# New York University

# Courant Institute of Mathematical Sciences

## Letter from the Director

Dear Alumni, Colleagues and Friends,

Thank you all for your interest and support of Courant. We are very pleased to send you this spring and summer edition of our newsletter. The spring semester included many exciting events, such as the first Courant Alumni Luncheon during NYU's Reunion Weekend; new honors and awards to faculty and students; exposure for Courant at an outstanding University Leadership Conference at NYU's La Pietra campus; the University's commitment to a Center for Computation in Science and Society; as well as the anticipation of our incoming classes in Computer Science and Mathematics.

On the note of incoming classes, we are pleased to report that we successfully offered the first Cathleen Synge Morawetz Fellowship to Felix Krahmer, one of the top mathematics Ph.D. applicants this year. Through the generous gifts of Cathleen Morawetz's family, friends, and colleagues at both Courant and at the J-STOR Scholarly Journal Archive, where Cathleen was a founding trustee, this fellowship honors the outstanding legacy of Cathleen Morawetz. The fellowship will be awarded each year to an incoming math Ph.D. student and will provide additional resources to the recipient to supplement summer research. The fellowship was formally announced at the 80th birthday celebration last November in honor of Cathleen Morawetz.
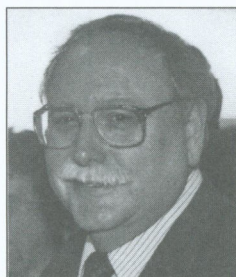
Courant is also proud to have the Keller Instructorship for outstanding post-doctoral students, in honor of Joe and Herb Keller, former students and faculty of Courant. In addition, the Moses Greenfield Research Award, which was created this year to honor Dr. Greenfield, will help support the summer research of current Courant students. Courant has a very rich history, and it is very pleasing to see the impact of that history take effect through permanent fellowship funds, student research awards, and instructorships. These named funds provide recognition and support for the students of Courant and form an important connection between Courant's past and its future.

In closing, I would like to acknowledge broadly the numerous alumni who have renewed their connections with Courant, whether through email correspondence, conducting seminars, attending the Alumni Luncheon, visiting us, making financial contributions, etc. Having alumni and friends involved with the Institute invigorates our curriculum, our ideas, and our connections with the real world and its practical needs for computer science and mathematics. Thank you all for your interest, support and enthusiasm for Courant – and thank you to the faculty who have devoted additional time and thought in helping us expand and inform our Courant community.

Sincerely,

*Chuck*

CHUCK NEWMAN
Director
Courant Institute

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## Contact Us

The Office of Alumni Relations for Courant is trying to connect Courant Alumni through new and exciting programs. If you're interested in reconnecting with the Institute and fellow Alumni through seminars, interest groups, social programs, career development, and mentoring, please take a moment and visit [www.cims.nyu.edu/alumnisurvey].

If you would like to submit information to appear in the next Courant Alumni Newsletter's Alumni Notes, or for any inquiries, please write to courant.alumni@nyu.edu.

## Courant Faculty Honors & Awards

We are delighted to announce that Chuck Newman is one of two NYU Faculty who were recently elected to the **National Academy of Sciences** (NAS) in recognition of outstanding achievements in research. This brings the total Courant membership in the NAS to fifteen along with two members of the National Academy of Engineering.

Other recent faculty honors include:
- **Election to the American Academy of Arts & Sciences:**
  Fang-Hua Lin and
  Lai-Sang Young
- **American Mathematical Society's Leroy P. Steele Prize for Lifetime Achievement:**
  Cathleen S. Morawetz
- **European Congress of Mathematics 2004 Awards:**
  Elon Lindenstrauss (European Mathematical Society Prize)
  Sylvia Serfaty (European Mathematical Society Prize)
  Anna-Karin Tornberg (Carl-Axel Fröberg Prize)
  *(The conference's running joke was that the best European University is NYU!)*

## Annual Courant Student Awards 2004

This year's Courant award ceremony was held on the afternoon of Friday, April 16th during NYU's Alumni Weekend and was followed by a reception in the 13th floor common area.

