

10th International Workshop on Accurate Solution of Eigenvalue Problems Dubrovnik, Croatia, June 2–5, 2014

Report by Beresford Parlett

“Eigenvalues, anyone?”

Thanks to the HBO series ‘Game of Thrones,’ the ‘old town’ part of Dubrovnik is familiar to even couch potatoes. The same is now true for some of us who work in numerical linear algebra because the IWASEP group held its biennial meeting, for the second time, in this ‘pearl of the Adriatic sea.’ The first occasion was in 2009. IWASEP is an acronym for *International Workshop on Accurate Solution of Eigenvalue Problems*. That odd title designated those few investigators, in 1986, who were interested in achieving high relative accuracy, when possible, in small or even tiny eigenvalues. The scene has changed steadily over the decades and the initial coterie, mainly from Croatia, Berkeley, and Penn State, has expanded along with the scope. Nevertheless, this year’s meeting comprised under 50 participants who met in plenary session in one nice room for three and half intense days. Two full periods were allotted to viewing posters and a modest prize was offered to one of them, authored by Ana Susnjara of the EPF Lausanne.

We all slept in the same handsome 1901 mansion, now owned by the University of Zagreb, in which our talks took place and in whose courtyard we sipped our coffee. This impressive building is close to two swimming places and is only a five minute walk North of the ‘old town.’ In the evening we were free to find attractive restaurants there. Could there be a better location? On this occasion the meeting was run jointly by the University of Split (Ivan Slapničar) and the University of Zagreb (Zlatko Drmač) to whom we are all grateful for providing such a splendid environment for our interactions.

What did we talk about? Concern with high relative accuracy was still present in Chris Beattie’s perturbation theory for matrix pairs and hyperbolic quadratic eigenvalue problems, as well as in the work of Heinrich Voss on the variational principles at work in specific vibration problems. Nevertheless, the variety of topics has burgeoned. Linear systems theory and transfer functions lurk in the background. Dimension reduction looms large along with special factorizations for special purposes: CUR = (a few columns)(low rank)(a few rows) for approximation and null space decomposition to reveal Jordan structure. On the theory side we heard about $\sin 2\Theta$ theorems for matrix pairs, probabilistic bounds for condition numbers, nonsymmetric preconditioners for self adjoint problems, convergence of block Jacobi methods, and some new nearness problems, namely distance to localization. We heard about Riccati equations, Sylvester equation, contour integrals for analytic matrix functions and the virtues of arrowhead matrices (rivals to tridiagonals). There were two presentations on roots of polynomials and one on the use of GPUs. We were all ready for Wednesday’s excursion to the ancient village of Ston and a fancy fish restaurant up the coast.

Exhausting, yes, but a rich experience.

The next meeting, announced for June 2016 at EPF Lausanne, will be hosted by Daniel Kressner. For more details, see <http://iwasep.fesb.hr/iwasep10>.

The 7th Linear Algebra Workshop (LAW’14), and the 23rd International Workshop on Matrices and Statistics (IWMS) Ljubljana, Slovenia, June 4–12, 2014 and June 8–12, 2014

Report by Damjana Kokol Bukovšek



Participants of LAW-IWMS 2014

The workshops were organized to coincide, IWMS taking place in the second week of LAW’14. The main theme of the 7th Linear Algebra Workshop workshop was the interplay between operator theory and algebra. After a few hours of talks in the morning, afternoons were used for work in smaller groups. The main theme of the 23rd International Workshop on Matrices and Statistics was the interplay between matrices and statistics. A special issue of the journal *Operators and Matrices* will be published as the proceedings of the workshops. On Tuesday, June 10, there was an invited ILAS lecture, given by Alexander Guterman from Moscow State University.

