THE INSTITUTE LETTER

INSTITUTE FOR ADVANCED STUDY

PRINCETON, NEW JERSEY · FALL 2005

INSTITUTE FOR ADVANCED STUDY CELEBRATES FOUNDERS DAY AND EINSTEIN

75th Anniversary of the Institute's Founding

In spite of rain, past and present Faculty and Members, local visitors, state and local officials, press and photographers turned out to participate in the Institute for Advanced Study's Founders Day events. On May 20, the day when the Institute's certificate of incorporation was filed with the State of New Jersey in 1930, the Institute reflected on its past, present and future in celebration of its 75th anniversary.

"Since its founding, the Institute has remained true to the mission set by its founders of providing an environment where curiosity-driven research into fundamental questions in the sciences and the humanities can flourish, and of gathering the ablest scholars and scientists from around the world to work here, selected on the basis of their outstanding abilities alone," said Institute Director Peter Goddard. "Unlike many academic institutions, its ethos and culture have remained essentially unchanged over the last 75 years."

CLIFF MOORE

Founders Day participants included (left to right): Robert B. Menschel (Institute Trustee, 1992–2005), Princeton Township Mayor Phyllis Marchand, sculptor Elyn Zimmerman, New Jersey Assemblywoman Bonnie Watson Coleman and Mercer County Executive Brian M. Hughes.

The Institute's eighth director presented one of several of the day's public lectures. In his illustrated talk, "The Founding of the Institute for Advanced Study," Dr. Goddard described the meeting of Institute founders Louis Bamberger and his sister Caroline Bamberger Fuld with Abraham Flexner, then the leading expert on medical education. Bamberger and Fuld consulted Flexner with a view to using part of the fortune they had amassed from the success of Bamberger's department store in Newark to found a medical school in that city. Flexner not only told them that their idea was misconceived, he also told them of his own dream, an institute for advanced study in which a community of scholars and scientists could pursue fundamental research, free from external pressures.

CLIFF MOORE

From left: Member in the School of Natural Sciences Ram Ramaswamy, and Members in the School of Historical Studies David Kennedy, Susan Morrissey and Boris Dreyer at the picnic lunch on May 20.

Among the Founders Day activities that were forced indoors because of rain was the rededication of Founders Walk, the modest memorial to Louis Bamberger and Caroline Bamberger Fuld that was to take place at Founders Rock, at the edge of the Institute woods where a new bench has been placed. Similarly, the dedication of a granite and steel sculpture by noted artist Elyn Zimmerman, installed between the Institute's pond and woods (see cover), took place in

(Continued on page 4)

CLIFF MOORE

Institute Director Peter Goddard (left) with former Director Carl Kaysen (1966–1976)

A CONFERENCE ON THE OCCASION OF THE SIXTY-FIRST BIRTHDAY OF PIERRE DELIGNE

> *"Now it's rather*
> *Pierre Deligne*
> *Of whose talents*
> *We should sing*
>
> *For the Weil conjecture*
> *Yielded*
> *To techniques*
> *That he fielded"*
>
> from "Will Fermat Last?"
> by Saunders MacLane,
> *The Mathematical Intelligencer*,
> Vol. 16, No. 3, 1994

In 2004, when the London Mathematical Society elected Pierre Deligne to Honorary Membership in "recognition of his *monumental* contributions to algebraic geometry," it was said that he had turned Alexander Grothendieck's philosophy of motives from a conjectural program into the driving force behind many of the most subtle areas of current algebraic geometry and arithmetic.

"There are very few mathematicians whose impact on modern mathematics comes close to that of Deligne," comments Peter Sarnak of Princeton University, Member in the School of Mathematics (1999–2002, 2005–06). "Deligne's research in algebraic geometry and arithmetic geometry have shaped these fields and led him to the solution of a number of long standing problems, including the Weil Conjectures (which are the analogues of the notorious Riemann Hypothesis for varieties over finite fields) and the celebrated Ramanujan Conjecture in the theory of modular forms. Deligne's foundational contributions range from the above fields to representation theory of groups, differential equations and monodromy, topology ... Many of the techniques and tools that he developed either in these papers or in response to questions posed to him (he is very approachable and generous) are at the bottom of much of the exciting research that is going in these fields today," comments Sarnak.

CLIFF MOORE

Pierre Deligne

At the Institute for Advanced Study, Pierre Deligne has brought new insight to deep problems in geometry and number theory. He was a Member in the School of Mathematics in 1972–73 and in 1976–77, a Visitor in 1981–82, and was appointed to the Faculty of the School of Mathematics in 1984.

The hallmark of his approach is to look for analogies between several areas which *a priori* do not share common features—to use, for example, algebraic methods to solve geometric questions and vice-versa. "Deligne's style is that of wanting to understand in simple and general terms things that are fundamental but appear to be very complex. His development of new insights and methods, as well as the solution of long standing problems, follow naturally from this point of view. Of course his striking success has a lot to do with his tremendous mathe-

(Continued on page 3)

NEWS OF THE INSTITUTE COMMUNITY

GLEN W. BOWERSOCK, Professor in the School of Historical Studies, received an honorary doctorate from the University of Athens in March.

At Harvard University's 354th Commencement in June, CAROLINE WALKER BYNUM, Professor in the School of Historical Studies, EDWARD WITTEN, Charles Simonyi Professor in the School of Natural Sciences, and QUENTIN SKINNER, Member in the School of Social Science (1976–79), were awarded honorary degrees.

The expanded Dutch translation of *Radical Enlightenment: Philosophy and the Making of Modernity, 1650–1750* by JONATHAN ISRAEL, Professor in the School of Historical Studies, was published in April. At a ceremony presided over by Princess Mathilde of Belgium in May, Professor Israel received an honorary doctorate from the University of Antwerp.

In May, a paperback edition of *Gender and the Politics of History* by JOAN WALLACH SCOTT, Harold F. Linder Professor in the School of Social Science, was published in Japan.