We are pleased to recognize the 2004 recipients below:



From left to right: Arjun Raj, Daniel Forger, Eric Freudenthal, Peter Friz, Valeriy Slastikov, Helga Schaffrin, Matthias Heymann, Yunyue Zhu, Yi Fang, Mikhail Korotiaev, and Ankur Mathur

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**Henning Biermann Award** for outstanding contributions by a doctoral student to education or service to the department of computer science: *Eric Freudenthal*

**Sandra Bleistein Prize** for notable achievement by a woman in applied mathematics or computer science: *Yi Fang*

**Hollis Cooley Prize** for excellence and promise in undergraduate mathematics: *Uri Laserson*

**Janet Fabri Prize** for an outstanding dissertation in computer science: *Yunyue Zhu*

**Kurt O. Friedrichs Prize** for an outstanding dissertation in mathematics: *Peter Friz* and *Valeriy Slastikov*

**Max Goldstein Prize** for undergraduate creativity in computing: *Ankur Mathur*

**Harold Grad Memorial Prize** for outstanding performance and promise as a graduate student: *Matthias Heymann* and *Mikhail Korotiaev*

**Wilhelm T. Magnus Memorial Prize** for significant contributions to the mathematical sciences: *Pisheng Ding* and *Daniel Forger*

**Bella Manel Prize** for excellence and promise in mathematics on the graduate level by a woman or a member of another under-represented group: *Helga Schaffrin*

**Matthew Smosna Prize** for excellence in computer science: *Fenil Bakkul Shah* and *Jonathan Harris*

## Moses A. Greenfield Research Award

To honor the career of her husband, Professor Moses A. Greenfield, Bella Manel Greenfield has established the Moses A. Greenfield Research Award at the Courant Institute of Mathematical Sciences at New York University.

Moses A. Greenfield received his doctorate in physics from NYU in 1941, taking many applied mathematics classes under Richard Courant and Kurt Friedrichs. Dr. Greenfield worked for the U.S. Navy during WWII and began his academic career at UCLA in 1948 with an assistant professorship. He went on to found the Medical Physics Graduate Program at UCLA's School of Medicine and to serve as its director from 1960 to 1996.

Dr. Greenfield's wife, Bella Manel Greenfield, was the first female student of Richard Courant in the U.S. as well as one of the very first female Ph.D. students in mathematics in the U.S. Dr. Manel wrote her dissertation on conformal mapping of multiply-connected domains on the basis of Plateau's problem, and earned her Ph.D. degree in 1939.

The Moses A. Greenfield Research Fund will be used to make annual research awards to Courant students who are combining studies in mathematics and another discipline such as physics and who have an interdisciplinary background or approach. The award is to fund academic research projects and allow recipients to attend important academic conferences or to travel during the summer to enhance their studies. By establishing this merit-based research fellowship for mathematics students at Courant, Moses and Bella hope the award will encourage more people like Moses Greenfield in their studies at the Courant Institute.



From left to right: Arjun Raj, Moses A. Greenfield, Bella Manel Greenfield, and Helga Schaffrin

## Student Profile: *Arjun Raj*

Arjun Raj is the winner of the first ever Moses A. Greenfield Award for interdisciplinary research. As a first-year graduate mathematics student, Raj was already looking for an opportunity to learn molecular biology in a practical, hands-on manner. Through the help of his advisor, Charlie Peskin, Raj began work with Fred Kramer, a microbiologist at the Public Health Research Institute in Newark, NJ.

Raj's laboratory research is concerned with elucidating the stochastic nature of gene expression by explicitly following and counting both the individual messenger RNA (mRNA) molecules made during the transcription of a particular gene and also the individual protein molecules made during the translation of those mRNAs. In both cases, fluorescent labeling allowed Raj to track and count individual molecules. The tracking of the mRNA is done with the help of "molecular beacons" (an invention of Kramer and Sanjay Tyagi from PHRI) that recognize a specific nucleotide sequence and light up when they bind to it.

