

# Courant Institute of Mathematical Sciences

## Letter from the Director

Dear Alumni, Colleagues and Friends,

I thank you for being part of our growing network of friends and supporters. It is wonderful that so many of you are reconnecting with the Institute and staying in touch.



We are extraordinarily pleased at the awarding of the 2005 Abel Prize in Mathematics to Peter Lax, who – as student, colleague, director and friend – has been at NYU and the Courant Institute for more than 60 years, and exemplifies the philosophy of the Institute that there should be no divisions between the applied and pure mathematical sciences. This award, considered the equivalent of the Nobel Prize in its field, is an honor for Peter, for the Courant Institute, and for NYU.

While writing this message, I look forward to attending the May 24 ceremony in Oslo, where King Harald of Norway will award the Abel Prize.

Peter is not the only faculty member to be honored since our last newsletter. We are also proud to announce the election to the National Academy of Engineering (NAE) of Marsha Berger who has been on leave at NASA's Ames Research Center in California. Together with Jack Schwartz and Margaret Wright, NYU has three members of the NAE, all at Courant in the Computer Science Department. Marsha and Jack are now members of both the National Academy of Science (NAS) and the NAE; and Charlie Peskin is a member of both the NAS and the Institute of Medicine.

Courant has much to celebrate this Spring: Margaret Wright will have hosted a Courant Alumni Reception during Reunion Weekend; many contributed to the retirement celebration for Jack Schwartz, and to the fund set up in his honor; and Robert Grimm was awarded a National Science Foundation CAREER research award.

In closing, I encourage your involvement with the Courant community through email and mail, and by visiting us. As alumni and friends, you understand the context in which Courant excels, and your feedback is very valuable to us as we move forward. We invite you to explore becoming even more involved with Courant.

Sincerely,

CHUCK NEWMAN  
Director, Courant Institute

p.s. Please see on page five the late breaking news that Margaret Wright has been elected to the National Academy of Sciences.

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## Dennis Shasha's Puzzling Adventures



Dennis Shasha

Computer Science Professor Dennis Shasha believes that puzzles are a good way to simplify a difficult problem. By representing a complex problem in the simplest way possible, the solution is easier to discover. His latest book, *Puzzling Adventures: Tales of Strategy, Logic and Mathematical Skill*, which was published by W.W. Norton & Company in January, uses just this method.

*Puzzling Adventures* is a collection of puzzles from Professor Shasha's columns in *Scientific American* and *Dr. Dobb's Journal*. He writes fascinating logic and math puzzles that not only offer readers a chance to exercise their mathematical skills, but be entertained as well.

Professor Shasha began writing puzzles when he was a graduate student working at IBM. He was having difficulty designing circuits whose purpose was to check other circuits. By writing a puzzle about boy scouts and girl scouts, he was able to visualize the problem in a less confusing way. He says that, "the perfect puzzle for me is where you can hear it and all you need to do is think [to solve it]."

Other puzzle books written by Professor Shasha include *The Puzzling Adventures of Dr. Ecco*; *Codes, Puzzles, and Conspiracy*; and *Dr. Ecco's Cyberpuzzles: 36 Puzzles for Hackers and Other Mathematical Detectives*, all of which have been translated into various languages including Hungarian, French, German, Portuguese, and Turkish. David Gelernter, a professor of computer science at Yale University says, "It's rare to know with perfect certainty who the absolute best is, but Dennis Shasha is the absolute best puzzle-writer alive." Professor Shasha has also written a book of biographies of great computer scientists, and technical works about database tuning, biological pattern recognition, and time series.

See if you can solve the puzzle in the next column, which is from *Puzzling Adventures*. The solution appears on page 4.

## Safecracking

Imagine that you are a thief (for a good cause, naturally). You must steal some papers from an evil-doer at great personal and societal risk. To accomplish this, you must find the combination of a safe having 10 switches, each of which has 3 values: low, middle, and high. To open the safe, you must set the switches to an opening combination and press the lever. To escape detection, you must do this as quickly as possible.

There are over 59,000 ( $3^{10}$ ) possible combinations. Fortunately for you, over 6,000 ( $3^8$ ) combinations of these switches will open the safe. The rule to open is simple: there is a certain pair of switches -- you don't know which pair and they need not be adjacent -- and a certain combination of the values of that pair -- you don't know which combination -- that opens the lock. The other 8 switch settings are irrelevant. Now, you want to guarantee to open the safe in as few lever pulls as you can.

