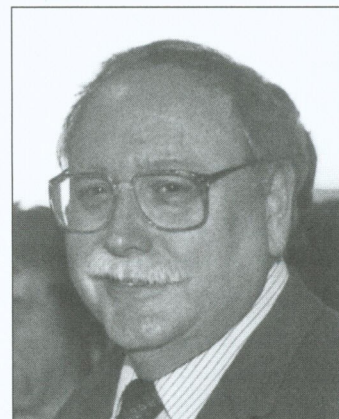


Courant Institute of Mathematical Sciences

Letter from the Director

Dear Alumni, Colleagues, and Friends,

If all goes as planned, this is my last issue of the Courant newsletter as Director. At the end of August I will step down, while continuing as professor of Mathematics. I am looking forward to devoting myself once again to full-time teaching and research, while continuing to play an active part in Courant's current fundraising campaign. I particularly look forward to being more active in K-12 education under the banner of CIMSE (the Courant Initiative for Mathematical Sciences in Education).



The timing of this transition in leadership is consistent with long-standing practice. Prior to the recruitment of my predecessor—now Provost—David McLaughlin, the directorship was held on a rotating basis by different faculty members, typically for 3 to 5 years. Just as this newsletter was going to print, Leslie Greengard (see article on page two) was named by Dave McLaughlin and President John Sexton as the next Courant Director – a wonderful choice. Another excellent piece of late-breaking news is that Margaret Wright has agreed to continue for several more years as Chair of Computer Science with Marsha Berger serving as Acting Chair for 2007 while Margaret takes a well-earned break to get some research and writing done.

One rewarding aspect of my tenure was the establishment of this newsletter in 2003, part of a broader effort to keep in better touch with our alumni and other members of the extended Courant family. One indication of success is the steady increase in the number of you who have supported our work through the Annual Fund. Five years ago we had a total of 57 donors; in the first six months of the current fiscal year, the number was over 200, with gifts equalling over \$100,000. These funds are being used in a variety of ways, including direct support to students, renovation of lab space, and other projects.

More than anything, it is the people who make Courant a real family, and this family has no more loyal son than Peter Lax. Having come to NYU in 1943, only nine years after the arrival of Richard Courant, he continues to be actively engaged in the life of our community, making contributions as a student, scholar, teacher, mentor, colleague, and friend. In 2005 Peter was honored with the Abel Prize in Mathematics; he then (in his own words) “used part of the loot” to create the Peter Lax Fund to support graduate students and postdoctoral fellows.

I believe that despite the many changes sure to occur in the coming decades, the Courant Institute will remain at the forefront of the Mathematical and Computer Sciences and their applications, continuing the trajectory started over 70 years ago. From strength to strength.

Sincerely,

Chuck

CHUCK NEWMAN
Director, Courant Institute

Table of Contents

SPRING/SUMMER NEWSLETTER 2006

<i>Letter from the Director</i>	1
<i>The Smuggler & the Merchant</i>	2
<i>Greengard elected to NAE</i>	2
<i>Take a Step Back in Time</i>	3
<i>First Annual cSplash!</i>	3
<i>Donor List</i>	3-4
<i>Faculty Honors</i>	5
<i>ICM2006</i>	5
<i>Student Profile</i>	6

Spring/Summer 2006 Puzzle: The Smuggler and the Merchant

by Dennis Shasha

An honorable merchant named Harout has acquired several valuable gold coins. He wants to send them from Yerevan to Zurich. Doing so by land requires passing through many unfriendly countries. Doing so by insured carrier is safe but requires paying 50% in insurance, shipping, and taxes.

He discussed this with an untrustworthy but very capable smuggler, named Michael who promises, "No matter how many coins you send with me in a shipment, my commission is only one gold coin for that shipment."

Harout laughs and responds: "Both of us know that you may just steal the whole shipment from me. I promise you one thing: If you ever steal from me, I'll never do business with you again."

Michael agrees, "True. I have a bad reputation. But it's either me or 50% goes to shipping."