It is quite a technical feat to get enough beacons to bind to one mRNA molecule to make that molecule visible as a spot of light in a fluorescence microscope. In a recent success, Raj and his team recorded a movie in which one can see several individual mRNA molecules, all transcripts of a single gene, diffusing within the nucleus of a cell. This movie reveals the complicated geometry of the space within the nucleus that is accessible to the mRNA molecules, and also opens the door to a quantitative investigation of molecular transport. Overall, Raj's experiments should determine the individual contributions of transcription and translation to fluctuations in protein production, once the experimental data are complete. Raj plans to focus on the development of mathematical models that account for the observed molecular noise.

The computational project, on which Raj is also working, focuses on the role of chromosome flexibility in chromosome transport. Chromosome transport is a spectacular example of how biomolecular motor molecules typically pull loads much larger than themselves. Previous work shows that a biomolecular motor can move a large load at a higher velocity when the motor is coupled to the load by an elastic linkage. In Raj's project, however, the situation is more complex, because the relevant elasticity is distributed over the load itself, instead of being located in the linkage between the motor and the load. The increased complexity is from stochastic ordinary differential equations to stochastic partial differential equations. It is well known that chromosomes bend substantially as they are pulled into the daughter cells. Raj has found that the flexibility that allows for such bending also increases the speed of chromosome transport. Raj's interdisciplinary work is a wonderful example of how mathematics applied to another discipline, in this case biology, can increase the rate of scientific discovery.

## Courant in NYU Alumni Magazine

We encourage you to keep an eye out for the semi-annual *NYU Magazine*, which will highlight Courant as a lead article in its fall issue. We expect that the story will focus on Courant's key initiatives along with "real life" counterparts for each of Courant's research endeavors – people whose work will be affected by the research of various Courant professors.

## Annual Alumni Reunion Weekend

### Portrait Unveiling in Honor of Prof. James J. Stoker

On Saturday, April 17, 2004 the Courant Institute was proud to unveil a portrait of Professor J.J. Stoker painted by Mary Donsker-Palet.

In 1937, James J. Stoker joined Richard Courant from the Carnegie Institute of Technology along with Professor Kurt O. Friedrichs who joined the Institute in the same year. Together with a few of the faculty members already in the department, they formed a closely-knit research group.



Portrait of Professor James J. Stoker

In 1958, Stoker succeeded Courant as director and served until 1966. During this period, the Institute acquired a large measure of autonomy within the University. It became the Courant Institute of Mathematical Sciences and in 1965 moved to a newly constructed building named in honor of Warren Weaver, an officer at the Sloan Foundation and a longtime supporter of the Courant Institute.

Thank you to those who were able to join us for the Alumni Reunion Luncheon and for the unveiling ceremony in honor of this dedicated and brilliant mathematician and teacher; without him, the Institute would not exist as it does today and Richard Courant's vision for a school where research and teaching go hand in hand could never have been realized. Stoker's portrait will hang in the lounge permanently alongside the portraits of Richard Courant and Kurt Friedrichs, uniting the three founders of the Institute.

## Excerpts of Remarks from the Courant Institute Alumni Reunion Luncheon

April 17, 2004

Christopher R. Friedrichs (son of the late Prof. Kurt Friedrichs)
Professor of History
University of British Columbia

I am very pleased as a member of the Friedrichs family to have been invited to this occasion and especially to be present on this day when a portrait of James Stoker was unveiled. As you know, this room contains a portrait of my father, painted by my parents' friend Ulfert Wilke and presented to the Courant Institute by my family, as well as the portrait of Richard Courant. […] But I remember thinking that this room should also have had a portrait of Jim Stoker. I grew up knowing that the two people who had worked most closely with Richard Courant in building up what became the Courant Institute were in fact James Stoker and my father. My father admired Jim Stoker enormously as a mathematician and a colleague, but he was also pleased about the fact that while he and Richard Courant represented the contribution of European émigrés to the creation of the Institute, Jim Stoker was a native-born American. For my father always felt that it was precisely the mixture of foreign-born and native talent that made the Institute such a great institution.

