UK and Republic of Ireland SIAM Section Annual Meeting

5th January, 2001

The 5th annual meeting of the UK and Republic of Ireland
(UKIE) SIAM Section attracted over 40 applied and industrial
mathematicians to the University of Strathclyde in Glasgow,
Scotland for an interesting and varied collection of
presentations on Friday 5th January: the first SIAM meeting of
the millenium (depending on how you count!).

The section officers Trevor Stuart (President, Imperial
College), Des Higham (Vice President, University of
Strathclyde) and Peter Jimack (Secretary and Treasurer,
University of Leeds) should be congratulated for arranging
speakers across such a varied cross section of the
discipline -- this aspect of generality and non-specialism has
quickly become a hallmark of this event and is much
appreciated by those many of us whose main other exposure to
the broad spectrum of research in industrial and applied maths
is through the SIAM annual meeting.

The venue for the event was the rather grand Court/Senate
Suite at the University of Strathclyde which provided an ideal
small lecture theatre for the presentations. After
introductory comments from the section President, the meeting
was started by Tim Goodman (University of Dundee) who
discussed results in approximation theory that relate to
refinable functions. It is well known that B-splines, when
suitably scaled, converge to a Gaussian, and it is of interest
to know under what conditions a general refinable function has
this property of asymptotic normality, and at what rate the
convergence takes place. Goodman gave a range of results, some
of which had been proved in weaker form by researchers in
probability theory. He also explained how the results relate
to Heisenberg's uncertainty principle and mentioned
applications to signal processing.

The second speaker was Howard Elman (University of Maryland)
who described some joint work with Alison Ramage (University
of Strathclyde) on the numerical solution of advection-
diffusion partial differential equation problems in two
dimensions. The oscillatory nature of Galerkin finite element
or centered finite difference approximations is well
understood in a one-dimensional (ODE) setting: the onset of
oscillations being triggered if the characteristic grid Peclet
number is greater than unity. Elman employed discrete Fourier
analysis techniques to show that in the two-dimensional case,
oscillations can exist perpendicular to the flow direction
even if the associated mesh Peclet number is less than one.
This analysis was also used to shed light on the thorny issue
of the optimal stabilisation parameter for streamline
diffusion discretisations in multi-dimensions. In particular,
two parameter choices were identified corresponding to a) the
most accurate discrete solution; and b) the smallest value
precluding the onset of oscillations. The merits of these
alternative philosophies provided for an interesting

discussion with other international experts in the audience.

During the Business Section of the meeting, the regular secretary and treasurers reports were given: there was general support for the way funds had been dispersed to support applied and industrial mathematics in the UK and RoI and in the ensuing discussion it was agreed to look further at the small amount of budget spent on student prizes. Since the section President is now also the President of the London Mathematical Society, it was perhaps forseeable that he would be questioned about possible reciprocity between the two societies - we wait to see...

The two-year terms of the President and Vice-President end in March 2001 and the results of the email election for new officers were announced by the secretary. David Parker (University of Edinburgh) will be the next section President and Ivan Graham (University of Bath) will serve as the next Vice President, both for two years from April 2001.

After lunch, Valerie Isham (University College, London) discussed spatio-temporal processes in hydrology. Based on radar and rain gauge data, both stochastic, point process models and empirical multivariate statistical models were developed. The techniques were illustrated on an interesting application to the prediction of rainfall patterns, and consequent flood damage, on housing in Galway, Ireland.

The next speaker, Mark Davis (Imperial College), had recently returned to academia from the financial sector and showed the audience the relevance of mathematical analysis even in the hectic world of option pricing! He described work that arose from a practical constraint: it is often impossible to trade the asset on which an option is written, but rather, one can trade a highly-correlated commodity. If the correlation is not perfect, what is a good hedging strategy? Davis defined the problem as maximizing a utility function. Studying a dual formulation allowed the problem to be expressed in terms of stochastic control under a quadratic penalty function and an elegant approach to computing a numerical solution based on an asymptotic expansion followed.

The final talk of the day, given by Alex Craik (University of St. Andrews) concerned a system of three nonlinear ordinary differential equations that arose from work on exact solutions of the Navier-Stokes equations. A special case of the system, which arises in the context of a rotating rigid body, was dealt with in a masterly manner by Euler by the use of Jacobian elliptic functions. The more general system that Craik studied can give rise to finite time blow up and spring-like solutions. A complicated four-leaf manifold of periodic solutions was illustrated numerically, and in conjunction with two saddle points this manifold was seen to organise the behaviour of the spring-like solutions.

Around half of the attendees stayed for the lively evening dinner - very much in keeping with the New Year spirit!

Overall this was a friendly and thought-provoking meeting. A good way to see some of the active research being pursued in the UK and RoI, to catch up with colleagues and to make new aquaintances.

The next meeting will be in January 2002, venue to be decided.

Andy Wathen is Reader in the Oxford University Computing Lab and thanks Des Higham and David Silvester for much help in the writing of this report.