In August 2004, HEINRICH VON STADEN, Professor in the School of Historical Studies, was elected to the presidency of the *Fédération Internationale des Études Classiques* for a term of five years. In April 2005, Professor von Staden was elected a Foreign Member of the Finnish Academy of Science and Letters, and in May 2005, he was awarded an honorary degree (Doctor of Humane Letters) by Quinnipiac University.

Arguing About War, a collection of essays and articles by MICHAEL WALZER, UPS Foundation Professor in the School of Social Science, has been released in Spanish (May 2004), French (August 2004), and Italian (September 2004). Professor Walzer's book *Thick and Thin: Moral Argument at Home and Abroad* has appeared in French (October 2004) and Japanese (Fall 2004). His Horkheimer Lectures, published in German in 1999, have come out in Spanish (2004); and an expanded English version of the lectures entitled *Politics and Passion: Toward a More Egalitarian Liberalism* was published by Yale University Press in February.

For his work on superstrings, EDWARD WITTEN, Charles Simonyi Professor in the School of Natural Sciences, was one of two recipients to be awarded the Technion-Israel Institute of Technology 2005 Harvey Prize in August. Past recipients of the Harvey Prize include David J. Gross (2000), Member in the School of Natural Sciences (1973, 1977–78). Professor Witten, who was named one of the 25 most influential figures of the 20th century by *Time* magazine, also received the 2005 "Pitagora" Prize, an international prize for mathematics sponsored by the European Union and administered by the city of Crotone in Southern Italy. The prize includes an award of $50,000 Euros. In May, Professor Witten received an honorary degree from Johns Hopkins University.

A paperback edition of *Madumo, A Man Bewitched* by ADAM ASHFORTH, Visiting Associate Professor in the School of Social Science, was published by the University of Chicago Press in May.

A collection of commentaries on the work of CLIFFORD GEERTZ, Professor Emeritus in the School of Social Science, *Clifford Geertz by His Colleagues*, edited by Richard A. Shweder and Byron Good, was published by The University of Chicago Press in February.

The Passions and the Interests by ALBERT O. HIRSCHMAN, Professor Emeritus in the School of Social Science, has been included in Princeton University Press' Century of Books, a selection of 100 of their best titles. New translations in Japanese of *Exit, Voice, and Loyalty* and *A Propensity to Self-Subversion* were published by the Hosei University Press, and a Korean language translation of *Exit, Voice and Loyalty* has been published by the Nanam Publishing House.

PETER PARET, Professor Emeritus in the School of Historical Studies, gave the opening talk and chaired a session at the conference "Altes Reich und Neue Reiche im Europa des 19. Jahrhunderts," held by the Centro per gli Studi Storici Italo-Germanici from September 12 to 16 in Trento, Italy. The proceedings of the conference will be published in 2006.

Current Members in the School of Social Science DRAZEN PRELEC and THOMAS J. SUGRUE received Guggenheim Fellowships in April.

MARTIN L. LEIBOWITZ, Trustee of the Institute for Advanced Study, is the recipient of the Chartered Financial Analyst Institute's Award for Professional Excellence. The award is presented from time to time to a member of the investment profession whose exemplary achievement, excellence of practice and true leadership have inspired and reflected honor upon the profession to the highest degree.

MARTIN REES, current Trustee of the Institute for Advanced Study and Member in the School of Natural Sciences (1969–70, 1992–93), succeeds Robert May, Member in the School of Natural Sciences (1971–72), as President of the Royal Society in November 2005. Past presidents of the Royal Society include Sir Michael Atiyah, Member in the School of Mathematics (1955–57, 1959–60, 1967–68, 1975–76, 1987–88). Martin Rees has been appointed to serve in the House of Lords of the Parliament of the United Kingdom. He takes the title Lord Rees of Ludlow.

In April, JOHN ELLIOTT, Regius Professor Emeritus of Modern History at Oxford University, and former Institute Professor (1973–90) chaired a multimedia presentation, "Text, Space & Object," as part of a symposium on "The Matter of History," held by the School of Historical Studies in celebration of the 75th anniversary of the Institute's founding in 1930.

In March, the Norwegian Academy of Science and Letters awarded the Abel Prize in mathematics to PETER D. LAX, Member in the School of Mathematics (1959–60). Professor Lax, an emeritus professor at New York University's Courant Institute of Mathematical Sciences, was cited for "ground-breaking contributions to the theory and application of partial differential equations and to the computation of their solutions." The honor is accompanied by a prize of $980,000.

In June, The Shaw Prize in Mathematical Sciences was awarded to ANDREW WILES, Member in the School of Mathematics (1981–82, 1991–92, 1995–2004) for his proof of Fermat's Last Theorem. Wiles completed his long and difficult proof in 1994. Dubbed the "Nobel of the East," The Shaw Prize is one of the major honors for achievements in mathematics. It consists of three annual awards of $1 million each in astronomy, in life science and medicine and in mathematical sciences and was established in 2002 by Sir Run Run Shaw, a Hong Kong film and television producer. Wiles is the second recipient of Prize. It was first awarded in 2004 to fellow Institute Member and geometer Shiing-Shen Chern, Member in the School of Mathematics (1943–46, 1954–55 and 1964–65).

ROMAN BEZRUKAVNIKOV, Member in the School of Mathematics (1996–99), delivered the 2005 Marston Morse Memorial Lectures. Bezrukavnikov presented recent advances in geometric representation theory in two talks: "From Commutative to Non-Commutative Resolutions of Singularities via Quantization in Positive Characteristic" and "Algebraic Symplectic Resolutions, Representation Theory and Loop Groups."

GIFT OF WEYL FURNITURE: Annemarie Weyl Carr, University Distinguished Professor of Art History at Southern Methodist University in Dallas and the grandchild of Hermann Weyl, Professor in the School of Mathematics (1933–1952), has donated her grandfather's desk and matching glass-fronted bookcase together with several of his books to the Institute for Advanced Study. The furniture arrived in June.

CLIFF MOORE

Institute Trustee Charles Simonyi with Susan Hutchison, Executive Director of the Charles Simonyi Fund for Arts and Sciences, at the Institute in May. The Institute announced in September that it had received a $25 million gift from the Charles Simonyi Fund for Arts and Sciences. The donation is the largest since the Institute's founding and will be named The Karoly Simonyi Memorial Endowment Fund in honor of Charles Simonyi's late father.