Cathleen Morawetz and Eleazer Bromberg

Meeting the two young men, [Peter Friz and Valeriy Slastikov] one of Austrian and one of Russian origin, I believe, who received the prize named after my father, I was reminded of my father's passionate commitment to the importance of teaching. My father could never imagine doing mathematics in isolation, because he believed that much of what is important in mathematics comes about through teaching. Indeed, when he was offered positions at other institutions at which he would have had no students he turned those offers down. He never would have wanted a career that did not involve teaching others. […]

I was struck yesterday during and after the awards ceremony by the frequency with which people spoke of the Courant Institute as a "family." And that has got me thinking about what people mean when they speak of "family." After all, there are many different kinds of families. […]

To see just how big this [mathematics] family is, one can look at the Mathematics Genealogy Project website maintained by the mathematics department of North Dakota State University. It lists every known person who ever received a PhD in mathematics, and links all of those mathematicians to their doctoral supervisors and to all of their own doctoral students. The first time I came across this website, I was intrigued to see that my father was listed as having not only 35 doctoral students but also, through his students and then their students, a total of 376 mathematical descendants. If you go back one generation, you find that Richard Courant has 1,652 descendants. And if you go back from Courant to his teacher Hilbert and then trace the generations step by step backwards, you finally come to Carl Friedrich Gauss, the great mathematician of the early nineteenth century, who is listed as having had 24,103 descendants. A very big family indeed! […]
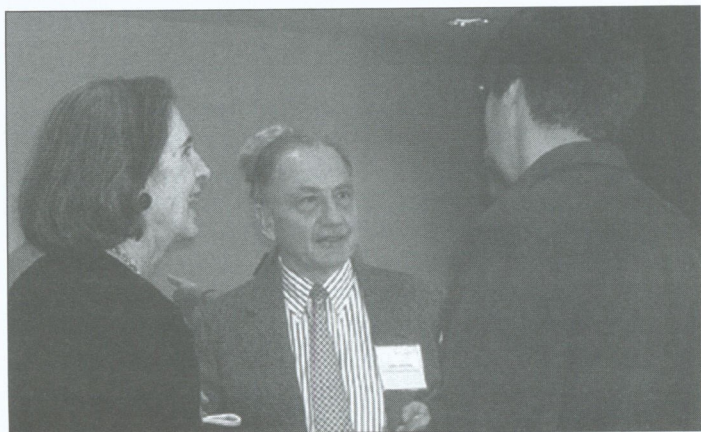
Yesterday as I listened to the descriptions of the various topics the award winners were working on, I found myself musing about which projects my father would himself have found most resonant. Some of the topics, such as those dealing with the application of mathematics to particular natural phenomena, involved problems he would certainly have related to. Others, such as the projects connected with the design of websites, had to do with things that were not part of his world of experience. But he certainly would have been excited to learn about the new questions and problems to which mathematics is being applied today, and I know he would have been proud of all the Courant Institute students who are doing such interesting and pioneering work.

So, as a member of the Friedrichs family, as a member of the Courant extended family, and perhaps also as an honorary member of the Courant Institute family, I am pleased indeed to have been invited to be part of this Courant Institute reunion today.

