

# MANY CHEERFUL FACTS

presents

## Spectral Theory for the Schroedinger Equation

a talk by Kiril Datchev

13:10 – 14:00 on Thursday, December 6, in room 1015.

The Schroedinger equation

$$i\partial_t u(x, t) = -\partial_x^2 u(x, t) + V(x)u(x, t)$$

describes the interaction of a nonrelativistic quantum particle with an external potential  $V(x)$ . Like almost any PDE, this has no explicit general solution, but here the spectral theorem for unbounded operators provides a great deal of concrete information. In this talk I will try to convey some of this information in a non-technical way, beginning with a review of the finite-dimensional spectral theorem and hopefully ending with the spectral resolution of the solution to Schroedinger's equation into a superposition of bound states and distorted plane waves (including explanations of what all these things are and mean).

*I am the very model of a modern Major General,  
I've information vegetable, animal, and mineral,  
I know the kings of England, and I quote the fights historical  
From Marathon to Waterloo, in order categorical;  
I'm very well acquainted, too, with matters mathematical,  
I understand equations, both the simple and quadratical,  
About binomial theorem I'm teeming with a lot o' news,  
With many cheerful facts about the square of the hypotenuse!*

— Gilbert & Sullivan,  $P \circ P$

The website for Many Cheerful Facts is  
<http://www.math.berkeley.edu/~mcf>