



The 17th Annual Conference will be held in Denver, CO, 19-21 June 2014. Visit the "Events" page at the web site below for details.



From the 2013 Conference. Above: A Roundtable Discussion group. Below: Mark Daniels (L) and Michael Starbird reporting on the IBL Center at the University of Texas at Austin.



INSIDE

New Book on Mathematics through Inquiry

"We are IBL:" Inquiry-Based Learning at the 16th Annual Legacy of RL Moore Conference

"We" refers to everyone interested in sharing experiences under the general rubric of IBL.

The gathering in Austin 13-15 June 2013, co-sponsored by the Mathematical Association of America, continued the trend of previous years: an increased proportion of new faces among the 250 attendees and a greater variety of teaching practices to share, mainly in undergraduate mathematics.

A generational shift has also been evident. A few attendees had a history of IBL exposure going back to when they were students of Dr. Moore or of his students 40 years ago or more, but the large majority is now a younger generation from other mathematical lineages. Different backgrounds, different teaching preferences, often described using terms such as "student-centered", "guided discovery", "active inquiry", "process oriented", and "problem oriented", but all converging on the basic idea of learners creatively engaging in mathematics.

One of the most unusual and best received plenary talks at any conference was given by Coke Reed, founder of Data Vortex Tech-

Please see [Conference](#), p. 2.

News Items

Marina Kogan and Sandra Laursen of the Ethnography and Evaluation Research team at the University of Colorado have another publication based on their large study of IBL mathematics as implemented at the four universities hosting IBL Math Centers and described in previous newsletters. The latest in 2013 is "Assessing long-term effects of inquiry-based learning: A case study from college mathematics," *Innovative Higher Education*, 39(3), available under Open Access through the publisher, Springer. Their work on the original large study was cited in an article in the January 2014 *Notices of the AMS*, "Persistent Learning, Critical Teaching: Intelligence Beliefs and Active Learning in Mathematics Courses" by Benjamin Braun.

Please see [News](#), p. 3.

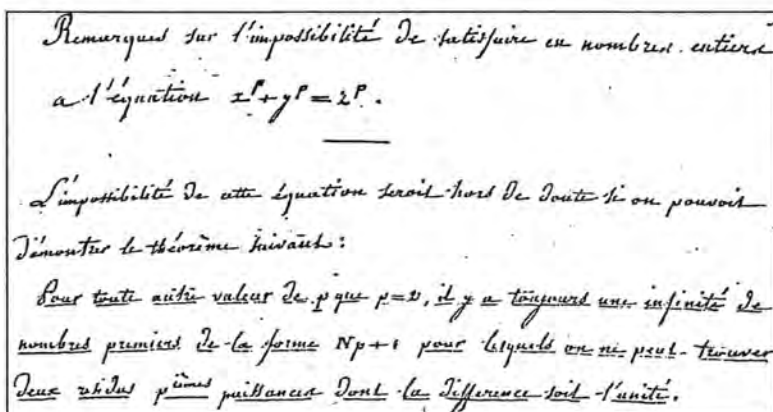
Conference continued from p. 1

nologies in Austin, a student of Moore and Moore's colleague at Texas, H.S. Wall. His "Mathematical Heroes" described a chain of remarkable discoveries of individuals through history including Gauss's work leading to the fast Fourier transform, a problem in the Scottish Book worked on by Polish mathematicians, Seymour Cray's supercomputer, and Reed's teachers. All of these and others he described form a chain of influences still affecting current work, such as Reed's own contributions to parallel computing architecture.

All are also examples of the confident, independent thinkers that teachers hope their students become.

Historical examples played a key role in another plenary presentation, by David Pengelley. Study of classical works from past masters, such as that by Sophie Germain below, can provide lessons on the creative process. Important results are often not easy to obtain and require a degree of trial and error, of conjecture and refutation. Exposure to the sources where a concept first arose can help lead a student to a more authentic appreciation of mathematical proof.

Pengelley and others have developed guided discovery paths in over 30 projects via read-



Manuscript of Sophie Germain, "Remarks on the impossibility of satisfying in whole numbers the equation $x^p + y^p = z^p$." Undated, prior to 1819.



Coke Reed

SCOTTISH BOOK #110

Let M be a Given Manifold. Does there exist a numerical constant K such that every continuous mapping f of the manifold M into part of itself which satisfies the condition $|f^n(x) - x| < K$ for $n=1,2,\dots$ [where f^n denotes the n^{th} iteration of the image $f(x)$] possesses a fixed point: $f(x_0) = x_0$?

ings and sequences of student tasks for a number of the standard undergraduate courses in discrete mathematics.

The projects have been published by the MAA, some in the book *Resources for Teaching Discrete Mathematics*, the rest in the MAA's online journal *Convergence*.

IBL in High Schools

The focus of the conferences has been on undergraduate mathematics and publicity for it has not extended appreciably beyond that community. However, as the reputation of the conference has spread, secondary mathematics teachers have joined and been very much welcome. In fact, teachers of any subject at any level can probably benefit from participation and are invited to attend.