You realize that if you try random settings, then you have roughly a 1 in 10 chance of finding a good setting. Your problem however is to GUARANTEE to find a solution within fewer than 20 switch settings.

### Warm-up:

Suppose there were just 4 switches each with three values but again there is some pair of switches and some combination of values of that pair that would open the lock. How many lever pulls would you need to guarantee to open the lock then?

### Warm-up solution:

Well, 9 is clearly a lower bound, because even if you knew the pair of switches to choose, you'd have to discover the pair of values of those switches. Remarkably, 9 are enough (here A means low, B means middle, and C means high):

Number	S1	S2	S3	S4
1	A	A	A	A
2	B	C	C	B
3	C	B	B	C
4	A	B	C	C
5	B	A	B	A
6	C	C	A	B
7	A	C	B	B
8	B	B	A	C
9	C	A	C	A

Now try to solve the problem with 10 switches.

### Open problem:

Suppose the cost, instead of being the number of lever pushes, were the total number of switches that must be moved. What would be a minimum cost solution under that metric and assuming that the lever does not reset all the switches upon each pull. I don't know the answer.

-Dennis Shasha

### *Courant Honors and Awards*



Professor Marsha Berger

Professor Marsha Berger of computer science and mathematics has been elected to the **National Academy of Engineering** "for developing adaptive mesh refinement algorithms and software that have advanced engineering applications, especially the analysis of aircraft and spacecraft." A complete list of the newly elected NAE members is available on the NAE Website, [ww.nae.edu](http://www.nae.edu).

Assistant Professor Robert Grimm of the computer science department has received a **Faculty Early Career Development (CAREER)** award from the National Science Foundation, for his research on "Better Systems with Extensible C." The CAREER program offers "NSF's most prestigious awards for outstanding faculty early in their independent professional careers," and is intended to recognize those "most likely to become the academic leaders of the 21st century."

Professor Emeritus Peter Lax was awarded the **Abel Prize in Mathematics** by the Norwegian Academy of Science and Letters. For an in-depth profile of Professor Lax, see page 5.



Professor Michael Overton, Professor Peter Lax, and Anina Karmen at the reception given at Courant in Professor Lax's honor on April 5th.

### *Courant Milestones*

There are quite a few faculty and staff who have been with us for many years. We commend them for devoting their careers to Courant and to NYU.

#### **FACULTY:**

##### **45 Years:**

Mel Hausner, Professor of Mathematics

Ricky Pollack, Professor of Mathematics and Computer Science

##### **40 Years:**

Simeon Berman, Professor of Mathematics

##### **35 Years:**

Henry McKean, Professor of Mathematics

##### **25 Years:**

Allan Gottlieb, Professor of Computer Science

Henry Strauss, Research Professor

##### **20 Years:**

Fang-Hua Lin, Professor of Mathematics

Bud Mishra, Professor of Computer Science and Mathematics

#### **STAFF:**

##### **30 Years:**

Larry Cohen, Duplicating Services Coordinator

##### **25 Years:**

Pat Struse, Administrative Aide

### *Catching up with Felix Krahmer*

Felix Krahmer, the first Cathleen Synge Morawetz Fellowship recipient, is finishing his first year as a Ph.D. student in Mathematics. Not only did he take four courses this past semester while auditing three others, but he was also a member of the NYU Jazz Choir as well as an avid devotee of the rockclimbing wall at the Coles Sports Center. Although he is not sure what specialization he will pursue for his thesis, he is interested in analysis of probability, game theory (through a class he is taking in the Politics Department) and harmonic analysis, which he will study in depth this summer at his undergraduate institution in Germany, the International University, Bremen. Both Courant and Felix thank the donors to the Morawetz Fellowship Fund, which provides summer support making this possible.

### *Alumni Reunion Weekend 2005*

This year's Alumni Reunion Weekend provided wonderful opportunities for reconnecting with the Institute. Alumni and friends returned to Warren Weaver Hall for an intimate reception hosted by Margaret Wright, Chair of the Computer Science Department and attended by Chuck Newman. Other weekend events included the Graduate School of Arts and Science Luncheon, walking tours with the themes, "Mansions of Fifth Avenue" and "Murder in Greenwich Village," the NYU Alumni Association Awards Dinner and the Saturday Night Gala. Many thanks to all who came back to campus this year; we hope to see you and others at next year's events.

