VINCENT LUCARELLI

# A Student Visits Mathfest

As a freshman, I knew very little about the life of a professional mathematician. I only saw professors in my department teach and research. I did not know who was in the math community or the areas of current research outside the department either. Fortunately, my advisor knew the benefits of attending professional meetings and convinced me to attend Mathfest, the joint summer meeting of the Mathematics Association of America, MAA, and Pi Mu Epsilon, $\pi\mu\varepsilon$, in Burlington, Vermont in 1995.

Full of anticipation, I arrived at school (Youngstown State in Ohio) early on a rainy morning—too early to remember. Four other students and I quickly loaded the leaky school van and embarked on a longer-than-expected escapade through the Adirondacks. After making a few wrong turns and negotiating mountain roads in a driving rain storm, we found Vermont.

I had heard a little about events for students at the summer meeting from my professors; once there, I quickly found that there are many presentations, meetings, and workshops during the four days. Our first activity was an ice cream social where I got to meet other undergraduates from across the country who were interested in and enthusiastic about mathematics. Some schools send five or ten students and others send one.

Meeting other people is easy, and even if you do not know anyone when you arrive, you will never be alone.
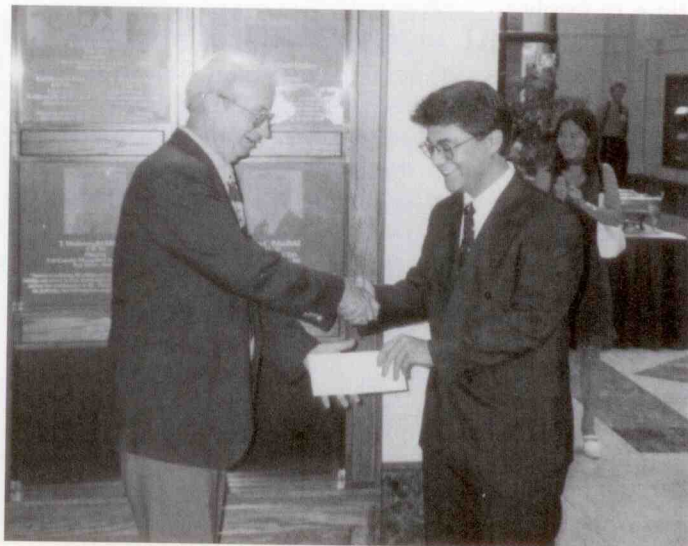
I found Mathfest so enjoyable that I attended the next three years in Seattle in '96, Atlanta in '97, and Toronto last year. I had never been to these cities, and the evenings provided an excellent time to see the sights. Finding other students eager to have fun out on the town is not a problem.

Many of the students come to give a talk at the student sessions, but not all. Usually the student sessions are spread over two days. Besides awaiting their fifteen minutes of fame while presenting, students can enjoy many of the other activities. The Earle Raymond Hedrick lecture series is one of the annual events. Some of the lectures in the series are accessible to undergraduates; other parts are more advanced. A highlight of the invited addresses each year is the $\pi\mu\varepsilon$ J. Sutherland Frame lecture after the student banquet. Dr. Joseph Gallian from the University of Minnesota, Duluth gave

the Frame lecture this past year in Toronto. He gave an unforgettable, and funny, presentation, "Breaking Drivers License Codes." The large crowd gave him a standing ovation.

The MAA sponsors student workshops and mini-courses on various topics. The artist/mathematician Helaman Ferguson drew one of the largest crowds in Toronto with his workshop, "Mathematics in Stone and Bronze." Workshop participants reproduced one of his Klein bottle sculptures using bagels.

Besides the fun and the great lectures and presentations, the summer meeting provides an opportunity for undergraduates to talk about doing real mathematics. My first year, I worked closely with my advisor to prepare a presentation on the Brachistochrone problem posed by Bernoulli and solved by, among others, Newton. I was nervous that first time, but after I finished I realized how much I liked mathematics and telling others about it. The MAA and $\pi\mu\varepsilon$ pick several outstanding student papers each

VINCENT LUCARELLI, a graduate of Youngstown State University, is currently pursuing a PhD in math at the University of Chicago. Vince is a two-time winner of a $\pi\mu\varepsilon$ prize for an excellent presentation by a student at Mathfest.