NEW IAS PUBLICATION:
The Institute for Advanced Study 1930–2005

Published to coincide with the Institute's 75th anniversary celebrations in 2005, this 48-page booklet presents an engaging look at the Institute's beginnings, its founders and the key moments that define its history and evolution into the present day. Research uncovered new facts and figures, and this information is accented by new photography of the Institute campus and materials from the Institute Archives.

THE INSTITUTE LETTER

Linda Arntzenius, *Editor* Alison Carver, *Design*

Institute for Advanced Study, Einstein Drive
Princeton, NJ 08540-0631

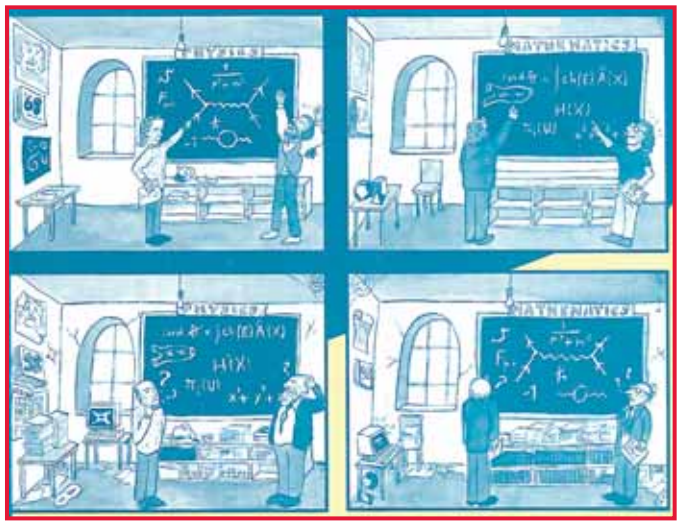
DELIGNE *(Continued from page 1)*

matical talent and especially his ability to think abstractly," says Peter Sarnak.

Deligne's early work and papers on Hodge theory ("Théorème de Lefschetz et critères de dégénérescence de suites spectrales" and "Théorie de Hodge I, II, III"), in which he develops his concept of weights, and tests it in complex geometry and his early work on the Weil conjecture "La conjecture de Weil pour les surfaces K3" and "Les intersections complètes de niveau de Hodge un" are prime examples of this style.

Pierre Deligne, whose work concerns many different aspects of the cohomology of algebraic varieties, pursues a fundamental understanding of the basic objects of arithmetical algebraic geometry—motives, L-functions, Shimura varieties—and applies the methods of algebraic geometry to trigonometrical sums, linear differential equations and their monodromy, representations of finite groups, and quantization deformation. His research includes work on Hilbert's 21st problem, Hodge theory, the relations between modular forms, Galois representations and L-series, the theory of moduli, Tannakian categories, and configurations of hyperplanes.

Among his achievements are the construction of mixed Hodge structures on the cohomology of varieties over the complex numbers; his famous 1974 proof of the last of the Weil conjectures; his construction in 1968 of the *l*-adic representation associated to a modular form, reducing the Ramanujan-Petersson conjecture to the Weil conjectures, as well as providing evidence for the Langlands program, and tools for the solution by Wiles and others of the Taniyama-Shimura-Weil conjecture; the development of the theory of weights, which found his achieved form with the approach to intersection cohomology (with Beilinson and Bernstein), perverse sheaves from the point of view of t-structures on derived categories; differential equations with regular singular points, and the solution of Hilbert's 21st problem; the theory of absolute Hodge cycles on abelian varieties, and the identification of the fundamental group of the category of CM motives; his ingenious reproving of the existence of local ε-factors, a key ingredient of the Langlands program; his investigation of the motivic structure on the fundamental group of an algebraic variety, providing (in the simplest case of the projective line minus three points) a link between polylogarithms and mixed Tate motives, and (with Beilinson) giving a motivic interpretation of Zagier's conjecture on special values of the Dedekind zeta function of a number field.



A cartoon by Robbert Dijkgraaf of the University of Amsterdam, Member in the School of Natural Sciences (1991–92, 2002–03), showing the interplay between mathematicians and physicists at the Institute, from the cover of volume 1 of Quantum Fields and Strings: A Course for Mathematicians *[American Mathematical Society/Institute for Advanced Study]. The publication, edited by Pierre Deligne and others, was the outcome of a year-long program in Quantum Field Theory that took place at the Institute in 1996–97 when Institute mathematicians and physicists worked together to create and convey an understanding, in terms congenial to mathematicians, of some fundamental notions of physics.*

"Deligne's work has structured the language in which generations of algebraic geometers and arithmeticians think and write," comments Hélène Esnault of the Universität Duisburg-Essen, Member in the School of Mathematics 1993–94 and Visitor 2005. Esnault, one of five organizers of a recent conference on the occasion of Deligne's 61st birthday, has described Deligne's legendary intellectual generosity: "Many algebraic geometers have slept for years with a few lines of Pierre Deligne's ideas on their night table, to meditate and think further. All algebraic geometers have the deepest admiration for Deligne's work."

Esnault recalls that Pierre Deligne once described the practice of mathematics as being similar to searching for a lost key on a street at night—one looks under the light. What he omitted to say, says Esnault, is that to a large extent, he provides the light.

Born in Brussels on October 3, 1944, Pierre Deligne's apprenticeship in mathematics began at the age of 14 when J. Nijs, an enthusiastic high school teacher and the father of a friend lent him the first volumes of the treatise of Nicolas Bourbaki (the collective pseudonym for a group of mathematicians active in France that included Jean-Pierre Serre and André Weil). Although his father wanted him to be an engineer and to pursue a career that would afford him a good living, Pierre knew early on that he should do something that he loved and

(Continued on page 4)

CLIFF MOORE

Pierre Deligne

PROSPECTS IN THEORETICAL PHYSICS
Summer Program in Collider Physics

MICHELLE SAGE

Chiara Nappi of Princeton University (center) with some of the participants in Prospects in Theoretical Physics, held at the Institute in July. Prospects in Theoretical Physics is an intensive two-week summer program geared specifically to graduate students considering a career in theoretical physics. First held at the Institute in 2002, the program has covered topics ranging from string theory to cosmology. This year's program was designed to prepare young physicists for the physics that will emerge from the Large Hadron Collider (LHC), the particle accelerator currently under construction in Geneva, Switzerland.