For example, Ruthmae Sears of the University of South Florida shared ideas on how to overcome the fact that most high school text books offer little if any opportunity for students to be introduced to mathematical proof.

News continued from p. 1



Ruthmae Sears

First-time attendee Justin Lanier teaches mathematics for middle and high schoolers at Saint Ann's School in Brooklyn. He used one of the impromptu five-minute speaking slots to describe examples of on-line outreach and community building such as can be found by looking up MathTwitter-Blogosphere on the web.

The Conference in the Media

An insightful account of the whole conference by Katharine Merow appeared in *MAA FOCUS* for August/September, pp. 22-24, available at maa.org.

YouTube videos of all 50 presentations plus the five-minute talks are available at LegacyRLMoore.org/library2013.



From the left: Michael Gagliardo (California Lutheran University), Stan Yoshinobu (CalPoly, San Luis Obispo), Chuck Hayward (University of Colorado, Boulder).

In addition, Laursen is the Principal Investigator for a \$500,000 NSF grant awarded for a project in which EAF is participating entitled "The Spread of Inquiry-Based Learning in Undergraduate Mathematics: An Ecosystem Approach to Studying a Community of Educational Change."

Angie Hodge (University of Nebraska, Omaha) and Dana Ernst (Northern Arizona University) have begun the *Math Ed Matters* as a new blog sponsored by the Mathematical Association of America. Hodge and Ernst are special project coordinators for the Academy of IBL. maamathedmatters.blogspot.com

In June 2013 Edward Burger became president of Southwestern University, a liberal arts institution of some 1,500 students and the oldest university in Texas. While in his previous position as a mathematics professor at Williams College, Dr. Burger was a trustee of EAF and co-author with Michael Starbird of several books with an IBL theme, the latest being *The 5 Elements of Effective Thinking*, described in the June 2013 Newsletter. As the photograph of a new building site indicates, he is making IBL a theme of Southwestern.

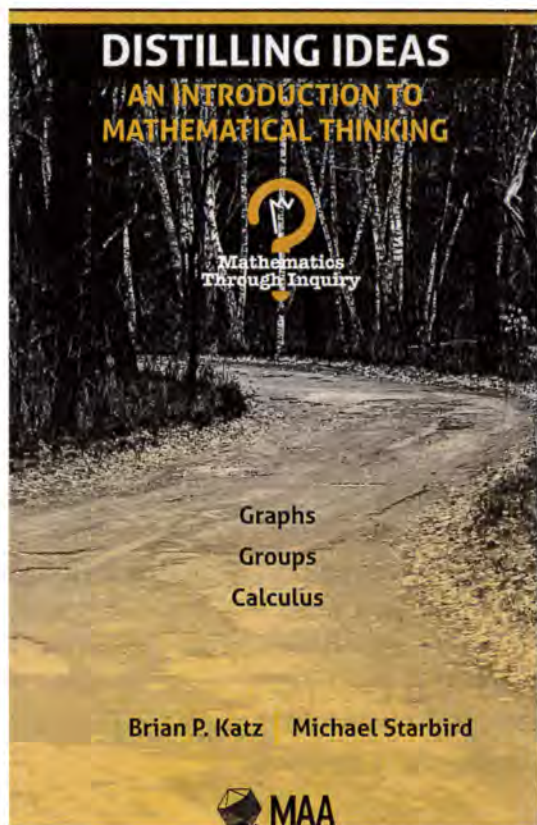


Featured Publication

Mathematics Through Inquiry

Complementing the earlier *Number Theory Through Inquiry* by D.C. Marshall, E. Odell, and M. Starbird, *Distilling Ideas* by Brian Katz and Michael Starbird is a textbook for an introduction to proof course that deals with graphs, groups and epsilon-delta calculus. From the cover blurb:

Each topic is accessible to users without a background in abstract mathematics because the concepts arise from asking questions about everyday experience. All the common proof structures emerge as natural solutions to authentic needs.



*Distilling Ideas:
An Introduction to Mathematical Thinking;
Graphs, Groups, Calculus,*
Brian P. Katz and Michael Starbird
The Mathematical Association of America, 2013.

The word “mathematics” is derived from the Greek term *mathematikos*, meaning “inclined to learn’ ... [M]athematicians are “universal learners” trained to employ certain skills in response to any new idea. (p. 1)

A Gift to the Future

The Foundation is grateful for recent contributions from individuals. Such gifts help to shape our response to the urgent need to improve student performance in science, technology, engineering, and mathematics. Guided inquiry, as part of the total learning environment, improves students’ creativity and problem solving abilities. Your support will help us increase the impact of our existing programs and extend efforts to new initiatives.

During the year 2014, **all gifts will be matched** one-to-one by an anonymous donor up to a total match of \$100,000.

You can send a tax deductible contribution to The Educational Advancement Foundation at:

327 Congress Avenue, Suite 500, Austin, Texas 78701-3656.