The author receiving an award from Richard Poss, president of Pi Mu Epsilon, at the Atlanta Mathfest.

*Courtesy of Doug Faires.*
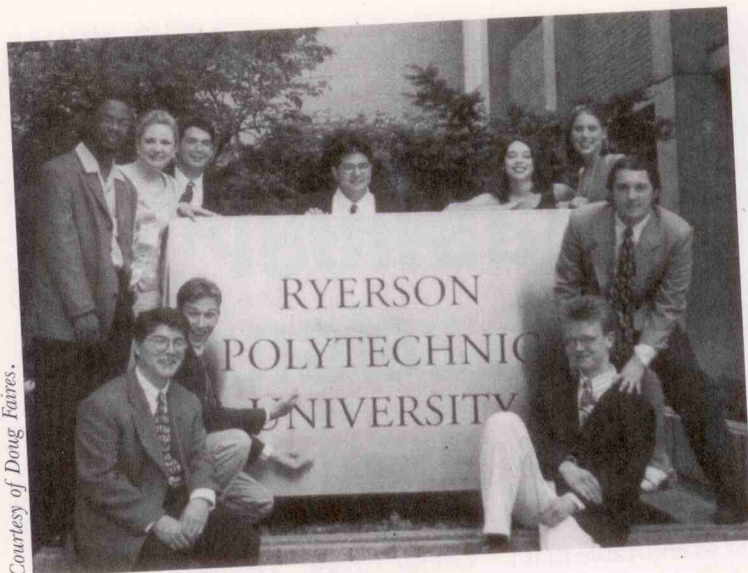
*Vince and friends at Mathfest in Toronto.*

year and present monetary awards at the $\pi\mu\varepsilon$ student banquet. Although I was not recognized that year in Burlington, the exposure to other undergraduates doing mathematics inspired me.

The meeting was in Seattle in 1996 and I wanted to participate. I needed a problem. Someone had mentioned that RSA public key encryption might provide a suitable topic. I went off to the Internet and quickly learned that factoring large numbers was equivalent to breaking RSA. During a particularly dry psychology lecture one day, I had an idea about how to factor numbers. Over the following months, I developed a new method. An overview of RSA provided a perfect introduction to the factoring method I presented.

After Seattle, I prepared a historical account of primality testing for the Atlanta meeting. This was at the end of my junior year, the time to apply to graduate schools. I am convinced the presentations at both the summer meetings and other regional meetings during the year made my applications more compelling. I was accepted by the University of Chicago, where I am currently pursuing my doctorate.

My final summer meeting as an undergraduate was in Toronto. I presented a portion of my senior project on elliptic curve factorization. I decided to present something that I loved, because that makes the best presentation, but the talk was too long and a little too advanced for a 15 minute student session.

All this experience has given me an idea of how to go about generating and presenting a good 15 minute presentation. Your first technical presentation to peers might be a little intimidating. Finding the topic and material might be a little frustrating, but knowing the topic well will provide you the confidence to make the presentation and not fear any questions from the audience.

Before you pick your topic, you should "know your audience," but knowing your audience for a technical presentation is tricky. For the student sessions, assume a basic freshman knowledge and build on that idea. Pick a topic that either a freshman has likely heard about or one that you can introduce well in a minute. This does not mean you should not consider advanced topics, just that the harder the topic the harder you must work to make it accessible. Nothing is worse than confusing the audience.

Topics are plentiful. Ask your advisor or favorite math professor, check the problem section in math journals, and search the Internet. Some of the best presentations result from an analysis of a specific problem or brain game. Do not be afraid to try and solve a hard applied problem, perhaps by making some simplifying assumptions. At the Atlanta meeting, a student presented his optimal soda can, a problem on which Coca-Cola has spent millions. Summer research topics from an REU are also popular, but be sure you do not try and use your final presentation at the summer meeting: you have a totally different audience that has not studied the topic all summer.