In addition to Professor Nappi, this year's organizers were: Nathan Seiberg of the School of Natural Sciences and Igor Klebanov of Princeton University. Lecturers included Jonathan Bagger (Johns Hopkins University); Lance Dixon (SLAC, Stanford University); Jonathan Feng (University of California, Irvine); Ian Hinchliffe (Lawrence Berkeley National Laboratory); Konstantin Matchev (University of Florida); Hitoshi Murayama (University of California, Berkeley); Michael Peskin (SLAC, Stanford University); Heidi Schellman (Northwestern University); Scott Thomas (Stanford University); Christopher Tully (Princeton University); and Dieter Zeppenfeld (University of Karlsruhe, Germany). For information, visit www.ias.edu/pitp.

PROGRAM FOR WOMEN AND MATHEMATICS
The Geometry of Groups

LINDA ARNTZENIUS

Karen Uhlenbeck (second from right) of The University of Texas at Austin with fellow mathematicians at this year's Program for Women and Mathematics in May: from left: Sun-Yung Alice Chang of Princeton University, Lisa Traynor of Bryn Mawr College, Antonella Grassi of the University of Pennsylvania, Karen Uhlenbeck, and Chuu-Lian Terng of the University of California, Irvine. Program for Women and Mathematics is an annual two-week residential program of the Institute for Advanced Study and Princeton University. Some 60 participants from around the country, including undergraduate and graduate students as well as postdoctoral scholars and senior researchers, gathered for a variety of formal and informal activities including undergraduate and graduate level lecture courses as well as research seminars, problem and review sessions, colloquia and Women-in-Science seminars.

Program organizers were: Sun-Yung Alice Chang (Princeton University), Ruth Charney (Brandeis University), Antonella Grassi (University of Pennsylvania), Chuu-Lian Terng (University of California, Irvine), Karen Uhlenbeck (Sid W. Richardson Foundation Regents' Chair in Mathematics at The University of Texas at Austin), and Karen Vogtmann (Cornell University). For information, visit http://www.math.ias.edu/womensprogram.

INSTITUTE CELEBRATES 75TH ANNIVERSARY *(Continued from page 1)*

Wolfensohn Hall. The sculpture is dedicated to the achievements in science and scholarship of the Institute. It was made possible through the generosity of Robert B. Menschel (Institute Trustee, 1992–2005).

Also on May 20, the Institute commemorated the 100th anniversary of Albert Einstein's *annus mirabilis* of 1905. Einstein (1879–1955) was one of the Institute's first Faculty members, serving from 1933 until his death in 1955. Noting that the last 25 years in the life of Einstein were the first 25 years in the life of the Institute, historian of technology George Dyson presented "Einstein and the Institute." Einstein played a significant part in the Institute's early development and Founders Day included a series of public lectures on Einstein's relationship with the Institute and the world and on his seminal 1905 scientific papers on Special Relativity, Brownian motion and the photoelectric effect.

Philip C. Argyres

Graham Kribs

Simeon Hellerman

Philip C. Argyres, Member, School of Natural Sciences, explained in non-technical terms, Einstein's two papers on "Special Relativity," and spoke on the origin of the famous formula E=mc2. Simeon Hellerman, Member, School of Natural Sciences, elucidated Einstein's paper interpreting the zig-zagging motion of particles of pollen suspended in liquid as evidence for the existence of atoms. His talk, "Brownian Motion and the Atomic Theory," described the experimental results on which Einstein's paper was based, and the conceptual shift Einstein's work caused in the realm of microscopic physics. In his talk on "The Photoelectric Effect," Graham Kribs, Member, School of Natural Sciences, discussed Einstein's first 1905 paper proposing that light comes in discrete quanta or particles and successfully predicting the photoelectric effect. This paper began the long road to the quantum revolution of the 1920s and its metamorphosis into modern-day particle physics.

Stephen Adler, Professor, School of Natural Sciences, presented "Einstein and Quantum Mechanics: A Love Hate Relationship," briefly describing Einstein's contributions to quantum mechanics before going on to discuss Einstein's estrangement from quantum mechanics. Peter Paret, Professor Emeritus, School of Historical Studies, described the unusual collaboration that Einstein initiated with Sigmund Freud and discussed its place in their lives and in the history of the 1930s in his lecture titled: "Einstein, Freud and their pamphlet 'Why War?'" In addition to his scientific work, Einstein took a number of outspoken political positions, and Joan Wallach Scott, Harold F. Linder Professor, School of Social Science, presented "Einstein and Politics," in which she spoke of Einstein's carefully thought out and deeply-rooted convictions with respect to pacifism, Hitler's Germany, internationalism and academic freedom. Michael Walzer, UPS Foundation Professor, School of Social Science spoke on "Einstein and Zionism" described Einstein's support for the movement and his criticism of it—from about 1920 until his death in 1955.

Chairman of the Institute's Board of Trustees James D. Wolfensohn (standing left) with fellow Trustee Charles Simonyi (seated, left) at the picnic lunch in the Institute Dining Hall on Founders Day.

Michael Walzer (left) and Institute Trustee Peter L. Galison

In his talk "The Assassin of Relativity," Peter L. Galison, Mallinckrodt Professor of the History of Science and of Physics, Harvard University, presented a heady mix of psychoanalysis, politics, physics and philosophy that followed the assassination of the Prime Minister of the Austro-Hungarian Empire by Friedrich Adler, son of the leader of the Socialist Party in Vienna, and a friend of Albert Einstein. Einstein rallied to his defense, and began an extraordinary correspondence with Adler about the meaning and validity of relativity.

