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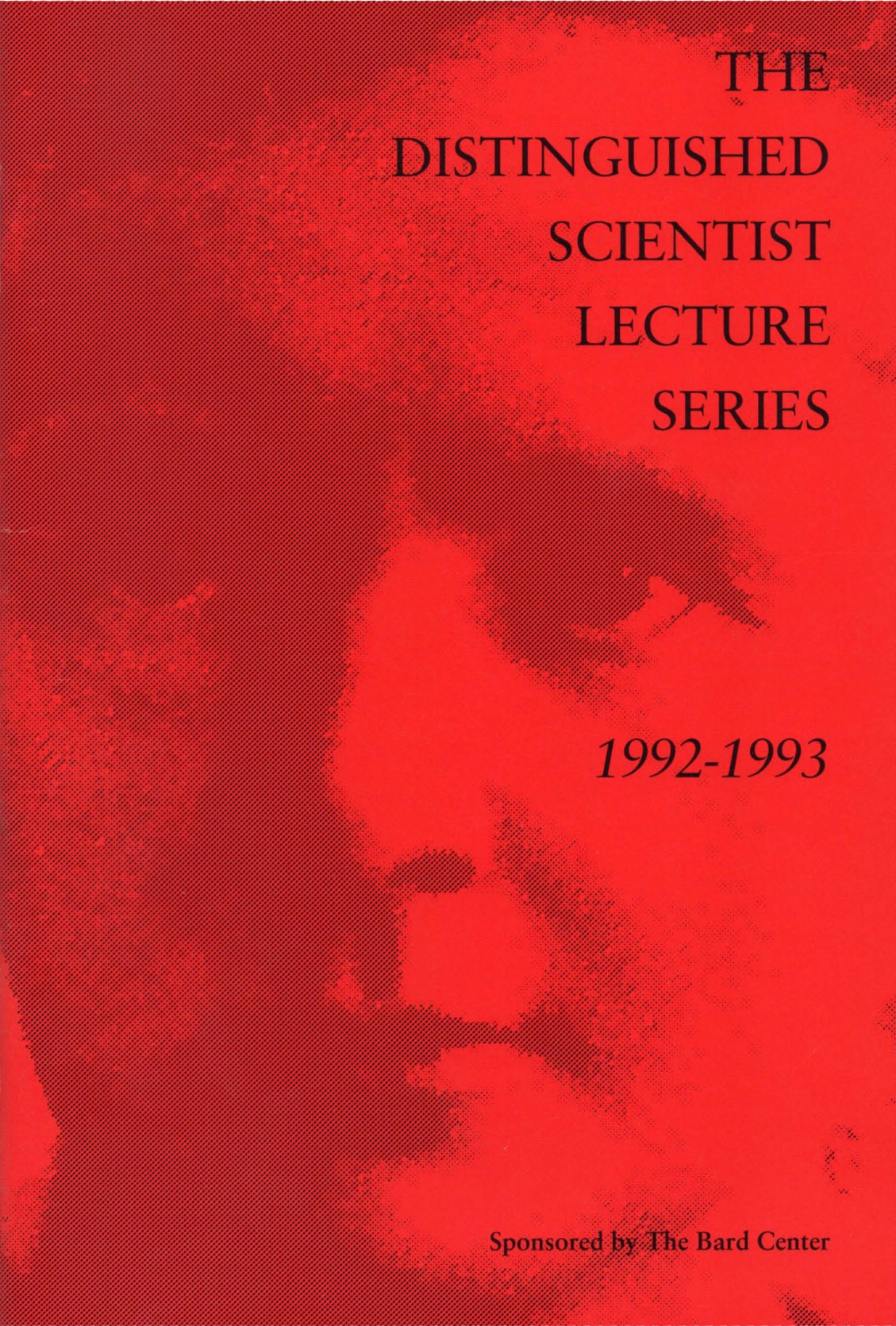
# Distinguished Scientist Lecture Series Program 1992-1993

