13th Householder Symposium Is Held in Switzerland

By Michael Overton

The Thirteenth Householder Symposium on Numerical Algebra was held June 17–21, 1996, in Pontresina, Switzerland. Named for Alston S. Householder, a pioneer in numerical linear algebra and organizer of the first four meetings (known originally as the Gatlinburg Symposia), the symposia take place once every three years, alternating between sites in North America and Europe. An international program committee, chaired this year by Dianne O'Leary (University of Maryland), organizes the symposia. Arrangements in Switzerland were made by Walter Gander and Martin Gutknecht (ETH Zürich).

The approximately 125 participants in this year's symposium had been chosen on the basis of extended abstracts submitted by all applicants. Many of the participants were recent PhD recipients; all were given the opportunity to present their work during a daytime plenary session or in one of the parallel evening sessions.

A much appreciated feature of the symposium—which, following tradition, was held in an isolated location—was its lively, informal atmosphere. Speakers were frequently interrupted by questions or comments, keeping them on their toes. As a speaker myself, I value this kind of audience interaction, as it typically clears up points of confusion early and makes the talk much more broadly accessible to the audience. Several of the evening sessions were particularly lively.

Outstanding Dissertations

A highlight of the meeting was the presentation of the ninth Householder thesis prize, awarded for the best PhD thesis in numerical algebra written during the period from 1993 to 1995. This year's prize went to Ming Gu for his thesis "Studies in Numerical Linear Algebra," completed at Yale University in 1993 under the direction of Stanley Eisenstat. Topics in the thesis included

Kong). Previous recipients of the prize who attended this year's symposium were Paul Van Dooren (1981), Ralph Byers and Jim Demmel (1984), Nick Higham (1987), and Alan Edelman (1990).

Sample Fare

Of the many excellent presentations (a complete list of symposium participants has been posted on the World Wide Web), two are briefly summarized here to give readers an idea of the flavor of the symposium. Alan Edelman gave a speculative but stimulating talk on the future fast Fourier transform (FFFT), based on the idea that in the not-so-distant future floating-point arithmetic will be so much faster than communication that the fastest algorithms will accept substantially increased arithmetic costs as a trade-off for reduced communication costs.

W. Kahan presented work of Ren-Cang Li, whose treatment of eigenvalue perturbation theory emphasizes sharp *relative* bounds even for small eigenvalues, for which the traditional absolute bounds are essentially useless. This work unifies and extends both classical absolute error bounds (due to Hoffman and Wielandt, Weyl and Lidskii, Davis and Kahan) and more recent work on relative error bounds (Barlow, Demmel, Kahan, and Veselic, Eisenstat and Ipsen). Li recently completed his PhD at Berkeley but was unable to present his work at the symposium because of U.S. visa difficulties. He currently holds a Householder postdoctoral fellowship at Oak Ridge National Laboratory.

Tribute to Alston Householder

Another highlight of the symposium was Fritz Bauer's moving tribute to the memory of Alston Householder, who died at the age of 89, shortly after attending the 1993 symposium at Lake Arrowhead, California.

Participants were fortunate that the symposium took place at an exceptionally beautiful location in Pontresina, Switzerland, in a grand 19th-century hotel with a view of a glacier. Walter Gander and Martin Gutknecht did an outstanding job on the local organization, arranging such fine accommodations at a very reasonable price. Together with their students and associates from ETH Zürich, they generally made all participants feel

Conference attendees get their "marching instructions" before setting out for a strenuous hike across this Swiss glacier.

the text of Bauer's tribute to Householder, a link to a Householder obituary by Pete Stewart (*SIAM News*, 1993), and more information on the symposium, see the symposium's web page at http:// www.inf.ethz.ch/department/WR/html/householder/.

Michael Overton is a professor at the Courant Institute of Mathematical Sciences, New York University.