The public lectures took place in Wolfensohn Hall with overflow seating in Bloomberg and Simonyi Halls where a simulcast broadcast was screened for those who could not be accommodated in Wolfensohn Hall. The day's events culminated in a celebratory dinner at which Chairman of the Board of Trustees, James D. Wolfensohn presented remarks and Wolf Lepenies, Visitor in the School of Social Science and Director's Visitor, toasted the Institute for Advanced Study.

Simulcasts of lectures taking place in Wolfensohn Hall on Founders Day were broadcast in Simonyi Hall

ALL PHOTOS BY CLIFF MOORE

75th Anniversary Events Continue

Throughout the year, the Institute has marked its milestone anniversary with a range of events that celebrate the work of its four Schools as well as its founders and Einstein. The School of Mathematics, the School of Historical Studies, and the School of Natural Sciences hosted a series of events on separate weekends in March, April and September, respectively. The School of Social Science will host celebrations on Friday, November 11 and Saturday, November 12. ■

DELIGNE *(Continued from page 3)*

what he loved was mathematics. He went to the University of Brussels with the ambition of becoming a high-school teacher, and of pursuing mathematics as a hobby for his own personal satisfaction. There, as a student of the Belgian algebraist Jacques Tits, Deligne was pleased to discover that, as he says "one could earn one's living by playing, i.e. by doing research in mathematics." He was encouraged by Professor Tits to continue his studies in Paris, by attending the seminars of Jean-Pierre Serre and of Alexandre Grothendieck. Deligne received his doctorate from the University of Brussels in 1968 and, after a year as a Junior Scientist at the Fond National de la Recherche Scientifique in Brussels, he joined the Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, where he met Jean Pierre Serre.

The mathematician who most influenced him is Alexandre Grothendieck, with whom he shared the Crafoord Prize of the Swedish Academy in 1988. With Grothendieck, he also shared a deep appreciation of nature, an important part of his life today.

In an interview with essayist and photographer Marian Schmidt for the book *Hommes de Science: 28 Portraits* (Hermann, 1990), Deligne spoke about his personal philosophy of simplicity, his love of nature and dedication to Mathematics. To have one's needs satisfied, he believes it is better to have few of them, rather than striving to satisfy many.

Contact with nature is indispensible for Deligne who appreciates the independence afforded by growing one's own vegetables and living simply. He enjoys walking in the woods and likes to spend summers backpacking on foot across Corsica. With Elena Alexeeva, the daughter of the Russian mathematician V.M. Alexeev, whom he married in 1980, he has two children and lives at the edge of the Institute Woods.

Professor Deligne is a foreign member of the Paris Académie des Sciences, the American Academy of Arts and Sciences, the Accademia dei Lincei, and the Académie Royale de Belgique. He was awarded a Fields Medal in 1978, the Crafoord Prize of the Swedish Academy in 1988, and the Balzan prize in mathematics in 2004. Other awards include the François Deruyts Prize from the Belgian Royal Academy in 1974, the Henri Poincaré Medal from the Academy of Sciences (Paris) in 1974, and the A. De Leeuw-Damry-Bourlart Prize in 1975.

A conference on the occasion of the sixty-first birthday of Pierre Deligne took place at the Institute, October 17–20, 2005. The conference, "Geometry and Arithmetic," organized by Alexander Beilinson (University of Chicago), Spencer Bloch (University of Chicago), Hélène Esnault (Universität Duisburg-Essen), Nicholas Katz (Princeton University), and Professor Robert MacPherson of the School of Mathematics), reflected the breadth of Professor Deligne's influence. Speakers included Gerd Faltings (Max Planck Institut für Mathematik), Guy Henniart (Université de Paris-Sud), Ofer Gabber (Institut des Hautes Études Scientifiques), Luc Illusie (Université de Paris-Sud), Tomohide Terasoma (University of Tokyo), Phillip Griffiths (School of Mathematics), Carlos Simpson (University of Nice), Andrew Wiles (Princeton University), George Lusztig (Massachusetts Institute of Technology), Marie-France Vignéras (Institut de Mathématiques de Jussieu), Gérard Laumon (University of Paris-Sud), Joseph Bernstein (Tel Aviv University, Israel), Yuri Manin (Northwestern University), Alexander Beilinson (University of Chicago), and Maxim Kontsevich (Institut des Hautes Études Scientifiques). The conference was supported by a grant from the National Science Foundation. ■

SCHOOL OF NATURAL SCIENCES
Celebratory Events for the Institute's 75th Anniversary

To mark the 75th anniversary of the founding of the Institute, the School of Natural Sciences—the third of the Institute's four schools, formed in 1966—organized a series of lectures and discussions on September 23 and 24. The events featured some of the world's leading scientists, many of them returning Members or Visitors.

The two-day celebration began on Friday, September 23 with the first of five public lectures geared for a general audience. Robbert Dijkgraaf of the University of Amsterdam, Member in the School of Natural Sciences (1991–92, 2002–03), spoke on "The Quantum Geometry of String Theory," and described the remarkable mathematical insights yielded by string theory with respect to the structure of space and time on the smallest scales where the laws of quantum physics rule.

Robbert Dijkgraaf and Juan Maldacena

Arnold J. Levine, Professor in the School of Natural Sciences, presented "Surfing the Human Genome for Genetic Predisposition to Cancer." Professor Levine's research centers on the causes of cancer. He directs the Institute's Center for Systems Biology.

Arnold J. Levine

Joseph J. Atick of Identix Incorporated, who was a Member in the School of Natural Sciences from 1987 to 1992, returned to the Institute to present a lecture on new methods and technologies in biometrics, "The Science and Politics of Managing Human Identity."

Joseph J. Atick

Following tea in the Fuld Hall Common Room, David Spergel of Princeton University, Member in the School of Natural Sciences (1985–88) spoke on "The New Cosmology," discussing future research on questions such as: "What happened during the first moments of the big bang?" "What is the dark energy?" and "What were the properties of the first stars?" Peter Goldreich, Professor in the School of Natural Sciences, then presented "Extrasolar Planets," whose detection is the first step in the search for life outside our solar system.

David Spergel

On Saturday, September 24, the School of Natural Sciences assembled a panel of past Members to speak about their experiences at the Institute. The panel was chaired by Robert May of Oxford University and Imperial College, London, a past Member in the School of Natural Sciences (1971–72).