## Alumni Notes

**Carole Siegel** (Ph.D. Mathematics '63) recently attended the CIMS Alumni Reunion. She is the Director of the Statistics and Services Research Division and the Center for the Study of Issues in Public Mental Health (CSIPMH) at the Nathan S. Kline Institute (NKI) for Psychiatric Research. NKI is affiliated with the Department of Psychiatry, NYU Medical Center and CSIPMH with NYU's Wagner School of Public Service. Her work involves biostatistics and mathematical modeling of issues related to mental health services and policy formation. Carole works with several Courant Alumni, including Eugene (Gene) Laska (M.S., Ph.D. Mathematics '60) and Morris Meisner (M.S., Ph.D. Mathematics '56).

**Jane Matthews** (Ph.D. Mathematics '64) has been an Associate Professor of Mathematics and Statistics and has taught at Hunter College for over 40 years. She leads the Teaching Opportunity Program (TOP) at Hunter, which seeks to train and place mid-career professionals in math teaching positions. Through the TOP program, adults with no prior education in teaching, but with a background in a math or science related field, can receive a Masters in adolescence education and teach in New York City.

**Paul Hindes** (B.A. Computer Science, Washington Square College '72), in his junior and senior years, was an assistant to Dr. Mal Kalos. (Mal is now at Lawrence Livermore, and the two have reconnected by email.) Paul recently attended the Courant Council meeting at the CS Media Lab, as well as the Alumni Reunion. He and Mel Mullin have had preliminary conversations about forming a Courant Interest Group (CIG) for alumni who work in financial services. The CIG might help with job placement, provide a professional network to connect the Courant diaspora, and for exploration of technical topics. If you think you might be interested in joining the group, send an e-mail to courant.alumni@cims.nyu.edu.

**Glen de Vries** (Computer Science) is the CTO of Medidata Solutions, Inc., a firm which he co-founded to provide software for clinical trials, including electronic data capture, study and site management applications, and patient diaries. He is staying involved with Courant by helping with the recruitment of CIMS computer science graduates.

**Ching-Cheng Lee** (M. Phil. Computer Science '81) lives in Danville, California and is now the CTO of a startup in Silicon Valley, California, and also an Adjunct Professor at California State University, Hayward. He received his Ph.D. from London University, UK.



Carole & Larry Sirovich and Martin Friedrichs



Left to right: Pablo Calderon, Eugene Laska, Raghu Varadhan, Louis Nirenberg, Will Miranker, and Eleazer Bromberg

**Pablo Calderon** (M.S. Mathematics '88, Ph.D. Mathematics '90) is starting his own hedge fund, Acies Partners, LP, and lives in Darien, Connecticut. He is staying involved with CIMS through the Math Finance program, serves on the Advisory Board for that program and attended the CIMS Alumni Reunion.

## In Memoriam

**Anastasia Czerniakiewicz**
(Ph.D. Mathematics '71)

Anastasia

Czerniakiewicz

Anastasia Czerniakiewicz, an alumna of the Courant Institute, passed away on May 20, 2004 at her home in Portland, Oregon after a battle with breast cancer.

Born in Buenos Aires, Argentina, Anastasia studied mathematics at the University of Buenos Aires on an Albert Einstein Scholarship. She later won a scholarship to attend the Courant Institute at New York University where she arrived with her first husband Norberto Kerzman (Ph.D. '70). She completed her Ph.D. in mathematics at Courant in 1971 under Professor Wilhelm Magnus and the mentoring of Professor Jack Schwartz.

After teaching appointments at Columbia University and Queens College, she returned to Courant in 1977 to study Computer Science. She then worked for Data General in North Carolina, where she met Roger Ray, whom she married in 1982. They both began working for Intel in 1981, where Anastasia led a distinguished career managing teams of engineers in complex software projects.

In appreciation for the scholarships she received, she established a fund at Courant to support Latin American students. As such, she was also a member of Courant Institute's Founders Society for those who named the Institute in their wills.

An accomplished teacher, engineer, artist, philanthropist, friend and wife, she will be missed by her husband Roger, her friends at the Institute, and all those who had the pleasure of knowing her. For more information about her, or to send condolences, please visit www.anastasia.com.