Authors of the top four theses cited in the Householder award (front row, left to right): Michael Ng, Ming Gu (recipient of this year's prize), Niloufer Mackey, and Lina Hemmingsson. Prize committee members (back row, left to right): Paul Van Dooren, Charles Van Loan, Olof Widlund, and Axel Ruhe (chair); (absent: Ludwig Elsner).

algorithms and perturbation theory for the symmetric eigenvalue problem and a new rank-revealing QR factorization. Gu recently completed a three-year term as a visiting assistant professor at the University of California, Berkeley, and has joined the UCLA faculty as an assistant professor. The award included a cash prize that, following Householder tradition, was made up of voluntary contributions collected from participants at the previous symposium. In addition to presenting his thesis, Gu also discussed a paper on fast algorithms for Toeplitz least squares problems.

The prize committee, chaired by Axel Ruhe (Chalmers), also named three runners-up for this year's award: Lina Hemmingsson (Uppsala University), Niloufer Mackey (SUNY Buffalo), and Michael Ng (Chinese University of Hong

very welcome. They also worked hard to obtain financial support from many Swiss corporate sponsors. In addition, the U.S. National Science Foundation and The Mathworks made generous contributions to the symposium, the former covering travel costs for students and recent PhDs from the U.S. The stimulating technical program and the well-organized local arrangements combined to make a memorable conference.

More to Come

The 14th Householder symposium will be held at Whistler Mountain, near Vancouver, British Columbia, in June 1999. Pete Stewart will chair the program committee, and Jim Varah is in charge of the local arrangements.

For a list of conference participants,

Workshop on Accurate Eigensolving and Applications

By Beresford Parlett

How can you tell a workshop from a regular meeting? Overhead projectors usually dominate regular meetings. At workshops, speakers are more likely to make use of the blackboard, all talks are peppered with questions from senior researchers, and graduate students often acquire the habit of interrupting.

With these thoughts in mind, a small group of specialists gathered at the International Workshop on Accurate Eigensolving and Applications in Split, Croatia, July 12–16, 1996. Their goal was to share their knowledge of methods for solving the problem $Ax = \lambda Bx$ (or its singular value *pendant*) to as much accuracy as the data warrant. In particular, the need exists to describe the structure of matrices A, B, which determines their small eigenvalues (the ones of interest in most, but not all applications) to high relative accuracy. For example, consider the stiffness and mass matrices, usually called K, M, obtained by finite difference approximation. For one-dimensional problems the unassembled form NDN^r does determine the eigensolution $(NDN^r - \lambda M)v = 0$ to high relative accuracy, but more generally finite element models, especially those in high dimensions, are still undecided.

While it was already known that factorizations like QR may essentially improve the computed accuracy of the singular values, we have now learned that the same is true of completely pivoted LU—a deeply non-unitary process. The highly accurate singular values of a bidiagonal were also shown to tune the subsequent inverse iterations so as to keep both their high speed and the necessary orthogonality.

Workshop organizers Jesse Barlow, Ivan Slapnicar, and Kresimir Veselic had thought hard about the format of the meeting. The participants fell into two groups: about ten senior researchers actively working on these problems (Demmel, Drmac, Hari, Ipsen, Parlett, Ruhe, and the organizers) and about 15 graduate students, who are writing dissertations in this area. All participants stayed in one of the student dormitories at the University of Split, the formal host of the workshop. After breakfast each day a small caravan of cars made its way to the Department of Mechanical Engineering, Electrical Engineering, and Naval Architecture. Following three one-hour talks in the morning and at most one afternoon session, attendees had time for group discussions on open problems, software, and the publication of a possible monograph. Although there were only 15 talks in four working days, participants agreed that they needed the remaining time for informal technical work. (A list of talks and abstracts can be found on the World Wide Web at http://adria.fesb.hr/~slap/workshop.)

The local organizer, Ivan Slapnicar, had arranged an impressive program of entertainment, including among other events a guided tour of Diocletian's palace (from which the city grew in the 5th century), a full day on the wonderful Zlatni Rat Beach on the island of Brac,

Workshop attendees gather at the Faculty of Electrical Engineering, Mechanical Engineering, and Naval Architechure at the University of Split.

and an open air performance of Verdi's *Nabucco*.

