

# WPI

# HAROLD J GAY LECTURE SERIES

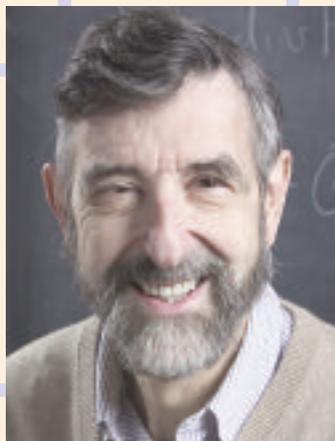
## PDEs and Fractals

## Walter Strauss

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### Steady Rotational Water Waves

Thursday, 3:00 pm  
November 20, 2008  
Bartlett Center



**ABSTRACT** Precise study of water waves began with the derivation of the basic mathematical equations of fluids by the great Euler in 1752. In the two and a half centuries since then, the theory of fluids has played a central role in the development of mathematics. Water waves are fluids with a free surface. I will discuss waves that travel at a constant speed. Using local and global bifurcation theory, we now know how to prove that there exist very many such waves. They may have either small or large amplitudes. I will outline the existence proof and then exhibit some recent computations of the waves using numerical continuation. The computations illustrate certain relationships between the amplitude, energy and mass flux of the waves. If the vorticity is sufficiently large, the first stagnation point of the wave occurs either at the crest, on the bed directly below the crest, or in the interior of the fluid. This work is a perfect example of the synergy between theory and computation.

Geometry with its applications has been at the heart of the development of partial differential equations and boundary value problems since the very beginning. In physics, biology, economics, and other applied fields, a variety of new problems are now emerging that display unusual geometrical, analytical and scaling features, possibly of fractal type. The objective of these lectures is to acquire the view of outstanding mathematicians on the subject of differential equations and fractals, and their developments and applications, in a broad perspective encompassing both classical highlights and contemporary trends.

Sponsored by WPI and hosted by the Department of Mathematical Sciences.  
Coffee and tea will be available one half hour before lecture time in  
Stratton Hall 107. Participation of faculty and students is most welcome.

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