Invited speakers at LAW’14 were: A. Guterman, J. Holbrook, T. Laffey, L. Livshits, L. Marcoux, M. Mastnak, V. Müller,

H. Radjavi, L. Rodman, A. Sourour, and V. Troitsky. Invited speakers at IWMS were: F. Akdeniz, K. Conradsen, T. Dayar, A. Hassairi, S. Kirkland, I. Olkin, G. P. H. Styan, K. Šivic, P. Taylor, Y. Tian, and P. Vassiliou. There were also 14 contributed talks at LAW'14 and 17 contributed talks at IWMS. Workshops were supported by the Faculty of Mathematics and Physics, University of Ljubljana, Slovenia; the Institute of Mathematics, Physics and Mechanics, Ljubljana, Slovenia; the International Linear Algebra Society; and the Jožef Stefan Institute, Slovenia. There were about 80 participants at both workshops. To see a list of those, a complete list of abstracts and some photos, please visit <http://www.law05.si/law14> and <http://www.law05.si/iwms>.

Graph Theory, Matrix Theory and Interactions
A conference to celebrate the scholarship of David Gregory
Queen's University, Canada, June 20–21, 2014

Report by Kevin Vander Meulen and David Wehlau

On June 20-21, the Department of Mathematics and Statistics at Queen's University (Kingston, ON, Canada) hosted a conference in honour of the late David A. Gregory. The conference, entitled "Graph Theory, Matrix Theory and Interactions," was a celebration of David's scholarship, mentoring and collaboration. Forty people attended, including three of David's former Ph.D. students.

David obtained his undergraduate mathematics degree from Queen's University, and after getting his Ph.D. from Michigan, joined the faculty at Queen's in 1967. He was a valued member of the department from 1967 until his death in the summer of 2013. David Gregory explored mathematical problems that bridged two areas of mathematics: linear algebra and discrete mathematics, especially graph theory. His insights, careful approach and writing influenced many mathematicians, especially in combinatorial matrix theory.

David's research initially focused upon vector sequence spaces but moved into topics related to ranks, exploring Boolean rank, nonnegative rank, and even introducing a new concept, Hermitian rank. He explored algebraic connections with some graph theoretic counting problems, like finding bounds on clique cover numbers, biclique partitions, and multiclique decompositions of graphs. He was fond of exploring variations on the Graham-Pollak theorem, a result which solves a purely combinatorial problem via clever algebraic means. Following along these lines, David has been keenly interested in eigenvalues of graphs and tournaments, exploring connections to inertia of graphs, spread of the eigenvalues of a graph, and most recently, relationships between eigenvalues and the size of matchings of a graph, or the independence number.

David Gregory made many contributions to these topics. The conference included presentations by both researchers who have collaborated with David (of which there are many), as well as other researchers who have been influenced by his work. A banquet was held at the University Club on June 20th, and many fond stories of David were shared.

The program included the following invited speakers: Richard Brualdi (University of Wisconsin), Sebastian Cioabă (University of Delaware), Randall Elzinga (Royal Military College), Robert Erdahl (Queen's University), Chris Godsil (University of Waterloo), Willem Haemers (Tilburg University), Steve Kirkland (University of Manitoba), Eric Moorhouse (University of Wyoming), Ram Murty (Queen's University), Naomi Shaked-Monderer (The Max Stern Yezreel Valley College), Claude Tardif (Royal Military College), Edwin van Dam (Tilburg University), Kevin N. Vander Meulen (Redeemer University College), and David Wehlau (Queen's University). Shaun Fallat (University of Regina) gave the the inaugural Hans Schneider ILAS Lecture.



Participants of the Conference in Honour of David A. Gregory

The Organizing Committee consisted of: Sebastian Cioabă, Ram Murty, Bryan Shader, Claude Tardif, Kevin N. Vander Meulen, and David Wehlau. The Organizing Committee gratefully acknowledges support from the Fields Institute for Research in Mathematical Sciences, the International Linear Algebra Society, and the Department of Mathematics and Statistics at Queen's University.

A special issue of the *Electronic Journal of Linear Algebra* will be dedicated to this conference.