At the end of the workshop, Jesse Barlow announced that a follow-up meeting will be held in two years at Pennsylvania State University.

Beresford Parlett is a professor in the Department of Mathematics, University of California at Berkeley.

Calendar

JANUARY

8–11 Joint Mathematics Meetings. San Diego, CA. Contact: AMS Meetings & Conferences Department, P.O. Box 6887, Providence, RI, 02940; (401) 455–4138; fax: (401) 455–4004; meet@ams.org; http://www.ams.org/amsmtgs/.

24–26 13th GAMM–Seminar Kiel on Numerical Treatment of Multi-Scale Problems. Kiel, Germany. Contact: http://www.numerik.uni-kiel.de/gamm.html.

27–31 Maths-in-Industry Study Group. Melbourne, Australia. Contact: Kerry Landman, Department of Mathematics, University of Melbourne, Parkville VIC 3052, Australia; 61 3 9344 6762; fax: 61 3 9344 4599; kal@maths.mu.oz.au; http://www.maths.mu.oz.au/.

28–31 Asia and South Pacific Design Automation Conference 1997. Makuhari Messe, Chiba, Japan. Contact: Kazutoshi Wakabayashi; 81 44 856 2134; fax: 81 44 856 2235; wakaba@sbl.cl.nec.co.jp; http://www.ieice.or.jp/callforpapers/ASPDAC/.

FEBRUARY 1997

5–7 2nd IMACS Symposium on Mathematical Modeling. Vienna, Austria. Contact: I. Troch, Technische Universitäet, Wiedner Hauptstrasse 8–10, A–1040 Vienna, Austria; 43 1 58801/5677; fax: 43 1 586 80 93; itroch@e-mail.tuwien.ac.at.

21–22 13th Annual Conference on Applied Mathematics (CAM). Edmond, OK. Contact: David Stapleton, Department of Mathematics and Statistics, University of Central Oklahoma, Edmond, OK 73034; (405) 341–3980, ext. 5012; fax: (405) 330–3824; cam@aix1.ucok.edu.

28 SAC '97: 1997 Symposium on Applied Computing.
March 1 San Jose, CA. Contact: Jim Hightower, California State University–Fullerton, Fullerton, CA 92634–9480; jim_hightower@qmail.fullerton.edu.

MARCH 1997

1–5 VRAIS '97: IEEE Virtual Reality Annual International Symposium. Albuquerque, NM. Contact: Larry F. Hodges, VRAIS '97 Program Co-Chair, Graphics, Visualization, and Usability Center, College of Computing, 801 Atlantic Drive, Georgia Institute of Technology, Atlanta, GA 30332–0280; (404) 894–8787; hodges@cc.gatech.edu; http://www.eece.unm.edu/eece/conf/vrais.

2–5 2nd International Conference on Computational Intelligence and Neuroscience. Research Triangle Park, NC. Contact: http://www.csci.csusb.edu/iccin.

MARCH

3–6 Shape Modeling International '97. Aizu-Wakamatsu City, Japan. Contact: T.L. Kunii, University of Aizu, Aizu-Wakamatsu City, Fukushima Prefecture, 965-80, Japan; +011–81–242–37–2528; kunii@u-aizu.ac.jp.

10–12 Workshop on Scientific Computing 97. Hong Kong. Contact: Wei-min Xue, Department of Mathematics, Hong Kong Baptist University, 224 Waterloo Road, Kowloon Tong, Hong Kong; wsc97@sci.hkbu.edu.hk; http://www.math.hkbu.edu.hk/wsc/reg97.html.

11–14 Computers, Freedom & Privacy 1997. Burlingame, CA. Contact: Kent Walker, Airtouch Communication Legal Department, One California, 21st Floor, San Francisco, CA 94111; (415) 658–2474; kent.walker@airtouch.com; http://www.cfp.com.

