

Taking Stock in CS&E, Looking Ahead to a Dynamic Conference Season

Readers will deduce from the potpourri of topics presented here that SIAM is in the midst of an intensely busy time. What follows is information about recent and upcoming events, most of which should be of interest to many SIAM members.

Computational science and engineering was the focus of two activities in the past several months. The first, the biennial conference of the SIAM Activity Group on CS&E—now the largest of the SIAGs, with more than 900 members—was held in February in San Diego. (Phil Davis's article, beginning on this page, gives readers a glimpse of the special session held at the conference to commemorate the 100th birthday of John von Neumann, and the article by Tom Kormsmeier and Jun Zeng on page 3 elaborates on one application from Kormsmeier's invited talk.)

The other recent CS&E-related event was a workshop, held in Washington, March 24–25, expressly to produce a report on the growing field of CS&E. The report, now in preparation, will detail promises and requirements for research and education in the field. Organized and presided over by Margaret Wright and Juan Meza, the workshop featured many outstanding speakers and discussions. A list of speakers and topics can be found on the Web site of the SIAM conference department.

The workshop's strong focus on applied mathematics and computer science was intentional. While recognizing the importance of application disciplines—CS&E is an inherently interdisciplinary domain, lying at the intersection of applied mathematics, computer science, and many application domains in the sciences and engineering—this workshop emphasized topics close to SIAM, the part of computational science that can be thought of as “the science of computation.” The report will recognize the application disciplines and draw on similar explorations undertaken in other areas of science and engineering; the focus, however, will be on the contributions of modeling, numerical methods and algorithms, visualization and software, and other topics from applied mathematics and computer science that undergird computational science.

The workshop fostered many lively discussions, during the sessions and continuing in the weeks afterward. Among the more lively ongoing discussions has been an exchange on the contributions of algorithms to the speedup of computations—a “Moore's law” for algorithms. Widely considered as significant as the speedups from ever-smaller line widths and from the ability to pack increasing numbers of transistors onto small patches of silicon, speedups from algorithms are a harder story to tell. Nevertheless, by doing a complexity analysis (counting floating-point operations) on a sample problem, we can see considerable progress from algorithms over the past decades (e.g., from $O(n^7)$ to $O(n^3)$). This, of course, is a simplification—it is the combination of improved hardware (processing speed and storage) and new algorithms that take advantage of the improved hardware and architectures, along with advances in software and environments, that enable scientists and engineers to tackle complex problems that were not previously possible. This, in turn, permits the development and use of new mathematical models that were not practical in the past.

Other discussions at the workshop concerned the interdisciplinary nature of CS&E and the challenges posed by interdisciplinary research in general. Several speakers pointed to the Department of Energy's SciDAC program as an exemplary framework for supporting multidisciplinary work through teams, and the unique role of DOE labs in bringing together academic researchers and people from the labs to focus on real-world and “grand challenge”—scale problems. Consideration of such problems reveals many themes, including the need to compute across many scales (a challenge that is the inspiration for SIAM's newest journal, *Multiscale Modeling and Simulation*), the need to deal with massive amounts of data in novel ways, and the recognition of a stochastic component in most of the important phenomena. This recognition of the need for statistics, while not new, has grown stronger with the desire to quantify uncertainty in calculations and to deal with new types of problems in which some aspects can only be described probabilistically.

The day following the CS&E workshop was designated “Hill Day” by SIAM's Committee on Science Policy. A total of 12 SIAM members spent March 26 in Washington, visiting congressional members and staffers, with a goal of making legislators aware of important issues in science policy and funding. Two teams visited ten offices in the course of the day, speaking about the importance of science in general to the economy, security, and welfare of the nation, and the role of mathematics and computational science in particular as an important part of the scientific enterprise. The visitors discussed the National Science Foundation budget and funding issues in DOE's Office of Science and responded to many questions about issues in homeland security.

One important issue not discussed, but under consideration by the science policy committee, is the delays experienced by students from many countries when they apply for visas to study in the U.S. The appropriate people need to be made aware of the obstacles and delays faced by these students; we will be providing guidance for a letter-writing campaign in the weeks to come.



Backed by a poster closer to the era of von Neumann et al., the group of “Hill Day” participants shown here gathered to discuss a topic of considerable current interest: funding for science in a time of large federal deficits. Confering with Joel Parriott of the Office of Management and Budget (second from left) are (from left) SIAM past president Tom Manteuffel, president Mac Hyman, and executive director Jim Crowley.

Finally, a word about future conferences. Rapidly approaching is the 2003 SIAM Annual Meeting, which will be held in Montreal, June 16–20. This is not the first time we have met in Canada, but it is the first time we have joined with CAIMS, the Canadian Applied and Industrial Mathematics Society, to organize an annual meeting.

This is a traditional SIAM meeting—for and by the SIAM community. The conference themes combine hot topics with practical relevance and hard mathematics: fluid dynamics, the environment, mathematical biology, nanoscience, quantum computing, and numerical methods.

The program promises to be exciting, beginning with the three plenary speakers: Raymond Laflamme (Waterloo), on robust quantum information; Eli Yablonovitch (UCLA), on photonic crystals; and Michel Delfour (Montreal), on control problems in which geometry is a control or optimization variable. Special speakers include Heinz-Otto Kreiss (UCLA), this year's John von Neumann lecturer, and Tom Manteuffel, who will give the past president's address. The plenary talks are supplemented by a set of invited "topical" talks, along with the usual strong slate of minisymposia and contributed talks.

Montreal, according to our organizer, Ilse Ipsen, is "the most extraordinary city in North America." The weather in Montreal is usually excellent at this time of year, and our meeting coincides with the Montreal Grand Prix. The city's atmosphere and food are magnificent at any time.

Go to <http://www.siam.org/meetings/an03/> to register, if you haven't done it already.

The ICIAM organizers also anticipate a large conference, with 2000 talks scheduled for the week of July 7–11, in Sydney, Australia. This quadrennial conference dominates the applied mathematics calendar for 2003 with its diverse array of talks and minisymposia spanning the breadth of applied and computational mathematics.

In addition to these large general meetings, SIAM will run several specialty conferences between now and the end of the summer. The SIAM Conference on Dynamical Systems (aka Snowbird), May 27–31, promises to attract a record-setting attendance. The program emphasizes many aspects of dynamical systems, including multi-scale phenomena and fluid dynamics, with interesting applications like the coordinated dynamics of autonomous vehicles. Spatiotemporal dynamics also plays a major role, with talks on applications in motor networks and in the analysis of patterns of gene expression.

The SIAM Conference on Mathematics for Industry, June 23–25 in Toronto, is the first of its kind. Initiated by the SIAM Great Lakes Section, the meeting promises to "put the I back in SIAM" by focusing on a set of topics in applied mathematics relevant to industry. The major motivation for this technical conference has been the development and encouragement of industrial, government, and academic collaboration.

Finally, the SIAM Conference on Linear Algebra will feature a lively selection of talks at the College of William & Mary, in Williamsburg, Virginia, July 15–19. (See James Nagy's item on page 3 for one example.) The conference features talks on matrix theory and computational linear algebra, as well as interesting applications, such as lattice QCD calculations and quantum computing, data mining, and biomedicine.—*James M. Crowley*