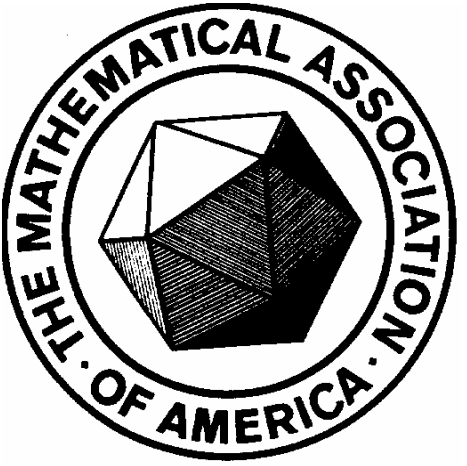
The Mathematical Association of America
New Jersey Section



Fall Meeting
Seton Hall University
South Orange, NJ

Saturday, November 4, 2006

Abstracts and Biographies of Speakers

Antibody dependent enhancement: Complex dynamics in the evolution of diseases

Lora Billings, Montclair State University

As we become more sophisticated in our resources to fight disease, pathogens become more resilient in their means to survive. Antibody dependent enhancement (ADE), a phenomenon in which viral replication is increased rather than decreased by immune sera, has been observed in vitro for a large number of viruses of public health importance, including flaviviruses, coronaviruses, and retroviruses. The most striking in vivo example of ADE in humans is dengue hemorrhagic fever, a disease in which ADE is thought to increase the severity of clinical manifestations of dengue virus infection by increasing virus replication. We examine the epidemiological impact of ADE on the prevalence and persistence of viral serotypes.

Using a dynamical system model of n co-circulating dengue serotypes, we study both autonomous and seasonally driven outbreaks in a model containing ADE. For sufficiently small ADE, the number of infectives of each serotype synchronizes, with outbreaks occurring in phase. When the ADE increases past a threshold, the system becomes chaotic, and infectives of each serotype desynchronize. However, certain groups of the primary and secondary infectives remain synchronized even in the chaotic regime.

We find that ADE may provide a competitive advantage to those serotypes that undergo enhancement compared to those that do not, and that this advantage increases with increasing numbers of co-circulating serotypes. Paradoxically, there are limits to the selective advantage provided by increasing levels of ADE, as greater levels of enhancement induce large amplitude oscillations in incidence of all dengue virus infections, threatening the persistence of both the enhanced and non-enhanced serotypes. We also investigate the complications in developing a vaccination for a virus with ADE.

Though the models presented here are specifically designed for dengue, our results are applicable to any epidemiological system in which partial immunity increases pathogen replication rates.

Lora Billings is an Associate Professor at Montclair State University. She received her Ph.D. in Applied Math from the University of Colorado, Boulder. Her training is in chaos and dynamical systems, but her recent research has applications in epidemiology and mathematical biology.

A Definition of Mathematics and Its Pedagogical Consequences
Guershon Harel, University of California - San Diego

Judging from current textbooks and teaching practices, teachers at all grade levels, including college instructors, tend to view mathematics in terms of subject matter, such as definitions, theorems, proofs, problems and their solutions, and so on, not in terms of the conceptual tools that are necessary to construct such mathematical objects. While knowledge of and focus on subject matter is indispensable for quality teaching, we argue it is not sufficient. Teachers should also concentrate on conceptual tools such as problem-solving approaches and beliefs about mathematics, which, we argue, constitute an important category of knowledge different from the subject matter category. Two main questions will be addressed in this presentation: What exactly are these two categories of knowledge? And what is the basis for the argument that both categories are needed?.

Guershon Harel is Professor at the Mathematics Department at the University of California, San Diego. Previously he served as Associate Editor of the American Mathematical Monthly, co-editor of the Research in Collegiate Mathematics Education Series, and Chair of the Editorial Board of the Journal for Research in Mathematics Education. Harel has research interest in cognition and epistemology of mathematics and their application in mathematics curricula and the education of mathematics teachers. Until the mid nineties, Harel's research interest revolved around the Multiplicative Conceptual Field and Advanced Mathematical Thinking, with particular attention to the learning and teaching of proof, linear algebra, and calculus concepts. He is co-editor of two books in these areas: *The development of multiplicative reasoning in the learning of mathematics* and *The concept of function; aspects of epistemology and pedagogy*. Since the mid nineties, he centered his attention on the learning and teaching of proof and the development of a conceptual framework, called *DNR-based instruction in mathematics*, for the teaching of mathematics.