Bard
*Bard College*

# THE DISTINGUISHED SCIENTIST LECTURE SERIES

*1992-1993*



Sponsored by The Bard Center

THE
DISTINGUISHED
SCIENTIST
LECTURE SERIES

*1992-1993*

## SCHEDULE OF LECTURES

*Fall*

•

September 26, 1992

MELVIN SCHWARTZ*

***"Symmetry Principles and Physical Laws"***

•

November 14, 1992

ELVIN A. KABAT

***"Antibody and T-cell Receptor Specificity and Structure—What Is New in Hypervariable Regions"***

•

*Spring*

•

February 27, 1993

HAROLD WEINTRAUB

***"Genes and Differentiation: How Does an Organism Develop From an Egg?"***

•

April 24, 1993

RONALD L. GRAHAM

***"Mathematics and Computers: Recent Successes and Insurmountable Challenges"***

•

The Bard Center
P.O. Box 5000
Annandale-on-Hudson
New York 12504-5000

** The 1992-93 Abe Gelbart Lecturer*

## HISTORY OF THE SERIES


The origin of the Distinguished Scientist Lecture Series goes back to the fall of 1979 when the late Nobel Laureate physicist Paul Dirac accepted an invitation from Dr. Abe Gelbart and the Bard Center to deliver a lecture on "The Discovery of Anti-Matter."

His talk combined scientific analysis with the history of science and personal reminiscences to present a view of modern science rarely seen by the general public—science as a record of personal achievement as well as a body of facts and knowledge. Professor Dirac's lecture drew an audience from throughout the East Coast, and its success inspired the establishment of the Bard Center Distinguished Scientist Lecture Series. The first two years of the Distinguished Scientist Lecture Series were supported by the Pre-College Teacher Development in Science Program of the National Science Foundation.

For all those interested in the field of science—students, teachers, researchers, professionals in scientific industries, and lay people—the series provides a rare opportunity for first-hand contact with men and women who have shaped modern science—the chance to see how they think and work, how they view their own achievements, and how they assess the challenges that scientists face, now and in the future.

To date, including the 1992-93 lectures, audiences will have heard eighty-three eminent scientists, including forty-three Nobel Laureates and four Fields medalists, speak on scientific issues of current and timeless concern.

## FORMAT OF THE LECTURES

Each lecture will begin at 3:00 p.m. in the F. W. Olin Auditorium on the campus of Bard College (see map on page 44). Admission is open to the public without charge. Before each talk, at 1:00 p.m. in the same auditorium, a Bard faculty member will introduce the topic for the day. Coffee and tea will be served between the two lectures in the rotunda outside the auditorium, and there will also be a reception after each talk in the rotunda, where the audience will have an opportunity to meet the day's speaker and ask further questions.

For more information, please call Ms. Karen Becker, Bard Center, (914) 758-7508.

MELVIN
SCHWARTZ*

*Physicist*

***"Symmetry Principles and Physical Laws"***
September 26, 1992

Melvin Schwartz is Professor of Physics at Columbia University and Associate Director for High Energy and Nuclear Physics at Brookhaven National Laboratory.

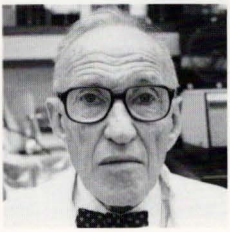
Born and educated in New York City, Mel Schwartz received his A.B. and Ph.D. degrees from Columbia University in 1953 and 1958, respectively, and was an associate professor there when he performed at Brookhaven National Laboratory the experiment that would be cited in his Nobel Prize. He left Columbia in 1966 to spend twenty-five years at Stanford University as Professor and then as Consulting Professor. While in California he became Chairman and Chief Executive Officer of Digital Pathways, Inc., a computer software company involved with data communications, security, and network management. In 1991 he returned to the New York area as Professor of Physics at Columbia and Associate Director for High Energy and Nuclear Physics at Brookhaven. In addition to some forty scientific articles in the field of high energy physics, Professor Schwartz has written a highly regarded textbook, *Principles of Electrodynamics*, most recently published by Dover in 1985.

In 1988 Professor Schwartz received the Nobel Prize in Physics. Among other honors, he has held fellowships supported by the National Science, Sloan, and Guggenheim Foundations. He is a Fellow of the American Physical Society and was elected to the National Academy of Sciences in 1975. Columbia awarded him an honorary D.Sc. in 1991.