12 Banquet for Gene Golub's 65th Birthday at the Workshop on Scientific Computing 97. Hong Kong. Contact: Raymond Chan, Department of Mathematics, The Chinese University of Hong Kong, Shatin, Hong Kong; (852) 2609–7970; fax: (852) 2603–5154; rchan@math.cuhk.edu.hk; http://www.math.cuhk.edu.hk/~rchan.

14–17 8th SIAM Conference on Parallel Processing for Scientific Computing. Minneapolis, MN. Contact: SIAM; (215) 382–9800; meetings@siam.org; http://www.siam.org/conf.htm.

16–21 4th International Conference on Approximation and Optimization in the Caribbean. Caracas, Venezuela. Contact: appopt4@usb.ve; http://www.usb.ve/AppOpt4.html.

19–21 Conference on Information Sciences and Systems. Baltimore, MD. Contact: ciss97@ece.jhu.edu; http://www.ece.jhu.edu/dept/ciss/97/ciss97.html.

23–27 Conference on the Inverse Problems of Wave Propagation and Diffraction. Aix les Bains, France. Contact: M.-C. Sance, INRIA Rocquencourt, Relations exterieures, Bureau des cours et colloques, B.P. 105, 78153 Le Chesnay Cedex, France; http://www.indmath.uni-linz.ac.at/www.texte/conf.html.

25–28 Global Analysis 30 Years Later. Cincinnati, OH. Contact: Chris McCord or Ken Meyer, Department of Mathematics, University of Cincinnati, Cincinnati, OH 45221–0025; global@math.uc.edu.

APRIL 1997

1–3 IMACS Seminar on Monte Carlo Methods. Brussels, Belgium. Contact: Alain Dubus, IMACS Monte Carlo Seminar, ULB, CP165, 50 av. F.D. Roosevelt, B–1050 Brussels, Belgium; mtc@metronu.ulb.ac.be.

APRIL

2–4 4th ACM Conference on Computer & Communications Security. Zurich, Switzerland. Contact: Richard Graveman, Bellcore, 444 Hoes Lane, Rm. 1K-221, Piscataway, NJ 08854; +1–908–699–4611; rfg@ctt.bellcore.com; http://www.csl.sri.com/acm-ccs/ccs.html.

6–10 High Performance Computing '97. Atlanta, GA. Contact: Adrian Tentner, Chairman, High Performance Computing '97, Argonne National Laboratory, 9700 S. Cass Avenue, Argonne, IL 60439; tentner@anl.gov.

7–9 8th SIAM Conference on Parallel Processing for Scientific Computing. Minneapolis, MN. Contact: SIAM Conference Coordinator, 3600 University City Science Center, Philadelphia, PA 19104–2688; (215) 382–9800; fax: (215) 386–7999; http://www.siam.org/conf.htm.

7–11 3rd Workshop on Models and Algorithms for Planning and Scheduling Problems. Cambridge, UK. Contact: R.R. Weber, Statistical Laboratory, 16 Mill Lane, Cambridge CB2 1SB, UK; 44 1223 337953; fax: 44 1223 337956; secretary@statslab.cam.ac.uk; http://www.statslab.cam.ac.uk/workshop/.

8–11 FRACTAL '97: 4th International Multidisciplinary Conference. Denver, CO. Contact: Miroslav M. Novak, School of Physics, Kingston University, Surrey KT1 2EE, England; 44 181 547 2000; fax: 44 181 547 7562; novak@kingston.ac.uk.

9–13 8th Copper Mountain Conference on Multigrid Methods. Copper Mountain, CO. Contact: Steve McCormick, Applied Mathematics, C.B. 526, University of Colorado, Boulder, CO 80309–0526; (303) 492–0662; fax: (303) 492–4066; stevem@newton.colorado.edu; ftp://amath.colorado.edu/pub; http://amath-www.colorado.edu/appm/faculty/stevem/.

National Defense Science and Engineering Graduate Fellowships
STARTING IN ACADEMIC YEAR 1997 - 1998