A New Primal Screen
Carl Pomerance, Dartmouth College

How fast can one determine if a given number is prime or composite? This question, which was first posed explicitly by Gauss in 1801, has been the subject of much attention in the computer age. In August, 2002 Agrawal, Kayal and Saxena announced a new and surprisingly simple deterministic algorithm that runs in polynomial time (within a fixed power of the number of digits of the number in question). Their algorithm gives a satisfying conclusion to a centuries-long quest. It is still hard for me to believe it, but at the time, Kayal

and Saxena had just graduated with their bachelor's degrees---this project comprised their (joint) senior thesis.

Carl Pomerance received his B.A. from Brown University in 1966 and his Ph.D. from Harvard University in 1972 under the direction of John Tate. Currently he is a mathematics professor at Dartmouth College, after previous positions at the University of Georgia and Bell Labs. A number theorist, Pomerance specializes in analytic, combinatorial, and computational number theory, with applications in the field of cryptology. He considers the late Paul Erdos as his greatest influence.

Abstracts and Biographies of Workshop Leaders

Sharing Session on Teaching Teachers

Amy Cohen, Rutgers University

We will offer each participant about 5 minutes to make a suggestion or to ask a question about the mathematical education of prospective teachers. The workshop will then discuss that topic for about 5 minutes more before moving on to the next question or suggestion. Participants will be encouraged to exchange names and e-mail addresses to continue the conversation later. Since NJ is introducing a middle grades specialization in math, discussion of middle grades content is particularly encouraged.

Amy Cohen has taught for over 30 years at Rutgers. For over 15 years she has focused on ways to make the undergraduate education in mathematics more satisfying for students and faculty alike. For the last 6 years she has focused especially on the mathematical education of future teachers. Using the MET report and collaborating with colleagues in mathematics education, she developed and taught a course “Connecting Advanced Math to High School Content” for students in the masters year of Rutgers’ Five Year Certification Program in Mathematics. This course makes explicit the ways that content of upper level mathematics major courses provides deeper understanding and cohesion for topics in the NJ secondary mathematics standards.

DNR-Based Instruction in Mathematics: A Conceptual Framework for Effective Teaching

Guershon Harel, University of California - San Diego

The workshop builds on the themes presented in the talk. The answers to the two questions addressed in the presentation draw upon epistemological, cognitive, and pedagogical considerations, and are oriented within a broader theoretical framework called *DNR-based instruction in mathematics* (*DNR* for

short). *DNR* stipulates conditions for achieving critical goals such as provoking students' *intellectual need* to learn mathematics, helping them acquire mathematical ideas and practices, and assuring that they internalize, organize, and retain the mathematics they learn. The workshop will focus on the three foundational principles of *DNR: Duality, Necessity,* and *Repeated Reasoning.*

See his biography under his talk, above.

ANNOUNCEMENTS

Lunch discussion tables for the Fall 06 meeting, organized by Theresa Michnowicz, New Jersey City University.

There will be six discussion tables at lunch, as well as tables dedicated to Project NJ-NExT participants.
1. The role of math in biology and other life sciences, led by Lora Billings, Montclair State University
2. What is the nature of the mathematical knowledge that we want students to acquire? led by Guershon Harel, University of California - San Diego
3. Unsolved problems that can be discussed in class, led by Carl Pomerance, Dartmouth College
4. Getting published -- books and articles, led by Patricia Kenschaft, Bloomfield College
5. Should Statistics be Taught as a Science or as Mathematics? led by Mark Bailey, SAS
6. Has the nature of proof changed? led by Bonnie Gold, Monmouth University
Those who pre-registered (online or during morning registration) have priority at these discussion tables. We look forward to a set of lively and interesting discussions!

Election of MAA-NJ Officers
As per our newly revised by-laws, elections will be held at this meeting.