His work: The current understanding of the basic structure of all matter involves two classes of particles. The heavier particles (hadrons) are made of quarks, which fall into three "generations." The lighter particles also fall into three generations, each of which consists of a relatively massive lepton (electron, muon, or tauon) and its associated and relatively much smaller neutrino. Dr. Schwartz's demonstration that the muon-type neutrino was not the same as the electron-associated neutrino of beta-decay was a critical step in the development of this understanding. He continues to oversee research in the physics of high energy particles, with particular emphasis on weak interactions.

**The 1992-93 Abe Gelbart Lecturer*

# ELVIN A. KABAT



*Immunochemist*

***"Antibody and T-cell Receptor Specificity and Structure—What Is New in Hypervariable Regions"***
November 14, 1992

Elvin A. Kabat is Higgins Professor Emeritus of Microbiology, Columbia University.

Born of parents who emigrated to the United States from Russia and Lithuania, Elvin Kabat entered the College of the City of New York at the age of fifteen, graduating at the age of eighteen with a B.S. in chemistry. He then became the first graduate student of Michael Heidelberger at Columbia College of Physicians and Surgeons, receiving an M.A. in 1934 and a Ph.D. in 1937, at the age of twenty-three. From 1937 to 1938 Dr. Kabat was a Rockefeller Foundation Fellow at the Institute of Physical Chemistry in Uppsala, Sweden, working in the laboratories of The Svedberg and Arne Tiselius. After three years as an instructor of pathology at the Cornell Medical College, Dr. Kabat returned to Columbia, where he rose from Research Associate in Biochemistry to Assistant, then to Associate Professor of Bacteriology, then to Professor of Microbiology, and finally to Higgins Professor of Microbiology. Dr. Kabat "retired" in 1985 as Higgins Professor of Microbiology Emeritus. He now spends four days a week at his lab at the College of Physicians and Surgeons and two days a week at the National Institutes of Allergy and Infectious Diseases, National Institutes of Health.

Among Dr. Kabat's many awards are his election to both the National Academy of Sciences and the American Academy of Arts and Sciences, the Eli Lilly Award in Bacteriology and Immunology, the Louisa Gross Horwitz Prize, the Academy Medal of the New York Academy of Medicine, and the National Medal of Science.

His work: Dr. Kabat discovered that antibodies are proteins (gamma-globulins, as defined by electrophoresis), and he has devoted his career to the elucidation of their structure. He found that antibodies differed from one another in "hypervariable" regions, and he predicted correctly that these regions would be involved in binding to target antigens. He thus is one of the founders of the field of immunochemistry. Among his over 400 scientific publications are the well-known books *Experimental Immunochemistry, Structural Concepts in Immunology and Immunochemistry*, and *Sequences of Proteins of Immunological Interest.*

HAROLD M.
WEINTRAUB

*Molecular Biologist*

***"Genes and Differentiation: How Does an Organism Develop From an Egg?"***
February 27, 1993

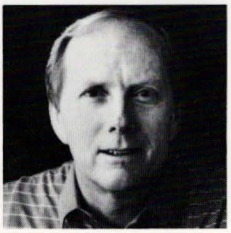
Harold M. Weintraub is Investigator, Howard Hughes Medical Institute, and Member, Division of Basic Sciences, at the Fred Hutchinson Cancer Research Center, Seattle, Washington.

Born in Newark, New Jersey, Hal Weintraub received his B.A. *cum laude* from Harvard University in 1967. Accepted to the Medical Scholar Training Program at the University of Pennsylvania School of Medicine, he received his Ph.D. under the supervision of Howard Holtzer in 1971 and his M.D. in 1973. On a Helen Hay Whitney Fellowship Dr. Weintraub traveled to the Laboratory of Molecular Biology at the Medical Research Council, Cambridge, England, were he worked with Sydney Brenner and Francis Crick (1972-73). An Assistant Professor, then Associate Professor, at Princeton University, Dr. Weintraub moved to the Fred Hutchinson Cancer Research Center in Seattle, Washington, where he is now a member of the Division of Basic Sciences and an investigator of the Howard Hughes Medical Institute. He is an Assistant Editor of both *Science* and *Cell*, and has been an Associate Editor of the *Journal of Cell Biology*.