Peter Goldreich

Panel of past Members (from left): Scott Tremaine, Robert H. Socolow, David Olive, Sara Seager, Curtis G. Callan, Robert May

Particle physicist Curtis G. Callan of Princeton University, Member in the School of Natural Sciences (1969–72, 1983–94, 2002–04), spoke of the symbiotic relationship between the Institute and Princeton University. He described the golf course that lies between the two institutions as a "worm hole" between them and saluted the Institute, which, he said, "has done an incredible job of reinventing itself," and "has the courage to do bold things."

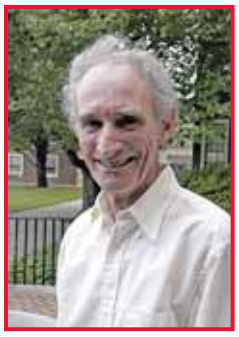
Sara Seager of the Carnegie Institution of Washington, Member in the School of Natural Sciences (1999–2002), described her work in astrophysics with Professor John Bahcall whom she recalled as a role model and mentor. "We were always watching him and noticing what he thought was important. He planted a seed in my mind and guided me through positive reinforcement. John always encouraged us to think far out!" she said.

Panelists David Olive of the University of Wales Swansea, Member in the School of Mathematics (1987–88); Robert H. Socolow of Princeton University, Member in the School of Natural Sciences (1971); Scott D. Tremaine of Princeton University, Member in the School of Natural Sciences (1978–81); and (via a recorded interview presented by video) David J. Gross of the University of California, Santa Barbara, Member in the School of Natural Sciences (1973, 1977–78), spoke about the special characteristics of the School that afford such memorable experiences for Members and Visitors. Among these were the high number of young people compared to Faculty, a consequence of which is that "one looks laterally for collegial intercourse," commented Professor Tremaine, who described the atmosphere of the IAS where postdocs are treated as Faculty as "tremendously liberating."

David Olive

Scott Tremaine and Sara Seager

The panel discussion was followed by a remembrance of Professor John Bahcall (1934–2005) by Robert May and remarks from Neta Bahcall of Princeton University. An excerpt of Professor Bahcall's interview from *BIG IDEAS*, the PBS documentary made by Channel Thirteen in 2003, was screened.



Robert May

Following the screening, a public lecture by Brian Greene, Member in the School of Natural Sciences (1992–94), was well-attended by members of the public and the Institute community. *The New York Times* best-selling author and leader in the field of superstring theory, Brian Greene is a professor of physics and of mathematics at Columbia University. He is the author of *The Elegant Universe* (1999), and *The Fabric of the Cosmos* (2004) and host of the 2003 NOVA program, "The Elegant Universe." His lecture, "Unification and String Theory," presumed no background in physics and described Einstein's relentless pursuit of a unified theory of physics, a pursuit that contemporary physicists have taken up in recent decades, pursuing an approach known as superstring theory. Greene presented the discoveries that led to superstring theory, and assessed how close it has come to realizing Einstein's dream. ■

Neta Bahcall

Members of the public waiting to attend Brian Greene's lecture in Wolfensohn Hall.

Brian Greene

ALL PHOTOS BY ANDREA KANE

JAZZ, GIANT PIPES AND FLOWER POTS

Institute for Advanced Study Concert Season Opens

DAVID BARTOLOMI

Fred Hersch

Wordless compositions by modern jazz pioneer Thelonius Monk, works by legendary composer and lyricist Cole Porter, and recent compositions by contemporary jazz pianist Fred Hersch featured in the opening concert of the Institute for Advanced Study's *Recent Pasts 20/21* 2005–2006 concert season. The concert, "Songs—With and Without Words," took place on Friday and Saturday, October 7 and 8. Fred Hersch, who is considered to be among the foremost of today's jazz artists, is widely recognized for his ability to reinvent the standard jazz repertoire and to invest time-tested classics with keen insight, fresh ideas and extraordinary technique. Possessing "an intensity of intelligence and emotional directness unparalleled among his peers" (*The New Yorker*), Hersch's accomplishments include a 2003 Guggenheim Memorial Fellowship for composition and two Grammy® nominations for Best Jazz Instrumental Performance. He has appeared on over one hundred recordings, including more than two dozen as a bandleader/solo pianist.

Following the concert, Hersch spoke with Institute Artist-in-Residence Jon Magnussen on the improvisatory artform and the connections between the jazz and classical musical traditions. "More so than in any other age, composers of our time are able to access and assimilate an ever-broadening range of music from around the world-classical, popular, folk and otherwise," said Magnussen. "Here in America, the largely improvisatory tradition of jazz is a significant part of our musical consciousness, and its impact on the art music tradition is considerable."

The wide variety of aesthetic perspectives in western art music of the 20th and 21st centuries is the focus of Magnussen's *Recent Pasts 20/21*, a four-year initiative begun in 2003–2004 and sponsored by the Institute's Artist-in-Residence program. The series of chamber music concerts and lectures continues with "Snapshots and Legacies: The Music of John Corigliano," performed by Music from Copland House on December 2 and 3 at 8:00 p.m. in Wolfensohn Hall. The concert will include works by Igor Stravinsky, Aaron Copland and John Corigliano. To compliment the concert, "Past, Present and Future: John Corigliano speaks with Michael Boriskin and Jon Magnussen," will take place on December 2 at 4:00 p.m. in the West Building Lecture Hall.

"Giant Pipes and Flower Pots: Music in the Birch Garden," a performance by innovative music groups So Percussion and Trollstilt will take place on May 13, 2006 at 7:30 p.m. in the Institute's Birch Garden. The concert will feature works by David Lang and Dan Trueman. Members of So Percussion and Trollstilt will participate in a pre-concert talk with Jon Magnussen on Friday, May 12 at 12:30 p.m. in the Dilworth Room (no tickets required). "A Music Redefined: David Lang speaks with Jon Magnussen," will take place before the concert on May 13 at 6:30 p.m. in the Birch Garden.