Slate of candidates proposed by the nominating committee:

Chair-elect:	Hieu Nguyen, Rowan University
Vice-Chair for Speakers:	Bonnie Gold, Monmouth University
Vice-Chair for Two-Year Colleges	Carol Avelsgaard, Middlesex County College
Vice-Chair for Student Activities	Lawrence D'Antonio, Ramapo College
Vice-Chair for Innovations	Theresa C. Michnowicz, NJ City University
Treasurer	Karen Clark, The College of New Jersey

Nominations will also be accepted from the floor.

(continued page 7, after schedule)

Mathematical Association of America
New Jersey Section
Fall 2006 Meeting Program
All talks (except workshops) in Jubilee Hall Auditorium

8:30 – 9:30	Registration and Coffee, Jubilee Hall, first floor
8:30 – 1:30	Book Exhibits, Jubilee Hall 211
9:30 – 9:40	**Welcome by Father C. Anthony Ziccardi, S.S.L.** Executive Director of Mission and Ministry, Seton Hall University
9:40 – 10:30	**Antibody dependent enhancement: Complex dynamics in the evolution of diseases** ***Lora Billings,*** Montclair State University Presider: Mark Korlie, Montclair State University
10:30 – 11:10	Intermission (Coffee and Book Exhibits)
11:10 – noon	**A Definition of Mathematics and Its Pedagogical Consequences** ***Guershon Harel,*** University of California - San Diego Presider: Kaaren B. Finberg, Ocean County College
Noon – 1:30	Lunch, Main Lounge, Bishop Dougherty University Center) (Book exhibits end at 1:30)
1:30 – 2:45	**Simultaneous workshops:** **Sharing Session on Teaching Teachers** *Jubilee Hall 214* ***Amy Cohen,*** Rutgers University Presider: Elizabeth Uptegrove, Felician College **DNR-Based Instruction in Mathematics: A Conceptual Framework for Effective Teaching** *Jubilee Hall Auditorium* ***Guershon Harel***, University of California - San Diego Presider: Bonnie Gold, Monmouth University
2:45 – 3:15	Intermission (Silent Auction bidding ends at 3:15)
3:15 – 3:30	Section business meeting, including elections

3:30 – 4:20	**A New Primal Screen** ***Carl Pomerance***, Dartmouth College Presider: Pangyen Ben Weng, Ramapo College
4:20	Drawing of door prizes and announcement of Silent Auction Winners (must be present to win)
5:00	Dinner honoring invited speakers

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(continued from p. 5)

DINNER HONORING INVITED SPEAKERS
The Section will honor the invited speakers at dinner following the meeting. Everyone is cordially invited.

MAA-NJ Spring 2007 Meeting: Euler 300th Anniversary Meeting
Mark your calendar for the Spring 2007 meeting, celebrating the 300th anniversary of the birth of Leonhard Euler (born April 15, 1707). It will be held at Rowan University, Glassboro, NJ on Saturday, March 31, 2007 in conjunction with the fourth annual *Garden State Undergraduate Mathematics Conference*. We have a program that you won't want to miss. The invited speakers will be Bill Dunham, Thomas Osler, and Peter Sarnak as the joint speaker with GSUMC.

Call for contributed papers / lunch table discussion topics, Spring 2007 Meeting
There will be one general contributed paper session and three special sessions at the MAA-NJ Spring 2007 Meeting. All papers will be reviewed by organizers and the selection committee. Please submit *title*, three to four line *summary* for the program, and *one page abstract* by **February 23**, 2007, to the organizer of the session. Theresa C. Michnowicz, New Jersey City University, tmichnowicz@njcu.edu, 201-200-3219 is the organizer of the general session. The special sessions are The Life and Work of Leonard Euler, organized by Larry D'Antonio, Ramapo College, ldant@ramapo.edu; Applications of Mathematics for Classroom Use organized by Paul J.Laumakis, Rowan University, laumakis@rowan.edu; and Statistics: Continuing Challenges in Education and Practice, organized by Dexter C. Whittinghill, III, Rowan University, Whittinghill@rowan.edu.

Topics for *lunch discussion tables* at the spring meeting should be sent to Theresa C. Michnowicz, tmichnowicz@njcu.edu by **February 2**, 2007. Further information will be posted on the section website, www.maa.org/newjersey.