Once you have a topic idea, gather research. That is easy. The library, the Internet, and your advisor are great sources. Yes, you should have a faculty member to oversee your work. He or she can help answer your questions, provide guidance, and help refine your work into an understandable and enjoyable presentation. Sometimes the simplest suggestion or hint will end your frustration.

Read what you have gathered and try to understand everything. Studying the details until they are automatic helps you formulate an intuitive presentation and gives you confidence. During this pro-

## Awarding-winning Students

At Mathfest 1998 in Toronto the MAA awarded prizes to ten student presenters. These prizes of $150 each are funded by the Exxon Education Foundation. The winners were:

Christos Athanasiou, University of Massachusetts–Lowell
Jeremy Dill, Pittsburg State University
Andrei Gnepp, Harvard University
Andrew Hetzel, University of Dayton
Yvonne Lai, Massachusetts Institute of Technology
Kuan Ju Liu, Harvard University
John Maki, University of Kentucky
Daniel Sheldon, Dartmouth College
Sean Simpson, Canisius College
David Wildstrom, Montgomery Blair High School

Pi Mu Epsilon also organized a session of student paper presentations at Mathfest and awarded prizes for each of six presentations. The $100 prizes are funded by the American Mathematical Society. The winners were:

Joe Ferguson, Youngstown State University
Nathan Gibson, Worcester Polytechnic Institute
Stephen Hartke, University of Dayton
Kimball Martin, University of Maryland, Baltimore County
John Slanina, Youngstown State University
Stephen Bochanski and Harry Smith, St. Joseph's University

cess, maybe your focus will shift to a different idea. Follow your curiosity: it is much easier to study the material in depth if it is interesting to you.

If you plan to present a survey of a topic, you're probably ready to begin crafting a presentation. Original work requires more time and effort, but is more personally rewarding. Beginning in the fall for the summer meeting allows for some time to do original work.

Developing your presentation from the research is not difficult. Try to make successive simple links from an idea that your audience knows to the final results. A link should not require more than a minute or so of discussion. Transparencies are the classic medium for presentation, but a few brave people are using computer presentation software. In either case you need to present each link on a single viewing page, which I will call a slide.

Slides should not be crowded or messy. Do not plan on reading the slide to the audience, they most likely can read. Instead, craft each slide to provide the most important information in that link. Overlays, as opposed to using overhead pens, are a good way to add to a particular slide during a presentation. Do not count on a blackboard being available.

Remember your time limit. If you present an engaging topic, people will most likely ask questions. A minute or two for introduction and history, eight to ten minutes for the actual topic, and one to two minutes for a conclusion. Most proofs are not necessary and con-

fuse the issue, but sometimes a single interesting, edifying, beautiful proof could be the entire presentation. Visual representations such as graphs or flow diagrams are a wonderful aid: the audience can easily forget words, but visual cues help clarify complex ideas.

Do not assume your first draft is your final draft. Present your talk to your advisor, friends, and other faculty to get suggestions to test the clarity of your presentation. Take all the criticism you can get.

Practice your talk—a lot. It is better to get clarifications from people who want to help you than questions from a confused audience.

Some people dress formally for their presentation, dress or coat and tie, others are more casual. Still others dress in day-old clothes because their luggage was lost. By the way, if you fly to the meeting, always include your presentation in carry-on luggage. You can deal with not having clean clothes at your talk, not having your slides could be a disaster.

Pi Mu Epsilon and MAA try to provide some financial support for student presenters to defray travel expenses, but funding is always tight and the policy can change. If your department does not send students, do not be afraid to ask for funding. Ask your advisor or department chair first; sometimes you have to go as far as your dean or provost, but somebody has money to support student activities.

Meeting people, sharing your work, hearing what your peers are doing, and learning new mathematics: that's what

professional mathematicians do at conferences. The MAA and $\pi\mu\varepsilon$ make a deliberate effort to give undergraduate students these same experiences at Mathfest. They succeed. Come to Providence this summer, July 31–August 2 to experience Mathfest for yourself. ■