## Courant Cryptography Seminar: Setting New Standards for Internet Security

As more of our communications and business are conducted electronically, the need for security becomes ever more acute.

Since 2002, the Department of Computer Science has been home to one of the most dynamic and innovative groups addressing this challenge.

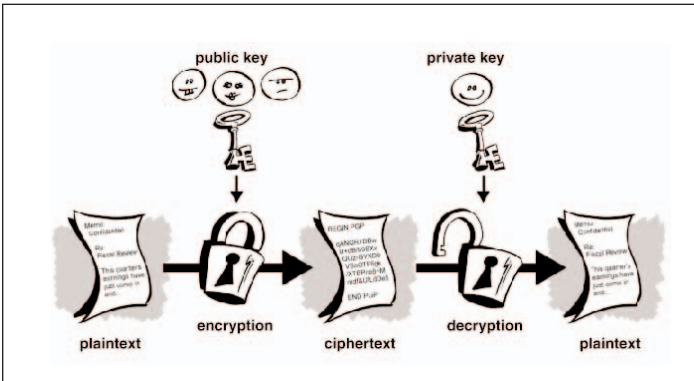


Image courtesy of nuitari.de

Cryptography helps keep private information out of the public eye.

Led by Assistant Professor Yevgeniy Dodis and Associate Professor Victor Shoup, the weekly meetings of the Courant Cryptography Seminar are a magnet for leading experts from around the world to showcase their latest discoveries.

Researchers from Western Europe, Japan, and Israel have all spoken at the seminar, which also provides a point of cross-fertilization between experts from the academic world and from private industry, including AT&T Laboratories, and IBM. Faculty from nearby universities also regularly participate.

According to Prof. Dodis, “This is one of only two programs on the east coast where such a high level of exchange is occurring on such a frequent basis.”

Part of the seminar’s success may be attributed to Courant’s privileged location in New York City, says Prof. Dodis. At the same time, a critical mass of talented and enthusiastic graduate students drawn from the United States and abroad contribute much to the liveliness and quality of discussion.

By providing financial support for faculty activities and graduate fellowships, our alumni and friends can help underwrite the continued excellence of such programs as the Courant Cryptography Seminar. For more information on the seminar, visit their web site at <http://www.scs.cs.nyu.edu/crypto/>.

## NYU Announces Newman to Continue as Courant Director

“It is a great pleasure for us to announce that Chuck Newman has agreed to continue to serve as Director of the Institute for a term of up to two years, through August 31, 2007. Chuck has requested, and has been granted, a leave for the fall 2005 semester -- in order to allow him to complete some of his research projects which are time-pressing. During his leave this coming fall, Deputy Director Richard Cole has agreed to serve as Acting Director of the Institute. Please join us in congratulating Chuck for doing, and continuing to do, such a good job as Director, and Richard for agreeing to serve this fall in Chuck's absence. The Institute and NYU are fortunate to have such dedicated leaders.”

John Sexton, President  
David McLaughlin, Provost, New York University

### Solution to Safecracking:

How can you find the combination of a safe having 10 switches each of which has 3 values?

Just 15 settings are sufficient.

The X represents "don't care".

So, you can leave the switch in the low position if an X is written. A represents low, B middle, and C high.

Number	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1	A	A	A	A	A	A	A	A	A	A
2	A	B	B	B	B	B	B	B	B	B
3	A	C	C	C	C	C	C	C	C	C
4	B	A	B	C	A	B	C	A	B	C
5	B	B	C	A	B	C	A	B	C	A
6	B	C	A	B	C	A	B	C	A	B
7	C	A	C	B	A	C	B	A	C	B
8	C	B	A	C	B	A	C	B	A	C
9	C	C	B	A	C	B	A	C	B	A
10	X	A	A	A	B	B	B	C	C	C
11	X	A	A	A	C	C	C	B	B	B
12	X	B	B	B	A	A	A	C	C	C
13	X	B	B	B	C	C	C	A	A	A
14	X	C	C	C	A	A	A	B	B	B
15	X	C	C	C	B	B	B	A	A	A



## *NYU Mathematician Peter Lax Named Winner of Abel Prize*

Peter D. Lax, an *emeritus* professor at Courant and an alumnus of NYU who earned his undergraduate and graduate degrees here, was awarded the Abel Prize in mathematics, as announced, on March 17 by the Norwegian Academy of Science and Letters for “his groundbreaking contributions to the theory and application of partial differential equations and to the computation of their solutions.” He received the Abel Prize from the Crown Prince Regent on behalf of His Majesty, King Harald V of Norway, in Oslo on May 24th. The honor is accompanied by a prize of \$980,000.