### Professor Malcolm Goldman

With sadness, we inform you that Malcolm Goldman passed away on Thursday, March 18th, 2004. Malcolm was a Professor of Mathematics who taught at NYU since 1965. Condolence notes may be sent to Ruby Goldman at Red Barnes Indian Brook Road, Garrison, NY 10524.

## Cheeger-Gromov Geometry Festival

Courant recently hosted a special Geometry Festival April 30 – May 2, 2004, culminating in a banquet dinner honoring the 60th birthdays of Professors Jeff Cheeger and Mikhail (Misha) Gromov. Open to everyone – with graduate students and younger researchers especially encouraged to attend – the Festival featured speakers Jean-Michel Bismut (Universite Paris-Sud), Yasha Eliashberg (Stanford University), Blaine Lawson (SUNY - Stony Brook), Dusa McDuff (SUNY - Stony Brook), Xiaochun Rong (Rutgers University), Dennis Sullivan (CUNY & SUNY - Stony Brook), Gang Tian (Princeton & MIT), and Edward Witten (Institute for Advanced Study).



From left to right: Blaine Lawson, Gang Tian, Mikhail Gromov, Dusa McDuff, Jeff Cheeger, Edward Witten, Jean-Michel Bismut, Xiaochun Rong, and Yasha Eliashberg

The conference and festivities showcased Courant's strong presence in geometry. The final banquet was held at NYU's Torch Club, with the evening emceed by Professor Sylvain Cappell. The remarks by distinguished mathematicians from near and far combined scholarly tributes to Jeff and Misha's celebrated scientific achievements with warm personal acknowledgments of their leadership and mentoring. The festival was supported by a grant from the National Science Foundation, by contributions from Drs. Henry Laufer and Jim Simons (who had been academic colleagues of Jeff and Misha before working at Renaissance Technologies), and by the Courant Institute.
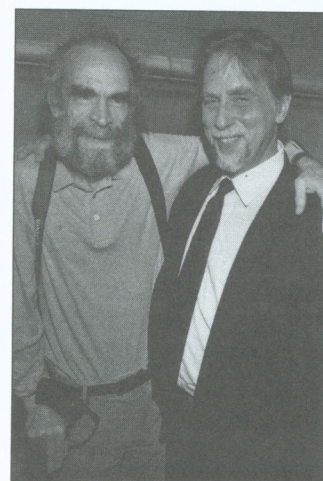


Mikhail Gromov and Jeff Cheeger

## Women in Science Initiative

Susan M. Puglia

The numbers of young women completing majors in computer science and pursuing careers in technical sciences is declining, and many of the alumnae and faculty at NYU are working to help reverse this trend. Following the recent Jurow Lecture given by the President of Princeton University, Dr. Shirley Tilghman, a group of alumnae met informally over dinner to discuss ideas for advancing NYU's presence and reputation among women in science and to help shape effective strategies to encourage women to come to NYU and study science.

Hosted by Courant's Chair of Computer Science, Margaret Wright, the dinner focused on Computer Science and Mathematics and included the following outstanding NYU alumnae: Ms. Evelyn Berezin (WSC, B.A. '46, Physics): Dr. Leora Morgenstern (Courant, PhD '88, Computer Science); Dr. Maggi Pack (GSAS, PhD '87, Biology); Ms. Susan M. Puglia (WSC BA '81, Mathematics, Computer Science, and Music); and Dr. Carole Hochman Sirovich (Courant, PhD '65, Mathematics).

As a second step in attracting and retaining women in the technical sciences, Professor Margaret Wright and Courant Council member Susan Puglia, plan to host a career panel for young

women at NYU in Spring 2005. Women with a wide variety of interests and insights will be there to help students who are beginning to plan their own career and cultivate mentor relationships. Based on Margaret's academic associations at Princeton and Columbia and Susan's leadership at IBM, where she is a Vice President in the IBM Systems and Technology Group, the event promises to be a well-represented and effective panel, followed by mentoring sessions between the individual women and students. We welcome ideas and involvement; if you're interested, please contact us at courant.alumni@nyu.edu.