Harout nods, "You are right. Let's start with the assumption that you know how many coins I have. I suggest the following protocol. I will divide my coins into a series of lots whose sizes I will tell you from the beginning. If you are honest for the first k lots, for $k \geq 0$, I will send you the next lot. But, if you steal even once, I will use the insured carrier from then on. I will send even the last lot with you if you've been honest with me up to that point."

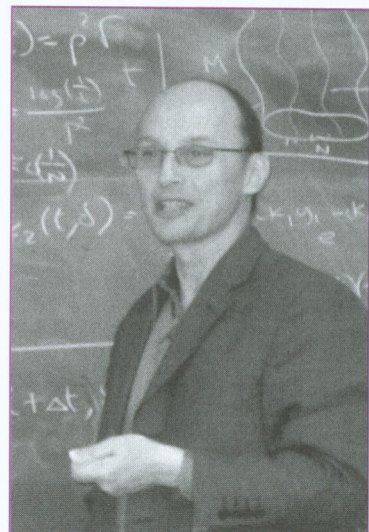
Suppose that Harout will live up to the protocol he promises and Michael knows this. Suppose that Michael will prefer honesty to dishonesty if his profit remains the same. If not, he will choose the most profit every time.

1. For 10 coins, what should the lot sizes be in order for Harout to get as many coins to Zurich as possible?
2. What about 50 coins?
3. What is the general solution?

To obtain the solution, email courant.alumni@nyu.edu.

Greengard elected to National Academy of Engineering

Leslie Greengard, Professor of Mathematics and Computer Science in the Courant Institute of Mathematical Sciences, has been elected to the National Academy of Engineering (NAE) for his pioneering development of algorithms and software for fast multipole methods.



Leslie Greengard

The recipient of the 2004 Margaret and Herman Sokol Faculty Award in the Sciences, Greengard also heads NYU's new Computation in Science and Society initiative. The initiative is concerned not only with the physical and biological sciences, but also the extension of the role of computation and statistical analysis into such less traditional fields as education, the social sciences, and the arts.

Earning both his M.D. and Ph.D. from Yale University in 1987, Greengard has taught at NYU throughout his entire academic career. From 2001–2004 he was the Chief Executive Officer and Chief Technology Officer for MadMax Optics, Inc., in Hamden, CT. His numerous awards include: The American Mathematical Society's Leroy P. Steel Prize, a National Science Foundation Presidential Young Investigator Award, and a Packard Foundation Fellowship.

Greengard is the fifth NYU faculty member to be elected to the NAE. The other four are members of the Courant Faculty in computer science: Silver Professor Marsha Berger, Professor Amir Pnueli, Emeritus Professor Jacob Schwartz, and Silver Professor Margaret Wright, Chair of the Computer Science Department.

In the words of the NAE, Academy membership honors those who have made outstanding contributions to "engineering research, practice, or education, including, where appropriate, significant contributions to the engineering literature," and to the "pioneering of new and developing fields of technology, making major advancements in traditional fields of engineering, or developing/implementing innovative approaches to engineering education."

This newsletter is produced by the Courant Institute of Mathematical Sciences

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First Annual *cSplash!*

March 25th was the date of the first annual *Courant Splash!*, a one-day festival of classes in the mathematical and computer sciences. Inspired by a similar program at MIT which began in 1957, *cSplash!* (as it is better known) was an opportunity for students in grades 9-12 to attend lectures by graduate and undergraduate students on such diverse topics as "The Math Behind Google," "Information Theory," and Mathematics and Origami." The goals of *cSplash!* are to bring together students with an interest in mathematical and computer sciences, to expose them to the beauty of mathematical ideas and the diversity of their uses, to stimulate and challenge them beyond the normal high school curriculum, and to give Courant students and affiliates the opportunity to share their passion with bright, motivated young minds. Although this was the festival's debut, it is hoped it will become an annual event.



Fifth year math PhD student, Tyler Neylon lectures on "The Math Behind Google."

Take A Step Back in Time

The way we use computers for research today is so drastically different from what investigators experienced in the 1950's. At Courant, we thought our newsletter readers would enjoy reading excerpts from interviews with scientists who were working during that early period. Published in a series of three, these interviews are the result of an ongoing oral history project conducted cooperatively between CIMS and NYU TV center.

