International Conference in Beijing Highlights Advances in Numerical Algebra and Scientific Computing

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Jian-Yu Pan (far left), one of two finalists for the Best Paper Prize by a young Chinese scientist, and Heng-Bin An (far right), the prize recipient, with prize committee members Iain Duff, Gene Golub, and Zhong-Ci Shi.

More than a hundred participants from around the world gathered in Beijing on the occasion of the First International Conference on Numerical Algebra and Scientific Computing, held October 22–25, 2006, at the Institute of Computational Mathematics of the Chinese Academy of Sciences. The aim of the meeting was "to highlight recent advances in theoretical, computational and practical aspects of linear and nonlinear numerical algebra." An important event was the awarding of the Best Paper Prize to a young Chinese scientist---more on this later.

The conference co-chairs were Raymond Chan (Chinese University of Hong Kong) and Zhong-Ci Shi (Chinese Academy of Sciences). The meeting, which was generously sponsored by no fewer than eight governmental institutions and local universities, was a model of organization and hospitality. Much of the credit for the success of the conference is due to the principal organizer, Zhong-Zhi Bai of the Institute of Computational Mathematics, and to his crew of wonderfully enthusiastic young colleagues and students. No effort was spared to ensure the well-being of the conference participants, particularly of the foreign guests, and the smooth unfolding of the proceedings.

The meeting opened with welcoming remarks from co-chair Zhong-Ci Shi, the dean of Chinese numerical analysts, and from Lei Guo, president of the Chinese Academy of Mathematics and Systems Science, followed by a short speech by Gene Golub (Stanford University). Golub expressed admiration for the Chinese people and culture, for the country's attitude toward scholarship and science, and for the efforts the Chinese government is focusing on scientific and technological advancement, which it recognizes as key to this immense country's economic development. Golub did not fail to mention his fondness for Chinese food and spoke for all the invited guests when he expressed his gratitude for the generosity and warm hospitality of the conference organizers. These remarks set the tone for the entire conference, which took place in an especially warm and friendly atmosphere.

The scientific program consisted of 14 invited and 21 contributed talks, distributed over three days, the last day of the conference being devoted to a sightseeing excursion. As there were no parallel sessions, this made for a rather intense program! The speakers covered a wide range of topics, including direct and iterative methods for linear equations and least-squares problems, preconditioning techniques, algorithms for model order reduction, inverse problems, parallel computing, eigenvalue solvers, multilevel and domain decomposition schemes for linear and nonlinear partial differential equations, Markov chains, systems of polynomial equations, nonlinear matrix equations, and the computation of permanents. Several speakers discussed applications---in fluid mechanics, image processing, reservoir simulation, optimal control, radiation diffusion, magnetohydrodynamics, electromagnetism, quantum chemistry, and nanoscience.

Notwithstanding the variety of topics treated, a few themes emerged in several of the talks. Among them is the need for effective solvers for linear systems with large skew-symmetric parts, such as those arising from the discretization of advection-dominated problems in fluid mechanics. A few speakers discussed recent and ongoing work on direct and iterative algorithms for skew-symmetric or shifted skew-symmetric matrices, as well as preconditioners and smoothers based on such techniques.

The level of the talks, including the contributed ones, was generally very high. Moreover, conference participants received a book of abstracts that included summaries of a number of submitted talks not selected for contributed presentations. Many of these abstracts looked extremely interesting, and it was a pity that more talks could not be accommodated in the program. At any rate, it was clear to many participants that research by Chinese mathematicians working in numerical algebra and scientific computing is growing at a very fast pace in both amount and quality. As pointed out by Andy Wathen (Oxford University) at the end of the conference, papers by China-based researchers already account for more than 40% of all submissions to some of the leading numerical analysis journals, and continued increase of this rate can be expected for the foreseeable future.

As mentioned earlier, a highlight of the meeting was the awarding of the prize for the best paper by a young Chinese scientist. The purpose of this newly established award is to encourage new generations of Chinese PhD students to choose numerical algebra and scientific computing as their research areas.

After a preliminary screening, the competition was reduced to two finalists, Heng-Bin An of the Laboratory of Computational Physics in Beijing

and Jian-Yu Pan of the Department of Mathematics at East China Normal University in Shanghai. Each finalist gave a talk presenting his results in a late-afternoon session on the first day of the conference. The level of both talks was extremely good, which made the choice of a winner very difficult!

The prize committee---Iain Duff, chair (Rutherford Appleton Laboratory, UK), Gene Golub, and Zhong-Ci Shi---met after dinner the same day and decided to award the prize to Heng-Bin An for his paper "On Convergence of the Additive Schwarz Preconditioned Inexact Newton Method" (*SIAM Journal on Numerical Analysis*, Volume 43, Number 5, 2005, pages 1850–1871). This paper, which is based in part on the author's 2004 PhD dissertation, provides the first rigorous convergence analysis of the additive Schwarz preconditioned inexact Newton (ASPIN) method introduced by X.-C. Cai and D. Keyes in 2002. Raymond Chan presented the award the following day in a ceremony at a local restaurant, during the banquet. The award consisted of a plaque, books, and some financial support, supplemented by a generous donation from Gene Golub (who contributed cash awards for both finalists).

The last day of the conference was dedicated to a trip to the spectacular Badaling Great Wall (approximately one hour by bus from the Haidian District of Beijing, where the conference was held) and a visit to the famed Ming Tombs. Between the two attractions, conference participants were treated, as throughout the conference, to a lavish meal at a fancy restaurant, where three young performers entertained the diners with a seemingly endless series of breathtaking stunts.

In summary, the First International Conference on Numerical Algebra and Scientific Computing was a great success. Readers working in these research areas can look forward to a second meeting, which the organizers envision taking place in about two years, either in Beijing or in some other location in China. Stay tuned!

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