Garden State Undergraduate Mathematics Conference
MAA-NJ is proud to host the fourth annual Garden State Undergraduate Mathematics Conference (GSUMC), which will be held concurrently with its spring meeting on Saturday, March 31, 2007, at Rowan University, Glassboro, NJ. GSUMC will emphasize undergraduate research. Please start planning your projects.

Call for Nominations for the New Jersey Section Award for Distinguished College or University Teaching
The MAA-NJ Section Distinguished Teacher Award Selection Committee is seeking nominations for the 2007 Distinguished College or University Award. Information about the nomination process and eligibility requirements are posted at http://www.maa.org/newjersey . The winner of the award will be recognized
at the Spring 2007 meeting. For more information you may contact
Naomi Shapiro (Secretary MAA-NJ Section) at shapiro@georgian.edu
732-987-2340. Deadline for nominations: January 26, 2007.

In Memorium: Paul Halmos (1916-2006) died October 2, 2006. See the obituary on MAA Online.

From the national office: The MAA is seeking members to fill positions in the organization. See www.maa.org for details.

Upcoming National MAA-AMS meetings
MAA-AMS Joint Mathematics Meeting: New Orleans, LA, January 4-7, 2007
MathFest 2007: San Jose, CA, August 3-5, 2007
MAA-AMS Joint Mathematics Meeting: San Diego, CA, January 6-9, 2008
MathFest 2008: Madison, WI, July 31-August 2, 2008

Governor's Report from Mathfest 2006
MathFest in Knoxville was a lively one, with our fair share of NJ MAA members attending and presenting.

It was my first Board of Governor's since 1987-93, when I attended as an observer who was the first chair of the Committee on Participation of Women, and I was pleased to notice two changes. (1) The MAA is on MUCH better financial footing. My first public Board statement was to express appreciation

for this to John Kennelly, who was elected treasurer shortly thereafter, (2) There seems to be more acceptance of women in the MAA. People still alive and not too elderly (by my standards) remember when the MAA Board of Governors was all male.

There were appeals for Governors to recruit for all 17 national MAA committees. The investment committee needs people with skills and experienced in investing. When I attended 15 years ago, the MAA was contemplating selling all its Washington real estate to make ends meet. Now it has three buildings to promote mathematics in an historic section of Washington. The two main buildings which are about a century old. The Carriage House behind, which is somewhat older, is being renovated (thanks to Paul and Virginia Halmos) to be a math conference center for conferences up to 60 people. Applications welcome. It is hoped this will be a new revenue stream for the MAA.

In general, the national MAA is less dependent on dues than it was, not because we have fewer members, but because there are other sources of finances. It has had close to 100% success in grant proposals. Sources of funding tend to come out of the membership. Share your ideas!

The MAA is using its location to lobby more. We were urged to urge members to get in touch with their Congresspeople and ask for better support of mathematics and mathematics education. The most effective messages to Congress come from constituents. The MAA is also running TV spots. Ideas for such spots are welcome; Carl Pomerance and president-elect Joe Gallian are eager to hear them. If you see MAA spots running, let someone know.

There are three major posts to be filled at the MAA. Anyone interested? Jim Tattersall has resigned as Associate Director for meetings. He coordinates the national meetings. Don Albers is retiring as Associate Director for publications. And Michael Pearson is looking for an Associate Director for student issues, a program that is "drowning in programs."

All the publications are looking for reviewers. The new CMJ editor said that most of his reviewers were elderly or dead. One wrote back a reply to his request for an review, "I gave that up when I turned 90." Email the editor of your favorite math journal and offer to review; your inquiry will be welcome. The *Monthly* is the math journal with the largest circulation in the world. *Mathematics Magazine* is second and the *College Mathematics Journal* is third.

First VP Carl Pomerance, who will be with us at our fall meeting, is leading a long-term self-evaluation. The first cycle is well along. It includes a study of

(1) professional development, (2) teacher education, and (3) revenue. Cycle two is beginning, including a study of students (high school through graduate school) and governance. We had break-out sessions on governance.

We were also asked to recruit for the committees that grant awards. If you are interested, get in touch with Martha Siegel.

Pat Kenschaft

News from NJ departments

Montclair State University's Department of Mathematical Sciences welcomes Dr. David Trubatch this fall. Prior to coming to Montclair State University, he taught at the United States Military Academy in West Point, NY. His research interests are in nonlinear wave equations and physical applied mathematics.