1st interview:

Ernest Courant, eldest son of Richard Courant and accomplished accelerator physicist, discusses how he used the machine installed at NYU by the US Atomic Energy Commission.

"I was working at Brookhaven Lab. My father suggested I should go to NYU and work on that new computer they had there, the Univac. So I went and learned how to do a bit of programming. I put in some of the problems we were interested in, to establish the stability of this new scheme of doing the accelerators. Every once in a while I would spend some time at NYU's 25 Waverly Place where the Univac was present. Usually the problem would take an overnight run and then I'd have to come again the next day and get the results. We had quite a few problems there and quite a few results. Some of them were very interesting but somehow I never got them written up and published until years later when there was a symposium at IBM. I showed some of these early Univac results there; they were indications of what is now known as "mathematical chaos." I really discovered that without knowing it. I really didn't make use of it."

Watch for the next excerpt in the Holiday 2006 Newsletter.

The Director's Circle is the Courant Institute's giving society for those making an unrestricted contribution of \$1,000 or more for a given fiscal year. Members receive special invitations as guests of the Director to events of interest throughout the year, with complimentary access extended where applicable. Additionally, those giving at the \$5,000 level and above qualify for membership in the various university-wide giving societies. Please contact the Courant Development Officer Mark Hansen at 212-998-6775 or mark.hansen@nyu.edu for further information.

2005-2006 Members of the Director's Circle as of April 4th, 2006:

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Carole Hochman Sirovich

Lawrence Sirovich
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Merryl Zegar

A Profile of Morawetz Fellow Hala Al Hajj Shehadeh

Born in Lebanon, Hala Al Hajj Shehadeh came from a family that always encouraged her to study science or medicine. Her father is a high school math teacher and her older siblings include a civil engineer, a student of business, and a pharmacy student. Receiving her BS in 2002 from the Beirut Arab University, Hala then earned a Masters Degree at the American University in Beirut in 2005, where she contributed to research in elliptic curves.

When it became clear that she could attend the Courant Institute, her family found it hard. "I had never traveled out of the country," she says. "All anybody knew about New York was from movies. My parents thought it was hard for a girl to travel alone, and we have no relatives in the United States." However, she says there were no great battles with her parents. "They knew it was for my best. They didn't

like it, but they knew. Friends of friends—people I didn't know directly—met me at the airport." Hala smiles cheerfully as she recounts her story, clearly comfortable. "My classmates are all so friendly," she says now. "We have lots of social events."

Receiving the Cathleen Morawetz Fellowship means that Hala will not have to find a job during the summer, allowing her to take more courses in Partial Differential Equations (PDEs). Her background is in Algebra, Topology, and Number Theory, and she looks forward to beginning her studies in PDEs.

Of her future, Hala says, "Of course, someday I want to go home. But for now, I want to experience really good universities and do research, probably in PDEs. Then I'll go home."

Courant Institute of Mathematical Sciences

New York University

SPRING/SUMMER 2006
Volume 3 - Number 2

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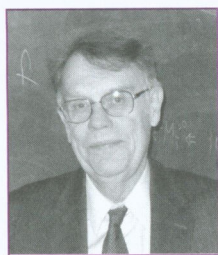
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Every effort has been made to ensure that this list is accurate as of April 4, 2006. The fiscal year ends August 31—please consider a summertime gift for inclusion in this year's totals, which we will gratefully acknowledge in the Holiday Issue of the newsletter. A business-reply envelope is enclosed for your convenience. At all times, donations, as well as any questions or comments, may be directed to:

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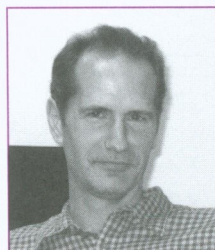
Did you know that it is possible to make a charitable gift to Courant while increasing your income and saving on taxes? Please contact Mark Hansen to find out more.

Faculty Honors/Awards



Computer Science and Mathematics Professor **Olof Widlund** has received the award for Professional and Scholarly Publishing in the field of Mathematics & Statistics from the Association of American Publishers.