## SIGGRAPH Jury Meeting at NYU

At this summer's SIGGRAPH 2004 a team from NYU, led by Courant Associate Professor Chris Bregler, is producing the prestigious Computer Animation Festival. The Courant/NYU team organized an international, expert jury that convened this past March at NYU to select the best pieces from 643 entries for their exemplary use of computer-generated imagery and compelling storytelling. The selected pieces are being composed into a series to show off the latest techniques in computer animations and visual effects done with incredibly creative twists.

Each year, the internationally recognized SIGGRAPH Animation Festival serves as a mirror of what is possible today and a window into what can be achieved in the future. This year's conference will run from August 8-12 in Los Angeles, California and will attract nearly 25,000 computer graphics and interactive technology professionals from six continents. Courant is proud of Chris Bregler's leadership and of the tremendous contributions of Associate Producer and volunteer coordinator, Debbi Baum; Pre-show Producer, Sally Rosenthal; Producers, Clilly Castiglia and Kevin Feeley; Project Manager, Jessica DeVincenzo; the Tisch School of the Arts; and all of the Courant students and the NYU Center for Advanced Technology who were involved in the jury weekend.

To see a preview of this year's selections, visit http://www.siggraph.org/s2004/conference/caf/index.php



Computer Animation Festival Jury for SIGGRAPH 2004 at NYU

## Puzzle – Blind Justice

Puzzling Adventures, Scientific American, July 2002
By Dennis E. Shasha
Professor of Computer Science, Courant Institute
*(Reprinted with the permission of Scientific American).*

A mathematically inclined judge uses a unique form of arbitration to settle monetary disputes. As in most arbitrations, the plaintiff and defendant present their evidence to the judge. But before the plaintiff begins, he writes down on a piece of paper how much money he thinks he should get – let's call the amount P – and puts the paper in a sealed envelope. Then the defendant writes down how much she is willing to pay – call it D – and puts that number in a separate envelope.

The judge does not know P or D. Once the plaintiff and defendant have presented their evidence, the judge determines an equitable monetary award, called J. But in this form of arbitration, the amount actually paid to the plaintiff is determined by comparing J with P and D. If J is closer to P, the defendant pays P; if J is closer to D, the defendant pays D. For example, say the plaintiff thinks he deserves $18 million, the defendant thinks she should pay nothing, and the judge decides the complaint is worth $8 million. Because $8 million is closer to zero than to $18 million, the plaintiff gets nothing.

Your challenge is to find the best strategy for the plaintiff. Suppose the judge hints that his award will be between $3 million and $10 million, with all numbers in that range having the same probability of being chosen. How much money should the plaintiff request to maximize his expected compensation? And should he change his request if he suspects that the defendant will be able read the number P through the sealed envelope?
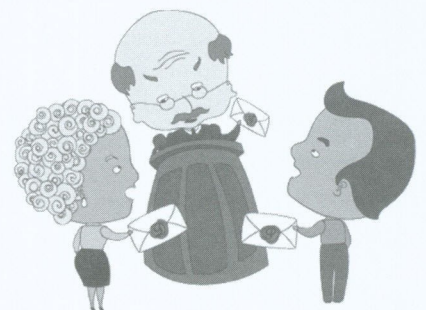
To find the answer to this puzzle, visit the Institute's website at www.cims.nyu.edu/newsletterpuzzle.html

## Closing Notes

● The Institute is pleased to recognize a recent gift from the estate of Thomas Benjamin John, in honor of his father Fritz John, who was a Courant Professor from 1946 until his death in 1994.

● If you wish to participate in this year's Courant Alumni Fellowship Fund, please know that the Institute's fiscal year end is August 31, 2004. Thank you. We appreciate your generous support.