Monmouth University's Mathematics Department welcomes two new faculty members this fall. *Dr. Richard Bastian* joined the department in a full-time capacity as lecturer after having been an adjunct for a couple of years. His doctorate is in electrical engineering, and before coming to Monmouth, he worked for over twenty years at Bell Labs and then did some independent consulting. *Dr. Robert Pawloski* joined us after finishing his Ph.D. in computational group theory at the University of Arizona; but prior to graduate work, he taught middle school mathematics after receiving an undergraduate degree in history. Monmouth started a mathematics colloquium series this fall, monthly talks directed at junior and senior undergraduates and faculty; if anyone has a good talk to give to such an audience, please contact David Marshall, dmarshal@monmouth.edu.

The College of New Jersey welcomes new faculty member *Leona A. Harris* who specializes in mathematical biology and brings strong teaching and research experiences to TCNJ. She graduated with a B.S.in mathematics from Spelman College and earned her M.S. and Ph.D. in applied mathematics from North Carolina State University. After completing her postdoctoral work at the National Health and Environmental Effects Research Laboratory of the U.S. Environmental Protection Agency (EPA), she joined the faculty at Bennett College before coming to TCNJ.

JOIN THE MAA (**http://www.maa.org/mbsvcs/future.html**).

MAA-NJ Officers

Chair	Mark Korlie, Montclair State University
Immediate Past Chair	Cathy Liebars, The College of New Jersey

Vice Chair for	
Speakers	Hieu D. Nguyen, Rowan University
Innovations	Theresa C. Michnowicz, NJCU
Student Activities	Lawrence D'Antonio, Ramapo College
Two-Year Colleges	Carol Avelsgaard, Middlesex County College
Secretary	Naomi Shapiro, Georgian Court University
Treasurer	Karen Clark, The College of New Jersey
Public Information Officer	Pangyen Ben Weng, Ramapo College
Program Editor	Bonnie Gold, Monmouth University
Liaison Coordinator	Aihua Li, Montclair State University
Workshop Organizer	Amy Cohen, Rutgers University
Book Sale Coordinator	Michael A. Jones, Montclair State University
Project NJNExT Co-Directors	Bonnie Gold, Monmouth University
	John T. Saccoman, Seton Hall University
Governor	Patricia Kenschaft, Bloomfield College

Organizing Committee Carol Avelsgaard, Middlesex County College, Karen Clark, The College of New Jersey, Amy Cohen, Rutgers University, Larry D'Antonio, Ramapo College, Bonnie Gold, Monmouth University, Michael A. Jones, Montclair State University, Mark S. Korlie, Montclair State University, Cathy Liebars, The College of New Jersey, Reginald Luke, Middlesex County College, Theresa C. Michnowicz, New Jersey City University, Hieu D. Nguyen, Rowan University, Naomi Shapiro, Georgian Court University, Pangyen Ben Weng, Ramapo College

Hosting Committee Kenneth Burke, Daniel Gross, Esther Guerin, Joan Guetti, Nathan Kahl, Daniel P. MacDonald, John T. Saccoman, Taruni Seth, Seton Hall University

Awards Committee Mark Korlie, Montclair State University, Reginald Luke, Middlesex County College, Theresa C. Michnowicz (chair), New Jersey City University, Naomi Shapiro, Georgian Court University

Contributed Paper Session Committee Carol Avelsgaard, Middlesex County College, Michael Jones, Montclair State University, Lawrence D'Antonio, Ramapo College, Theresa C. Michnowicz (organizer), New Jersey City University

Nominating Committee Carol Avelsgaard, Middlesex County College, Mark Korlie, Montclair State University, Theresa Michnowicz (chair), New Jersey City University, Hieu D. Nguyen, Rowan University

Teaching Award Committee Janet H. Caldwell, Rowan University, Amy Cohen (chair), Rutgers University, Roger Pinkham, Stevens Institute of Technology, Arthur Schwartz, Mercer County Community College, Kenneth Wolff, Montclair State University

Acknowledgments The MAA-NJ thanks the Mathematics Department of Seton Hall University for their kind hospitality in hosting the meeting and Springer for donations for the Door Prizes and Silent Auction.