Dr. Weintraub was elected to the AOA National Medical Honor Society, received the Lilley Award in 1982, has been elected to both the National Academy of Sciences and the American Academy of Arts and Sciences, and has received the National Academy's prestigious Lounsberry Award (1991).

His work: In over 110 scientific publications Dr. Weintraub has extensively explored chromosome structure and its importance for the regulation of gene activity. Along the way he discovered *MyoD*, a master regulatory gene for myogenesis, and was responsible for the conception and development of anti-sense RNA and DNA as inhibitors of gene activity. He has described this important technology in the January 1990 issue of *Scientific American*.

RONALD L.
GRAHAM



*Mathematician*

***"Mathematics and Computers: Recent Successes and Insurmountable Challenges"***
April 24, 1993

Ronald L. Graham is Adjunct Director, Research, Information Sciences Division, AT&T Bell Laboratories, Murray Hill, New Jersey; University Professor of Mathematical Sciences, Rutgers University; and President-Elect of the American Mathematical Society.

Before going off to college Ron Graham was a Ford Foundation Scholar at the University of Chicago. He received his B.S. in Physics from the University of Alaska at Fairbanks, then went on to the University of California at Berkeley, where as a National Science Foundation and Woodrow Wilson Fellow he was awarded an M.A. and a Ph.D. in Mathematics. He went immediately to the Bell Labs in Murray Hill, New Jersey, where he remains today. Since joining the Bell Labs, Dr. Graham has off and on been a Visiting Professor of Computer Science at Princeton and Stanford Universities, a Fairchild Distinguished Scholar at the California Institute of Technology, a Distinguished Visiting Letters and Sciences Professor at the University of California, Davis, and a Regents Professor of Mathematics at the University of California, Los Angeles. Since 1986 he has been University Professor of Mathematical Sciences at Rutgers University.

Dr. Graham is a member of the National Academy of Sciences and a Fellow of the American Academy of Arts and Sciences, the New York Academy of Sciences, and the American Association for the Advancement of Science. In 1972 he received the Polya Prize in Combinatorics, in 1981 he was chosen Scientist of the Year by *World Book Encyclopedia,* and more recently the Mathematics Association of America has presented him with the Carl Allendorfer Award (1990) and the Lester Ford Award (1991). At the time of his talk he will be President of the American Mathematical Society.

His work: Dr. Graham has made important contributions to the fields of combinatorics, number theory, and theoretical computer science. He has an active interest in mathematics education and serves on the Square One Television Series Advisory Committee of the Children's Television Workshop. He currently serves on the editorial boards of more than thirty mathematics journals.

JOHN B.
FERGUSON

*Director of the Series*

ABE
GELBART

*Founding Director of the Series, 1979-1991*

John B. Ferguson is an Associate Professor of Biology and past chair of the Division of Natural Sciences and Mathematics at Bard College. He received his Sc.B. degree in biology from Brown University (1969) and his Ph.D. degree in the same field from Yale. Professor Ferguson came to Bard in 1977 following an N.I.H. Postdoctoral Research Fellowship in the Department of Chemistry at Harvard. He is author of reviews and articles in *Experientia, The Journal of Biological Chemistry, The New Columbia Encyclopedia, Science Books and Film*s, and *Science Software*. His current research interests are in biochemistry, particularly the enzymology of *Tetrahymena pyriformis*.

Abe Gelbart, a well-known mathematician and Dean Emeritus of the Belfer Graduate School of Science at Yeshiva University, was a Bard Center Fellow and held the David and Rosalie Rose Distinguished Professorship of Natural Sciences and Mathematics at Bard. A former member of the Institute for Advanced Study at Princeton, Dr. Gelbart was Fulbright Lecturer in Norway in 1951-52. He taught at Syracuse University from 1943 to 1958, and was associated with the journal *Scripta Mathematica*, first as associate editor and then, for fourteen years, as editor. Dr. Gelbart is the co-developer of the theory of pseudoanalytic functions, the mathematical foundation for modern fluid dynamics. He has received several honorary degrees, has lectured at many American and European universities, and was lecturer at the Institute for Fluid Dynamics in Paris. In 1981 Dr. Gelbart was the recipient of the Bard Medal, the Bard Alumni/ae Association's highest honor, and in 1986 he received an Award of Special Recognition from the School of Nursing at the University of Pennsylvania. Bar-Ilan University in Israel recently named a chair in mathematics after Dr. Gelbart and in 1990 went on to name its International Research Institute for Mathematical Sciences, of which he is an honorary director, in honor of Dr. Gelbart. He is currently writing a history of twentieth-century science.

