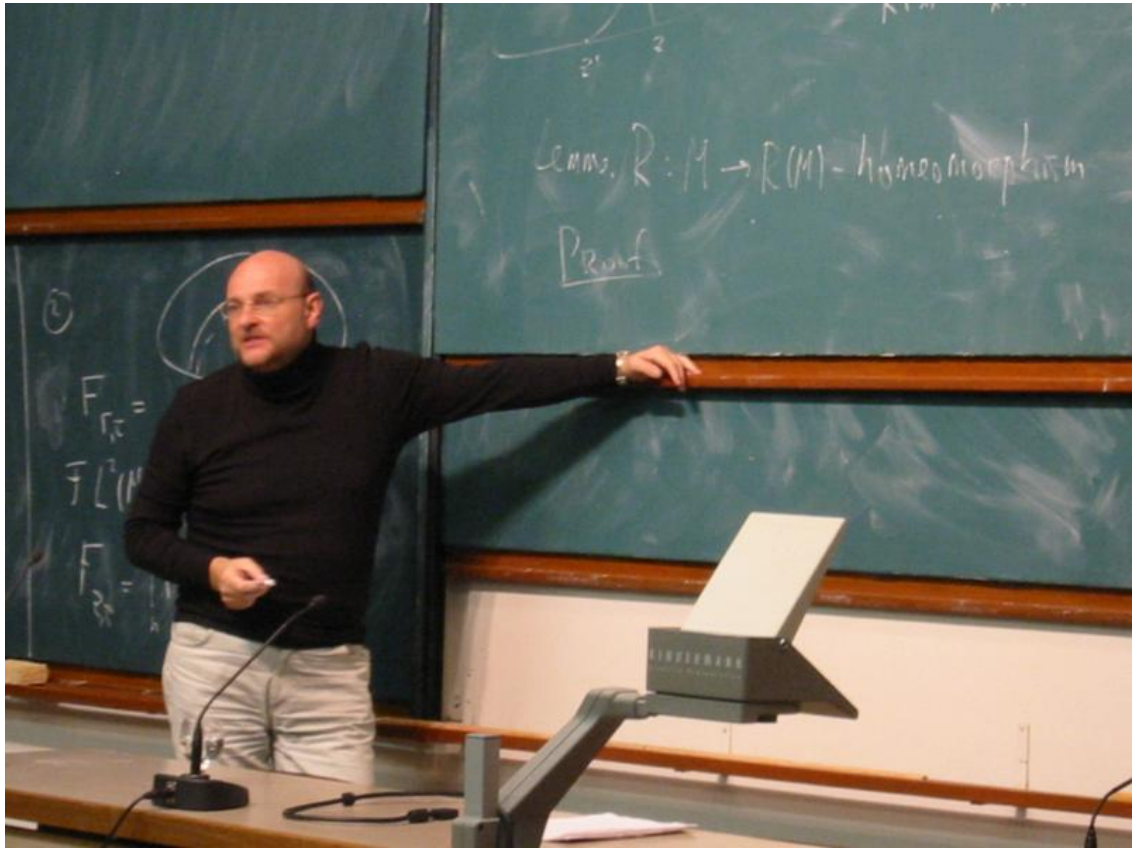
In memory of Yaroslav Kurylev

16.12.1952-19.1.2019



Slava loved his work. He was interested in connecting distant things together. With this attitude, Slava developed a new point of view to inverse problems that is based on geometry. His main point was not to do something useful. Instead, his aim was to "provide aesthetic experiences for the future generation".

Matti Lassas

Short biography

Slava obtained his PhD at the Leningrad (St. Petersburg) Department of Steklov Mathematical Institute in 1979.

He began his career in spectral theory[1].

He was one of the leading researchers who laid the foundations of the theory of multi-dimensional inverse problems in the late 1980's and early 1990's[2].

Since 1995 he was working in the UK, first at Loughborough University, and since 2007 at the University College London.

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[1] Kurylev. The asymptotic behavior of the spectral function of a 2nd order elliptic differential operator. Dokl. Akad. Nauk 1979.