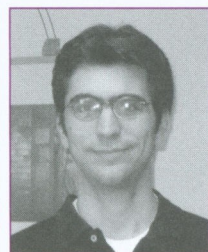
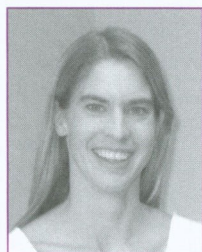
Professor Widlund was recognized for his book, *Domain Decomposition Methods - Algorithms and Theory* (Springer), which was co-written with Andrea Toselli.



Michael Shelley, Professor of Mathematics and Neural Science, has been selected to receive the Julian Cole Lectureship to be awarded at the July 2006 SIAM (Society for Industrial and Applied Mathematics) Annual Meeting in Boston. Awarded every

four years, this lectureship honors an outstanding contribution to the mathematical characterization and solution of a challenging problem in the physical or biological sciences, or in engineering, or for the development of mathematical methods for the solution of such problems.

Cathleen Morawetz, Professor Emerita of Mathematics, has received the 2006 AMS-SIAM George David Birkhoff Prize in Applied Mathematics. This prize is given every three years by the American Mathematical Society and the Society for Industrial and Applied Mathematics. Cathleen is being honored for her deep and influential work in partial differential equations, most notably in the study of shock waves, transonic flow, scattering theory, and conformally invariant estimates for the wave equation.



Please join us in congratulating **Anna-Karin Tornberg**, Assistant Professor of Mathematics, and **C. Sinan Gunturk**, Assistant

Professor of Mathematics, on being named 2006 Sloan Foundation Fellows. These awards are intended to enhance the careers of the finest young faculty members in specified fields of science. Currently a total of 116 fellowships are awarded annually in seven fields: chemistry, computational and evolutionary molecular biology, computer science, economics, mathematics, neuroscience, and physics.

Scott Sheffield, Assistant Professor of Mathematics, received the 2006 Rollo Davidson Prize for young researchers of outstanding promise and achievement in Probability Theory. Scott was awarded the prize for his work on spatial models of probability theory and especially their relationship to Schramm Loewner evolutions.

Courant at ICM2006

The International Congress of Mathematicians, held every four years since 1897, is the largest and one of the most influential events on the calendar of the global mathematics community.

This year's "ICM2006," to be held August 22-30 in Madrid, will showcase a remarkable array of talent from the Courant Institute, including two of the conference's twenty-one plenary lecturers, Percy Deift and Robert Kohn. Among those invited as sectional speakers are three other Courant faculty: Yuri Tschinkel on Algebraic and Complex Geometry, Sylvia Serfaty on Partial Differential Equations, and Alan Siegel on Primary and Secondary Mathematics Education. Thanks to a special travel grant from William Randolph Hearst III, two doctoral students, Paris Pender and Michael Korotiaev, will also be present for the proceedings.

The plenary lecture to be given by Professor of Mathematics Percy Deift is titled "Universality for Mathematical and Physical Systems." Using examples from many different areas, Prof. Deift will show that on the appropriate scale a wide variety of mathematical problems exhibit universal behavior. This is in analogy with the emergence of universal behavior in physical systems. The main tool in Prof. Deift's work is random matrix theory.

In his lecture entitled "Energy-Driven Pattern Formation," Professor of Mathematics Robert Kohn will discuss the physical systems that can be modeled by nonconvex variational problems regularized by higher-order terms. The primary goal of Prof. Kohn's presentation will be to communicate the methodological developments for analyzing microstructure, the internal structures of walls, and local as well as global minimizers and the thermally-activated transitions between them. Additionally, Prof. Kohn will explore the material science problems that led to these developments.

Spain's "successful bid to bring the ICM to Madrid in 2006 is emblematic of its efforts to highlight Spanish mathematics and keep it thriving," according to Allyn Jackson in *Notices of the AMS*. With many satellite activities taking place throughout Spain and Western Europe, the ICM2006 is being viewed as an opportunity to strengthen local relationships among the Spanish mathematical community. Considered to be the largest scientific event ever to take place in Spain, the ICM2006 has received the full support of King Juan Carlos I, who is expected to attend the presentation of the Fields Medals, the Nevanlinna Prize, and the newly created Carl Friedrich Gauss Prize.

For more information about the International Congress of Mathematicians, visit www.icm2006.org