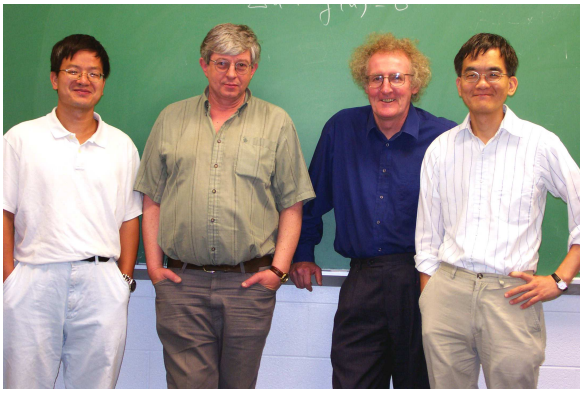
THE PDE GROUP



C. Gui, I. Koltracht, P. J. McKenna, and Y.-S. Choi

Partial differential equations arise in almost every scientific or engineering endeavour. This is because in all of these disciplines there are scientific laws which describe the rate at which things are evolving. 'Rate of change' means derivative, and that means you are dealing with equations with derivatives, usually ordinary or partial differential equations. The Partial Differential Equations group in the Department has grown over the years so that it is now a group of national prominence in linear and nonlinear boundary value problems.

The senior members of the group are Richard Bass, Yung Choi, Changfeng Gui, Israel Koltracht, and Joe McKenna. While each has his own distinctive area of research, the group is friendly and cooperative and has many areas of overlap, which has resulted in several collaborations.

Bass works primarily in the area of linear partial differential equations and Brownian motion, although he also works on nonlinear problems with Gui, the most recent addition to the group. In addition, he is playing a leading role in the new program in Applied Financial Mathematics.

Choi's interests are varied, ranging from nonlinear analysis (where he and McKenna pioneered the mountain pass algorithm, a new way of proving existence of solutions by finding saddle points) to numerical analysis to widely accaimed recent work with researchers from the UConn School of Medicine on the Virtual Cell Project, which is supported by a major grant from the National Institutes of Health.

Gui's main interest is nonlinear analysis and its applications in pure mathematics such as differential geometry and in applied areas such as mathematical biology, phase transitions, etc. His most recent works deal with the Gierer-Meinhardt model of biological pattern formation and local structure of transition layers of two or three phase transition.

Koltracht is a more recent convert to nonlinear partial differential equations, coming from a background in integral equations, operator theory and linear algebra. For some time, he has been working productively with Physics Department members on nonlinear problems arising from Bose-Enstein condensates, and this has resulted in recent papers with McKenna, Choi, and others. Members of the group have also collaborated with UConn faculty in biology, mechanical engineering, and statistics. (In other cross-disciplinary interaction, Kinetsu Abe has been contributing his insights in differential geometry to a research project on "Surface reconstruction" with UConn CSE faculty members Tom Peters and Alex Russell and computer scientist Takis Sakkalis of MIT and the Agricultural University of Athens. Their joint work is supported by an NSF grant in Computational Topology for Graphics.)

McKenna started out in semilinear differential equations and now works in a variety of areas, unified by the central idea of nonlinearity. These include numerical analysis and nonlinear vibrations of ships and suspension bridges. His work has been covered in many scientific magazines and is finding its way into undergraduate differential equations textbooks. Recently, Rich and Joe collaborated with Joe's student Jiri Horak (PhD 2001) on an article on nonlinear problems.

Members of the group have had their share of honors, some of which have been mentioned in this and earlier issues of MathCONNections, such as Changfeng's PIMS and André-Aisensdadt Prizes and Joe's Lester Ford prize from the MAA. We are also proud that at UConn, Rich, Choi, and Joe have each won the Chancellor's prize for excellence in research, and we note that Rich was an invited speaker at the International Congress of Mathematics at Zürich in 1994, a very high distinction indeed.

The PDE group attracts many scientists from around the world who come to study and engage in research with them, and next year will see post-docs from China, Argentina, Germany, Italy, and Albania at UConn, studying and working on research with the group.