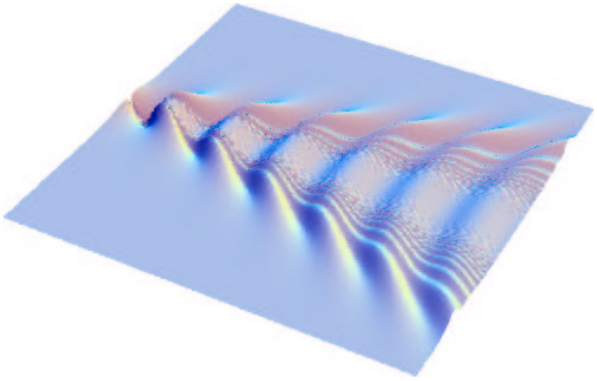
V63.0394: Senior Honors Course, Spring 2004
Mathematical Wave Dynamics

Instructors: **Oliver Buhler & Alexander Barnett**

Prerequisites: Calculus I, II and III. Time: Tuesdays, 2 to 5pm



ship's wake simulation

wave resonances of cavity

Waves and wave propagation are ubiquitous in nature and lead to many puzzling questions. For instance, what produces mirages in the desert? Why is it that a storm over the ocean sets off a steady swell of small-amplitude waves, but an earthquake at the sea floor can release an enormous flood wave? Can you hear the shape of a drum? In response to these questions, a great deal of mathematics has been developed to understand and predict the dynamics of light or sound waves, the propagation of quantum (matter) waves, the vibration patterns of elastic bodies, or the peculiar nature of water waves. This course will give a guided tour of mathematical wave theory together with physical applications, including normal mode theory, the linear wave equation, superposition, interference and diffraction, short-wavelength asymptotics and ray theory, dispersion, and nonlinear waves and solitons. By the last few weeks of the course, each student will have chosen a topic for more intensive study, and will work towards a final oral presentation and written report. Typically this will involve numerical investigation on a computer (in which case programming experience is helpful), but a theoretical topic is also possible.

More information: `obuhler AT cims.nyu.edu` and `barnett AT cims.nyu.edu`