

**Research conference: „Operator-theoretical approaches
to energy decay and related matters”**

**Warsaw, IM PAN, Banach Center,
25.05.2015–29.05.2015**

Monday, 25.05.2015

Chairman: **Tomilov**

15.00–15.05 **Opening**
15.05–15.50 **Batty**
15.50–16.20 PAUSE/COFFEE
16.20–17.05 **Batty**

Tuesday, 26.05.2015

Chairman: **Batty**

10.30–11.15 **Zworski**
11.15–11.45 PAUSE/COFFEE
11.45–12.30 **Zworski**

Chairman: **Seifert**

15.00–15.45 **Chill**
15.45–16.15 PAUSE/COFFEE
16.15–17.00 **Chill**

Wednesday, 27.05.2015

Chairman: **Zworski**

10.30–11.15 **Dereziński**
11.15–11.45 PAUSE/COFFEE
11.45–12.30 **Dereziński**

Chairman: **Chill**

15.00–15.45 **Seifert**
15.45–16.15 PAUSE/COFFEE
16.15–17.00 **Seifert**

19.00– ... **DINNER**

Thursday, 28.05.2015

16.30– ... **M. Zworski**, *From classical to quantum and back*,
Polish Mathematical Society/ Banach Center Colloquium,
Room No. 321

Friday, 29.05.2015

Chairman: **Dereziński**

10.00–10.45 **Zworski**
10.45–11.15 PAUSE/COFFEE
11.15–12.00 **Zworski**

Chairman: **Batty**

15.00–16.00 **Open Topics**
16.00–16.30 PAUSE/COFFEE

Abstracts of Talks

Rates of convergence obtained from resolvent estimates for semigroup generators

Charles J . K. Batty (Oxford)

In many problems concerning evolution equations or dynamical systems, sharp rates of convergence can be obtained from estimates of resolvents of operator semigroups. I will survey some results of this type, and explain how they can be obtained.

Reflections on a paper by E. Schenck

Ralph Chill (Dresden)

In semigroup theory an important question of spectral determined growth, that is, the question whether the growth bound of the semigroup coincides with the spectral bound of its generator. One counterexample of a semigroup on a Hilbert space, showing that equality does not hold in general, was given by Zabczyk. The construction of this counterexample is, arguably, theoretical and not motivated by a partial differential equation. A second counterexample, based on a wave type equation with a drift term with complex coefficients, was given by Renardy. Very recently, Schenck showed that counterexamples to the spectral determined growth arise also from damped wave equations; the associated semigroups are bounded but not exponentially stable, while smooth solutions decay exponentially. The purpose of this talk is to understand this type of counterexamples.

Asymptotic completeness of many-body scattering

Jan Dereziński (Warsaw)

A proof of asymptotic completeness of scattering theory for many-body Schroedinger operators has been obtained in the late 80's and early 90s, with contributions of Enss, Sigal, Soffer, Graf and myself. In my opinion it

is one of the gems mathematical physics. It has an interesting history. In my talk I would like to recall the formulation of the problem, sketch various attempts to prove it, including the successful one.

Quantified versions of Ingham's Tauberian theorem

David Seifert (Oxford)

We present several quantified versions of this Ingham's Tauberian theorem in which the rate of decay is determined by the behaviour of a certain boundary function near its singularities. The proofs of these results are modified versions of Ingham's own proof and, in particular, involve no estimates of contour integrals. The general results are then applied in the setting of C_0 -semigroups, giving both new proofs of previously known results and, in one important case, a sharper result than was previously available. Joint work with R. Chill (Dresden).

Energy decay in a 1D coupled heat-wave system

David Seifert (Oxford)

We study a simple one-dimensional coupled heat wave system, obtaining a sharp estimate for the rate of energy decay of classical solutions. Our approach is based on the asymptotic theory of C_0 -semigroups and in particular on a result due to Borichev and Tomilov (2010), which reduces the problem of estimating the rate of energy decay to finding a growth bound for the resolvent of the semigroup generator. This technique not only leads to an optimal result, it is also simpler than the methods used by other authors in similar situations. Joint work with C.J.K. Batty (Oxford) and L. Paunonen (Tampere).

Scattering resonances as viscosity limits.

Maciej Zworski (Berkeley)

In practically all situations resonances can be defined as limits of L^2 eigenvalues of operators which regularize the Hamiltonian at infinity. For instance,

Pollicott–Ruelle resonances in the theory of dynamical systems are given by viscosity limits: adding a Laplacian to the generator of an Anosov flow gives an operator with a discrete spectrum; letting the coupling constant go to zero turns eigenvalues into the resonances (joint work with S. Dyatlov). This principle seems to apply in all other settings where resonances can be defined and I will explain it in the simplest case of scattering by compactly supported potentials. The method has also been numerically investigated in the chemistry literature as an alternative to complex scaling.

Microlocal methods in hyperbolic dynamics

Maciej Zworski (Berkeley)

The purpose of the talk will be to provide a more detailed presentation of the ideas presented in the talk on Thursday: I will show how propagation of singularities and semiclassical analysis give an easy proof of Smale’s conjecture on the meromorphic continuation of dynamical zeta functions and provides existence of infinitely many Ruelle resonances. The talk is based on joint works with Dyatlov and Jin.