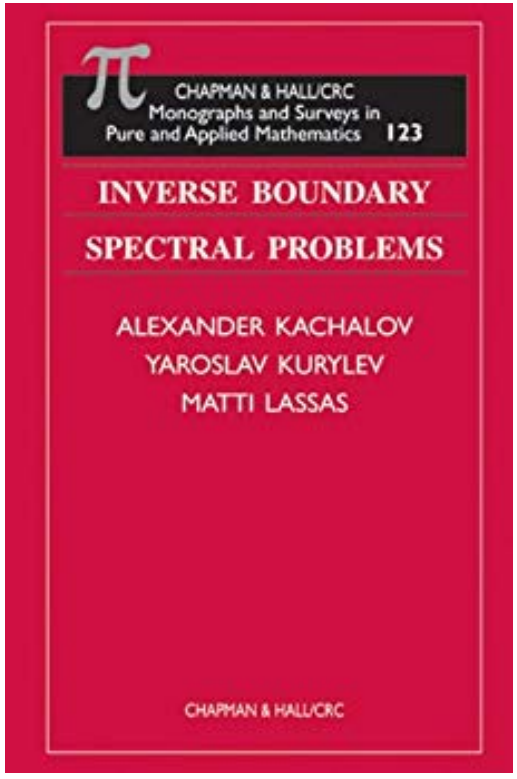
[2] Belishev, Kurylev. To the reconstruction of a Riemannian manifold via its spectral data. Comm. PDE 1992.

Inverse boundary spectral problems

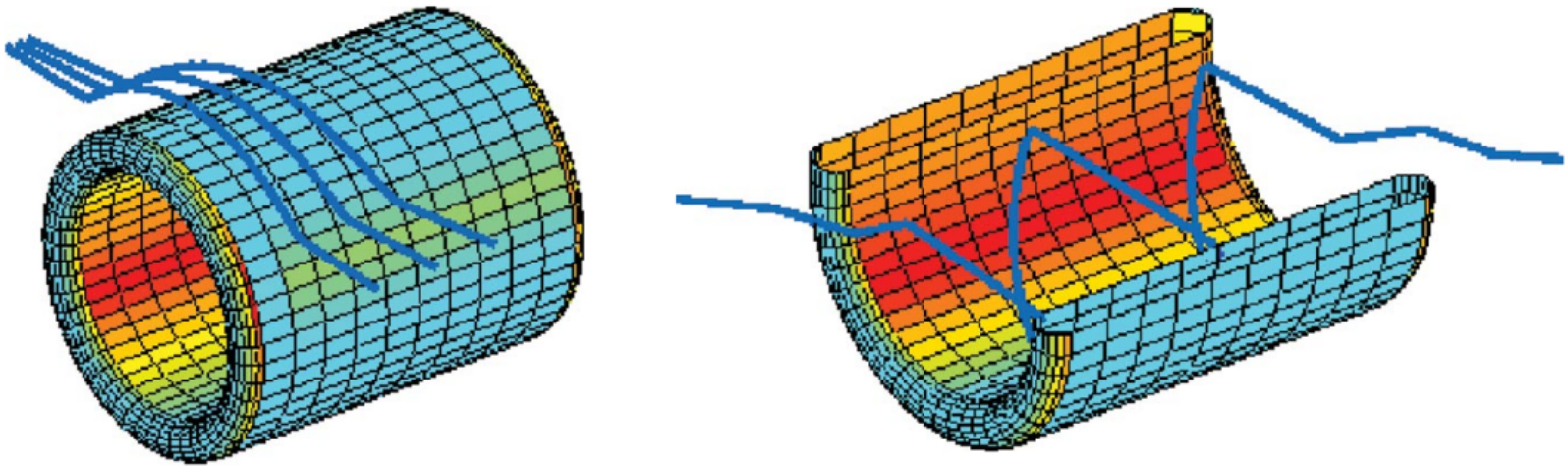
Slava's seminal result with Belishev says that a compact Riemannian manifold with boundary is determined, up to an isometry, by its Dirichlet eigenvalues together with the normal derivatives of the corresponding eigenfunctions.

Coefficient determination problems for several PDEs can be reduced to this result, including:

- time-domain wave and Schrödinger
- time-domain Maxwell and Dirac
- heat equations, including time-fractional ones
- elliptic equations in wave guides



Electromagnetic wormholes



Slava enjoyed geometric constructions like the above wormhole[3].

[3] Greenleaf, Kurylev, Lassas, Uhlmann. Cloaking devices, electromagnetic wormholes, and transformation optics. SIAM Rev. 2009.

Non-linear wave equations

Recently Slava developed a technique with Lassas and Uhlmann that leads to solution of inverse problems for non-linear hyperbolic equations[4].

Strikingly, their result covers a large class of geometric settings for which the corresponding problems for linear equations are open.

This result has already generated a lot of research activity.

I had the privilege to work with Slava when we applied this technique to the Einstein equations with him, Lassas and Uhlmann.

[4] Kurylev, Lassas, Uhlmann. Inverse problems for Lorentzian manifolds and non-linear hyperbolic equations. Invent. Math. 2018.

Slava never gave conference talks as he had originally planned. He was always carried away by the interesting additional points that he wanted to share with his audience, so we almost never got to hear the end of presentation. However, in everyday work and in collaboration, Slava was a master to explain new ideas. That is why he had such a wide impact.

Matti Lassas

Slava was outside-the-box thinker and he spread his enthusiasm to others. It was always exciting to be around him.