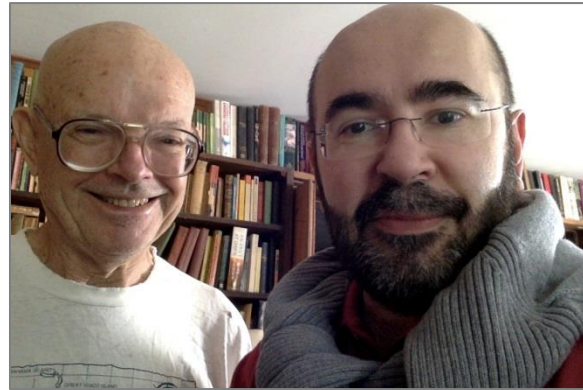




50, 75, 250,000: DIMACS Commemorates the OEIS

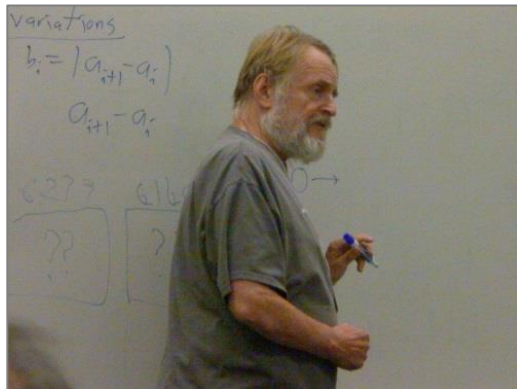
[November, 2014] Sequences play an important role in number theory, combinatorics, and discrete mathematics (among other fields), and arguably no one has done more to highlight this role than Neil J. A. Sloane. The DIMACS Conference on Challenges of Identifying Integer Sequences, held on October 9-10, 2014, celebrated Sloane's 75th birthday and paid tribute to the On-Line Encyclopedia of Integer



Neil Sloane and fellow OEIS editor-in-chief Olivier Gérard discuss sequences after the conference

Sequences® (OEIS®), the massive catalog of sequences that he created. With roughly 100 registered participants, it was one of the largest events held so far this year at DIMACS. Among the participants were many long-time editors and contributors to the OEIS who have communicated for years but met for the first time at the conference.

By gathering sequences – and a wealth of information about them – together in a common database, the OEIS provides the mathematically curious an invaluable resource with which to explore. It all began in 1964 when Sloane was a graduate student at Cornell. He happened upon a sequence that began “0, 1, 8, 78, 944...” Interested in getting additional terms in the sequence,



John Conway presents during the conference

Sloane perused books in the library but was unable to find a reference to this particular sequence. To keep track of this and other sequences, he began recording them on index cards sorted in lexicographic order. By 1967, the sequences were transferred to punched cards, and, in 1973, they were published in a book, *A Handbook of Integer Sequences*, containing 2,372 sequences. Almost immediately, Sloane began receiving correspondence from all over the world with suggestions for additional sequences and updates to existing ones. Over the next 20 years, the collection

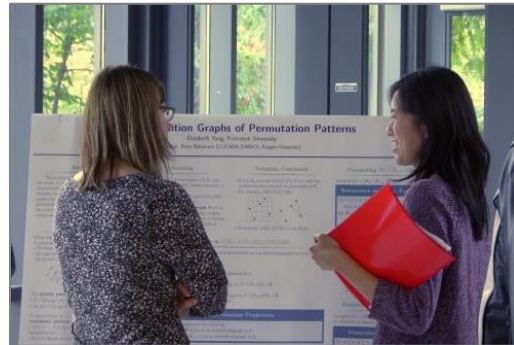
grew and eventually led to the publication of a second book of 5,487 sequences. Once again, suggestions poured in as soon as the new edition appeared. In 1996, Sloane launched the On-Line Encyclopedia of Integer Sequences as part of his homepage at AT&T Research, and it remained there until 2009 when a non-profit foundation, The OEIS Foundation Inc., was set up to own and operate it.

The database went online with approximately 10,000 sequences. Liberated from the constraints of print media, the OEIS is now growing at a rate of roughly 15,000 entries per year and will soon surpass 250,000 total entries. Each entry typically contains a variety of useful information – the initial terms of the sequence, formulas, references, relevant links, Maple or Mathematica

programs to generate it, etc. – harvested from a crowd of trusted sources. An early and compelling example of crowdsourcing, the OEIS provides a resource for researchers and recreationalists alike and exemplifies the spirit of “if you build it they will come.”

The research impact of the OEIS is impressive. There are currently more than 3,000 papers and books in mathematics, computer science, engineering, physics, and many other branches of science that reference and/or acknowledge the OEIS. Conference speakers highlighted past breakthroughs and existing open problems, discussed some of the many contributions of the OEIS to research, and identified a “wish list” of features for the future OEIS. Several speakers

talked of sequences as an entry into mathematics: Douglas Hofstadter (Indiana University) described his teenage fascination with integer sequences; Jeffrey Shallit (University of Waterloo) spoke of how he struck up a correspondence with Sloane after receiving his book for Christmas in 1974; and Lara Pudwell (Valparaiso University) gave examples of how the OEIS makes undergraduate



Elizabeth Yang (r) describes her research from the 2014 DIMACS REU during the conference

students “more powerful”. Conference speakers Sara Billey (University of Washington) and Bridget Tenner (DePaul University) described how the OEIS can make mathematicians of all levels more powerful, saying in their recent paper that “each entry in the OEIS chronicles a mathematical theorem, and the integer sequence associated with the entry is that theorem’s fingerprint. The OEIS is arguably the most established fingerprint database for theorems to date.” In their talk, they went on to suggest ways in which the OEIS and other fingerprint databases could be enhanced to be even more empowering to researchers. The conference didn’t just celebrate OEIS. It looked ahead to the next 50 years with extensive discussion of how to expand use of OEIS by high school and college students, how to improve its utility to researchers, and how to improve workflow to avoid backlogs in vetting new contributions.

On the importance of OEIS and the magnitude of Sloane’s contributions to the mathematics community, conference co-organizer Doron Zeilberger states on his website (in Opinion 124), “True, Neil did not prove Fermat’s Last Theorem, nor did he prove the Poincaré Conjecture, nevertheless, the impact of his brainchild OEIS (On-line Encyclopedia of Integer Sequences) on today’s (and tomorrow’s!) mathematical research far surpasses that of any living mathematician.” That impact continues to grow with the OEIS.

Related Links:

- DIMACS Conference on Challenges of Identifying Integer Sequences: <http://dimacs.rutgers.edu/Workshops/OEIS/>
- Neil J. A. Sloane: <http://neilsloane.com/>
- OEIS: <http://oeis.org/>
- Videos of conference presentations: <http://www.math.rutgers.edu/~zeilberg/oeis50.html>