Concert tickets are free but must be reserved in advance. For information on ticket availability, or further information about the Institute for Advanced Study's Artist-in-Residence program, call (609) 734-8228 or visit www.ias.edu/air. ■

NEW FELIX GILBERT MEMBERSHIP IN THE SCHOOL OF HISTORICAL STUDIES

In honor of Felix Gilbert, George Labalme has provided support to the Institute for Advanced Study for the Felix Gilbert Membership in the School of Historical Studies. The above photograph taken in June 1970 shows Felix Gilbert (center) with his wife Mary (top right) dining outdoors in the restaurant La Colomba in Venice, Italy with the late Patsy Labalme (top left), George Labalme and their children Jennifer, Henry, Lisa, and Victoria. La Colomba is five minutes from St. Mark's square, and another five from La Fenice, the famous opera house.

Felix Gilbert was Professor of Renaissance and 19th-century German History in the School of Historical Studies (1962–75). He encouraged Patsy Labalme in her research on the Italian Renaissance figure Marin Sanudo. Patsy Labalme's book, Venice, Cita Excelentissima: Selections from the Renaissance Diaries of Marin Sanudo, *is forthcoming from The Johns Hopkins University Press.*

AMIAS RECEPTION FOR NEW MEMBERS

CLIFF MOORE

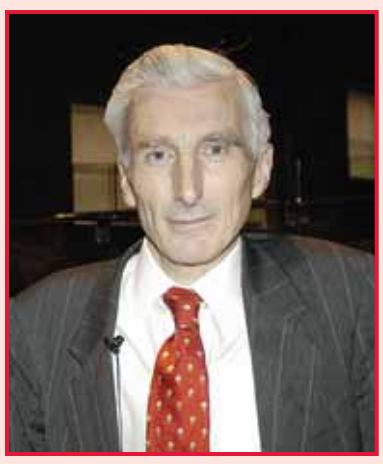
A reception to welcome new Members of the Institute for Advanced Study was held on Wednesday, September 21 in the Institute Dining Hall.

DANTE IN HIS STUDY

This 1982 screenprint (76 x 55 cm) is the work of painter, writer and composer Tom Phillips, Director's Visitor to the Institute for Advanced Study. Tom Phillips is the first visual artist to be a Director's Visitor. Selected works by the artist can be viewed at: http://www.tomphillips.co.uk/.

SIR MARTIN REES ON THE LEGACY OF ALBERT EINSTEIN

Sir Martin Rees, Institute Trustee and past Member in the School of Natural Sciences, presented "Einstein's Legacy as Scientist and Icon" on Friday, May 6, at 6:00 p.m. in Wolfensohn Hall. The public lecture was part of the Institute's 75th Anniversary year, and marked the centenary of Albert Einstein's annus mirabilis *of 1905, when he published his seminal papers on Special Relativity, Brownian motion and the photoelectric effect. Rees is Professor of Cosmology and Astrophysics and Master of Trinity College at Cambridge University. As reported on page 2, Martin Rees has been made a member of the House of Lords in the Parliament of the United Kingdom. He takes the title Lord Rees of Ludlow.*



JOHN NORRIS BAHCALL
December 30, 1934 – August 17, 2005

John Norris Bahcall, the Richard Black Professor of Astrophysics in the School of Natural Sciences at the Institute for Advanced Study, passed away on August 17, 2005, in New York City. He was 70.

"John Bahcall was a true pioneer in the fields of astronomy and astrophysics. His contributions have had an indelible impact. Always generous with his time, John Bahcall was an inspirational teacher and mentor who shaped the careers of a generation of scientists. His passing is deeply felt at the Institute," said Peter Goddard, Director of the Institute for Advanced Study.

James D. Wolfensohn, Chairman of the Institute's Board of Trustees, stated: "John Bahcall was one of the great treasures of the Institute. His personal leadership, his professional achievements and his devotion to the Institute made a contribution that helped shape our lives. We loved John and will miss him sorely."

CLIFF MOORE

John N. Bahcall

Professor Bahcall, who came to the Institute as a Member in 1968, joined the Faculty of the School of Natural Sciences in 1971. He served as the Richard Black Professor from 1997. He had a long and prolific career in astronomy and astrophysics, spanning five decades and the publication of more than five hundred technical papers, books, and popular articles. His most recognized scientific contribution was the novel proposal in 1964, together with Raymond Davis Jr., that scientific mysteries of our sun—how it shines, how old it is, how hot it is—could be examined by measuring the number of neutrinos arriving on Earth from the sun. Neutrinos are weakly interacting elementary particles that travel at nearly the speed of light. They are produced as byproducts of the nuclear fusion reactions that power stars. Measuring the properties of these neutrinos tests both our understanding of how stars shine and our understanding of fundamental particle physics.

Observations by Raymond Davis Jr. in the 1960s and 1970s revealed a clear discrepancy between Bahcall's predictions, based on standard solar and particle physics models, and what was measured experimentally. This discrepancy, known as the "Solar Neutrino Puzzle," was examined by hundreds of physicists, chemists, and astronomers over the subsequent three decades. In the 1990s through 2002, new large-scale neutrino experiments in Japan, Canada, Italy, and Russia culminated in the conclusion that the discrepancy between Bahcall's predictions and experimental results required a modification of our understanding of particle physics: neutrinos must have a mass and 'oscillate' between different particle states. These results led to the 2002 Nobel Prize being awarded to the leaders of the American and Japanese neutrino experiments, Raymond Davis and Masatoshi Koshiba.

Dr. Bahcall contributed to many areas of astrophysics in addition to neutrino astrophysics, including the interpretation of quasar absorption lines, the study of dark matter in the universe, and the identification of the first neutron star companion. His most lasting influence, however, may be the promising young scientists whom he nurtured, and who went on to successful careers and scientific leadership positions in the academic and scientific community. He created the astronomy group at the Institute for Advanced Study, which became the leading training ground in the country for postgraduate researchers. At the Institute, Professor Bahcall's daily cry of "Lunch," from the top of the stairs in the astrophysics section of Bloomberg Hall gathered visiting and member scientists for their daily luncheon. He also helped establish the astronomy groups at the Weizmann Institute and Tel Aviv University of Israel, among others. He derived tremendous pleasure from building a culture and community that attracted, encouraged, and stimulated the best young scientists.