Professor Lax received his bachelor’s degree in 1947 and his Ph.D. in 1949 from New York University. He became an assistant professor of mathematics at NYU in 1949, was director of the Courant Institute from 1972–1980, and was named an emeritus professor in 1999.

NYU President John Sexton said, “The entire New York University community is thrilled and proud to have the Abel Prize bestowed upon Peter Lax. He is a true ‘home-town hero’ – an alumnus with both undergraduate and graduate degrees from NYU, he then went on to devote his professional life to the University, making enormous contributions in mathematics and to the NYU community. It is this sort of dedication that exemplifies our motto, *Perstare et Praestare* – to persist and to excel. The Courant Institute of Mathematical Sciences is renowned for the superb scholars it attracts and their influence at the interface between mathematics and applications; this honor adds greatly to the luster of the Institute.” David McLaughlin, NYU’s Provost and former director of the Courant Institute of Mathematical Sciences, said, “The choice of Peter Lax by the Abel Prize committee and its recognition of the impact and importance of his work is a well deserved honor. Peter has led mathematics at NYU for half a century, and we are delighted that his work and contributions have been so recognized.”

Professor Lax – who was named to the National Academy of Sciences in 1962 – is one of the most prominent mathematicians of the second-half of the 20th Century. He is the recipient of many honors, including the National Medal of Science (1986), the Wolf Prize (1987), the Chauvenet Prize (1974), the American Mathematical Society’s Steele Prize (1974), and the Norbert Weiner Prize (1975).

He was president of the American Mathematical Society from 1977–1980. He worked on the Manhattan Project at Los Alamos in 1945–6, and was a staff member at Los Alamos in 1950.

In awarding the prize, the Norwegian Academy of Science and Letters cited among his extraordinary scholarship the work Professor Lax did in the 1950s and 1960s laying the foundations for the modern theory of nonlinear equations for hyperbolic systems; his introduction of the widely used Lax–Friedrichs and Lax–Wendroff numerical schemes for computing solutions (which has been extraordinarily fruitful for practical applications, from weather prediction to airplane design); his development of the “Lax Equivalence Theorem,” a cornerstone of modern numerical analysis; and his work on



Peter Lax

“soliton” solutions, in which he developed a unifying concept for understanding them, rewriting the equations in terms of what are now called “Lax pairs”.

The Academy said, “Peter D. Lax has been described as the most versatile mathematician of his generation ... Peter D. Lax stands out in joining together pure and applied mathematics, combining a deep understanding of analysis with an extraordinary capacity to find unifying concepts. He has had a profound influence, not only by his research, but also by his writing, his lifelong commitment to education and his generosity to younger mathematicians.”

*Adapted from NYU Today article*

### ***Breaking News: Wright elected to NAS***

As this publication was going to the printer, it was announced that Margaret Wright, Professor and Chair of the Computer Science Department, has been elected as a member of the National Academy of Sciences along with 71 other new members and 18 new foreign associates. Election to membership in the Academy is considered one of the highest honors that can be accorded a U.S. scientist or engineer.

“Wright, a pioneer in numerical optimization (especially interior-point methods) and a SIAM president who built enduring bridges between industry, academia, and government, is co-author of the classic book *Practical Optimization* and of widely distributed computer codes (MINOS, NPSOL),” according to a NAS statement. “Her influence extends from wireless communication to Americas Cup yacht design.”

The Courant Community is proud of Margaret in achieving this well-deserved honor.

***Produced by the Courant Institute of Mathematical Sciences***

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*The Courant Institute is grateful to the following alumni and friends  
who have generously given in the 2004 – 2005 academic year:*

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Every effort has been made to ensure that this list is accurate as of April 28, 2005. The fiscal year ends August 30 – please consider a gift for inclusion in this year's totals. Donations may be sent to the attention of:

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