric. I will explain how this scattering map is defined mathematically and describe some of its basic properties. The description as a Lagrangian distribution allows to formulate and solve new problems in the theory of partial differential equations, and re-interpret classical results in a different way.

Walter van Suijlekom. [Wednesday, 11:00–12:00](#)*A generalization of K-theory to operator systems*

We present a generalization of K-theory to operator systems. Motivated by spectral truncations of noncommutative spaces described by C*-algebras and inspired by the realization of the K-theory of a C*-algebra as the Witt group of hermitian forms, we introduce new operator system invariants indexed by the corresponding matrix size. A direct system is constructed whose direct limit possesses a semigroup structure, and we define the K_0 -group as the corresponding Grothendieck group.

This is an invariant of unital operator systems, and, more generally, an invariant up to Morita equivalence of operator systems. For C^* -algebras it reduces to the usual definition. We illustrate our invariant by means of spectral truncations and the spectral localizer.

Colloquium talk (Walter van Suijlekom) Tuesday, 16:00–17:00

Drummed up for maths : spectra and geometry

Can you hear the shape of a drum? This question was asked some 60 years ago by mathematician Mark Kac, trying to reconstruct the shape of a vibrating membrane (the drum) from its (audible) vibrational spectrum. In the first part of the lecture we will study this spectral approach to geometry, while illustrating it using drums of different shapes.

We will then turn to the applications of spectral geometry in physics and astrophysics. We come to the conclusion that actually all our information about, say, the universe comes to us through spectra: instead of sound waves, the observed spectrum now ranges from radio waves, to electromagnetic waves, to gravitational waves. This means that the mathematical question of whether you can reconstruct the shape (of, say, the universe) from a spectrum is directly applicable in physics and astronomy.

We end with a brief impression of current research, which deals with the question of how geometry is an emergent phenomenon, when an increasing part of the vibrational spectrum becomes available.

Christiane Tretter. Wednesday, 9:00–10:00

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CONTRIBUTED TALKS, TITLES AND ABSTRACTS

DINNER

Wednesday, 19:00

Tuscolo Bonn Münsterblick
Gerhard-von-Are-Straße 8
53111 Bonn

Menu: https://tuscolo.de/wp-content/uploads/Menu_Tuscolo_WEB_EN.pdf