Householder Numerical Linear Algebra Symposium Meets in Peebles, Scotland

Mark Embree

The Edwardian charm of the Peebles Hotel Hydro in the Scottish Borders was the backdrop for the Fifteenth Householder Symposium on Numerical Linear Algebra, held June 10–14. The conference, which meets every three years, continues the tradition established by the Gatlinburg Symposia, originally organized by Alston Householder and held in the Great Smoky Mountains of Tennessee.

A picture from an early symposium is immortalized in MATLAB:

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load gatlin; image(X); colormap(map)
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The Householder Symposia are exceptional for their limited size (roughly 125 delegates) and remote location, intended to minimize distractions. Young researchers have ample opportunity to mix with the leaders in the field, facilitated at this year's conference by random seating at lunch and dinner in the hotel dining room. The customary format consists of plenary talks during the day, followed by parallel sessions in the afternoon and evening. Lively exchanges during the talks are encouraged, although the audience was generally decorous at this year's meeting.

Some Highlights

The Householder meetings provide good vantage points to identify research trends in numerical linear algebra. A visitor to the 1999 symposium in Whistler, British Columbia, for example, would have noticed an emphasis on model reduction of large-scale dynamical systems.

This year's meeting began with two talks on polynomial eigenvalue problems. Peter Lancaster opened with a well-organized discussion of spectral perturbation theory for matrix functions with quadratic dependence on two different parameters; such functions arise in vibrating and gyroscopic systems. Volker Mehrmann followed with a talk on Krylov subspace methods for solving quadratic eigenvalue problems involving Hamiltonian symmetry properties. The theme was continued later in the week by Françoise Tisseur, who described a generalization of pseudospectra to polynomial (possibly rectangular) eigenvalue problems.

Applications in computational biology were another focus. Sabine Van Huffel discussed a variety of biomedical data processing problems, in which tools from linear algebra and optimization are used to process patient data in a clinical setting. Genome-inspired data mining motivated Inderjit Dhillon's plenary talk.

A third topic receiving particular attention was algebraic multigrid (AMG) preconditioning. Van Emden Henson surveyed the variety of methods that have emerged in recent years from the classic Ruge–Stüben algorithm. Preconditioning, in general, continues to be of central importance. Reinhard Nabben described a new algebraic convergence theory for additive and multiplicative Schwarz

domain decomposition methods, developed with Michele Benzi, Andreas Frommer, and Daniel Szyld. Other speakers presented further results on AMG, sparse approximate inverses (Benzi), and special techniques for saddlepoint/KKT systems (Eric de Sturler and Jörg Liesen, Daniel Loghin, Miro Rozložník).

The Householder Prize

The Peebles meeting saw the announcement of the 11th Householder Prize, awarded for the best thesis in the field written during the preceding three calendar years. The recipient, Jing-Rebecca Li, was a student of Jacob White at MIT and is now an associate research scientist at the Courant Institute at New York University. Her dissertation addresses model reduction of dynamical systems via the solution of Lyapunov equations with low-rank right-hand sides. Li used her Cholesky factor implementation of the ADI algorithm to develop these solutions. The accompanying convergence analysis relates the dominant invariant subspaces of the Lyapunov solution to Krylov or rational Krylov subspaces.

Following longstanding tradition, Li's award included prize money collected from delegates at the previous symposium. At the end of this year's conference dinner, a hat was passed for contributions to the next prize.

An important component of the Householder award is a talk given by the recipient on the morning following the conference dinner. The recipient is only notified of the award after the meeting's start, making for a few hectic days of preparation for this forty-five minute, 8:30am address. Li's prize talk described her thesis material, together with her current work with Leslie Greengard.

The Householder Prize Committee, chaired by Ludwig Elsner, awarded honorable mentions to Bor Plestenjak, of the University of Ljubljana, Slovenia, for his dissertation on mulitparameter eigenvalue problems; Andrea Toselli (currently of ETH Zürich), for his thesis on domain decomposition methods (written at the Courant Institute); and Hao-Min Zhou (currently at Caltech), for his UCLA thesis on the application of PDE techniques in image processing.

Advisers of students who will be completing theses in numerical linear algebra and related fields during the calendar years 2002-04 are urged to nominate outstanding candidates for the 2005 prize. Judging from the strong talks given by graduate students at this meeting, we can look forward to a robust competition.

In addition to these awards, the conference dinner featured a talk by Hans Schneider on Helmut Wielandt, who died last year. Schneider quoted from Wielandt's inaugural address to the Heidelberg Academy of Sciences in the early 1960s. Wielandt suggested that linear algebra and finite mathematics, which he considered under-appreciated fields at that time, would enjoy renewed importance in the computer era.

To close out the evening, the Householder program committee, chaired this year by Nick Higham, announced the retirement of Pete Stewart and Chandler Davis from the committee after many years of much appreciated service, to be replaced by Alan Edelman and Roy Mathias. Sabine Van Huffel joined the Householder Prize Committee, with Ludwig Elsner stepping down after his turn as chair. The final administrative detail was the announcement that the Sixteenth Symposium will meet in the Victorian seaside resort of Cape May, New Jersey, in the summer of 2005.

Scottish Hospitality

All meals were provided in common in the Hotel Hydro dining room, where gentlemen were advised to wear jacket and tie. (The village clothier was reported to be crowded with mathematicians on the meeting's first afternoon, despite the fact that the conference organizers provided tartan neckties and scarves to keep delegates looking sharp.)

The local organizers, Philip Knight and Alison Ramage of the University of Strathclyde, and Andy Wathen of Oxford University, worked tirelessly throughout the conference, and should be congratulated for the success of their endeavor. Sponsorship from more than fifteen government and private organizations eased the cost of attending the meeting for all delegates. While the bulk of participants were from the United States and Europe, several had come from as far as India and Mauritius. All were treated to a vibrant Scottish experience, fortified with haggis at the conference dinner (toasted by David Sloan of the University of Strathclyde with bagpipes and "To a Haggis" by Robert Burns) and a whisky tasting the following night. The week of the conference marked the celebration of the Peebles Beltane festival, a local tradition commemorating the 1513 Battle of Flodden. Houses in town were colorfully decked out, and traditionally clad horseback riders paraded past the hotel one evening.

Continuing another Householder tradition, one afternoon was devoted to local excursions. Several options were available in Peebles: a walk to the 14th-century Neidpath Castle, a ride to the ancient Traquair House in nearby Innerleithen, or hill walking in the steep Glentress Forest, which rose right next to the hotel.

Nick Higham took many photos, now posted on the conference Web site

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http://www.maths.strath.ac.uk/~matrix/
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This site also includes links to slides from a number of talks, as well as "Downa Dating," Jim Demmel's conference ballad and Robert Burns homage, sung to the tune of Auld Lang Syne.

Mark Embree is an assistant professor of computational and applied mathematics at Rice University.