Dr. Bahcall was a powerful driving force in the astronomy and scientific community of the United States. He led the effort to create the Hubble Space Telescope in the 1970s together with Lyman Spitzer; chaired the National Academy of Science committee that created the decade roadmap for U.S. astronomy research, which came to be known as the Bahcall Report; served as President of the American Astronomical Society from 1990-92 and as president-elect of the American Physical society this past year. He was active in many areas of science policy relating to astronomy and physics, chairing numerous committees of the National Academy of Science, the U.S. National Committee of the International Astronomical Union and the National Underground Science Laboratory Committee, and advising or serving on Congressional committees.

Born in Shreveport, Louisiana, John Bahcall's love of physics had a non-traditional beginning. He took no science classes in high school. Focusing instead on tennis and the debate team, he became both a state tennis champion and a national debate team champion. He began his first year at Louisiana State University convinced he wanted to study philosophy and perhaps become a rabbi. At the University of California at Berkeley he began by studying philosophy but a graduation requirement led him to take a physics class—the first science class he ever took. "I fell in love with physics," he said, "and it changed my life." Deciding that physics, and eventually astronomy, best-suited a lifelong 'quest for the truth,' John Bahcall received his A.B. from Berkeley in 1956, an M.S. from the University of Chicago in 1957, and a Ph.D. from Harvard University in 1961. He was a Research Fellow at Indiana University before joining the faculty at CalTech, where was strongly influenced by leading physics and astronomy luminaries including Richard Feynman, Murray Gell-Man, and William Fowler.

Dr. Bahcall received numerous awards and prizes including the 1998 National Medal of Science from President Clinton; the Hans Bethe Prize of the American Physical Society; the Dan David Prize of Israel; the Gold Medal of the Royal Astronomical Society; the Fermi Award (with Raymond Davis); and the Benjamin Franklin Medal in Physics (with Raymond Davis and Masatoshi Koshiba). He received Honorary Doctorates from University of Pennsylvania, University of Chicago, University of Notre Dame, Hebrew University of Jerusalem, and the University of Milano. He has been a member of the National Academy of Sciences since 1976.

With a scientific mind that delighted in questioning and a spirit of discovery and perseverance, John Bahcall actively continued his research until his final days. He suffered from a rare blood disorder that advanced rapidly. He passed away peacefully in his sleep in New York, surrounded by his family, reiterating his satisfaction at a long and fulfilling life, and telling jokes until the end. He was tremendously loved, admired, and respected, and will be much missed.

Dr. Bahcall is survived by his wife, Dr. Neta Bahcall, Professor of Astrophysics at Princeton University; three children, Safi, Dan, and Orli, and brother Robert of Baton Rouge, Louisiana. A tribute was held at the Institute on October 29. It featured both scientific lectures and personal remembrances by professional colleagues, friends and family. ■

PHYSICSQUEST MARKS THE WORLD YEAR OF PHYSICS 2005

JAMES RIORDON

John Bahcall, late Richard Black Professor in the School of Natural Sciences, and a group of high school students from Iowa at the Institute for Advanced Study in May.

On Saturday, May 21, the day following its Founders Day celebration, the Institute for Advanced Study hosted the winning team of high school students from the American Physical Society's PhysicsQuest, a competition involving over 69,000 students from all fifty states. The event was part of The World Year of Physics 2005, marking Einstein's *annus mirabilis*. The contest, featured four physics experiments that used a map of the Institute grounds. Teacher Julie Mooney's 9th grade physical science class at St. Albert Catholic Schools in Council Bluffs, Iowa won the competition. The class participated in a treasure hunt at the Institute and attended a special, hands-on physics demonstration.

THE INSTITUTE LETTER

CLIFF MOORE

Situated along the southern edge of the Institute's pond and fitting gracefully into the environment, this new work by noted artist Elyn Zimmerman is dedicated to the achievements in science and scholarship of the Institute for Advanced Study. The sculpture consists of three curved granite panels, totaling forty feet in length, suspended from and surrounded by groupings of powder-coated stainless steel poles of varying heights and thicknesses. It appears as a sinuous bench floating amid slender trees.

Each of the sculpture's three benches bears an inscribed quotation from a key figure in the Institute's history: Abraham Flexner, whose vision inspired the foundation of the Institute and who served as its first Director (1930–39)—"Those who have moved the world have usually been those who have followed the will-o'-the-wisp of their own intellectual and spiritual curiosity;" Albert Einstein, one of the Institute's first Faculty members in the School of Mathematics (1933–55)—"All our science, measured against reality, is primitive and childlike —and yet it is the most precious thing we have," and George F. Kennan, who was a Faculty member in the School of Historical Studies (1956–2005)—"True scholars often work in loneliness, compelled to find reward in the awareness that they have made valuable, even beautiful, contributions to the cumulative structure of human knowledge, whether anyone knows it at the time or not."

Zimmerman's large-scale outdoor projects for private and public institutions include works at the National Geographic Society in Washington, D.C. and O'Hare International Center in Chicago, as well as a fountain memorial for the victims of the 1993 World Trade Center bombing that was destroyed on September 11, 2001.

The sculpture was made possible through the generosity of Robert B. Menschel, Institute Trustee from 1992 to 2005. Over the course of his tenure on the Board of the Institute, Menschel, who also serves as Chairman of the Board of Trustees of the Museum of Modern Art in New York, has funded scholarships and academic programs for the work of the Institute's Members. The sculpture was dedicated on May 20, 2005 to mark the 75th anniversary of the Institute's certificate of incorporation on that date in 1930.

INSTITUTE FOR ADVANCED STUDY
EINSTEIN DRIVE
PRINCETON, NEW JERSEY 08540
www.ias.edu

Have you moved? Please notify us of your change of address. Send changes to Linda Geraci, Institute for Advanced Study, Einstein Drive, Princeton, NJ 08540-0631 or email llg@ias.edu

Non-Profit Org.
U.S. Postage PAID
Permit #49
Princeton, NJ