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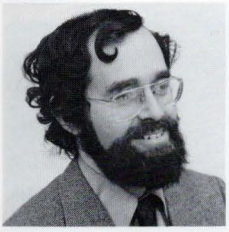
## IRVING R. EPSTEIN

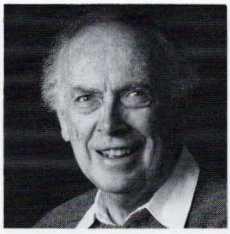


*Chemical Physicist*

***"Can Simple Chemical Reactions Tell us How the Leopard Got Its Spots?"***
April 11, 1992

Born in New York City, Dr. Epstein received a B.A. in Chemistry and Physics, an M.A. in Chemistry, and a Ph.D. in Chemical Physics (with W.N. Lipscomb), all from Harvard University. By the time he visited Bard he was Helena Rubinstein Professor of Chemistry and a member of the Center for Complex Systems at Brandeis University. His group developed the first systematic approach to designing new chemical oscillators, and they have pioneered in the discovery and mechanistic analysis of oscillating chemical reactions. Dr. Epstein is the author of more than 175 publications.

## JAMES D. WATSON

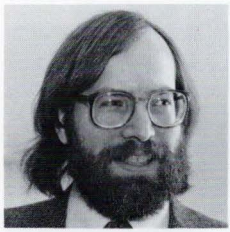


*Molecular Biologist*

***"The Human Genome Project"***
March 7, 1992

James D. Watson is best known for his discovery of the structure of deoxyribonucleic acid (DNA), for which he shared with Francis Crick and Maurice Wilkins the 1962 Nobel Prize in Physiology or Medicine. His writings include five books: *Molecular Biology of the Gene, The Double Helix, The DNA Story, Molecular Biology of the Cell*, and *Recombinant DNA: A Short Course*. At the time of his lecture, Dr. Watson was Director of the Cold Spring Harbor Laboratory and Associate Director for Human Genome Research of the National Institutes of Health.

## ROBERT E. TARJAN



*Computer Scientist*

***"Data Structures"***
February 15, 1992

The James S. McDonnell Distinguished University Professor of Computer Science at Princeton University at the time of his talk, Dr. Tarjan received his B.S. degree in mathematics from the California Institute of Technology in 1969 and his M.S. and Ph.D. degrees in computer science from Stanford University in 1971 and 1972, respectively. Dr. Tarjan is well known for his pioneering work on the design and analysis of algorithms and data structures and is widely published in these and related fields. He is the recipient of both the Nevanlinna Prize in Information Science and the A.M. Turing Award.

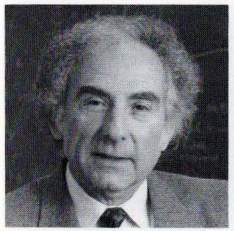
## GENE E. LIKENS

*Ecologist*

***"Human-Accelerated Environmental Change"***
November 16, 1991

At the time of his visit to Bard, Dr. Likens was Vice President of the New York Botanical Garden and Director of the Institute of Ecosystem Studies and the Mary Flagler Cary Arboretum, Millbrook, New York. An ecologist best known for his discovery of acid rain in North America, he co-directed the Hubbard Brook Ecosystem Study, a multidisciplinary ecological analysis of forest, stream, and lake ecosystems in the White Mountains of New Hampshire. Dr. Likens is author, co-author, or editor of more than 300 research articles and ten books.

## LEON COOPER



*Physicist*

***"Science and Science Policy in the 21st Century: A Modest Proposal"***
October 19, 1991

Dr. Cooper shared the Nobel Prize in Physics in 1972 with John Bardeen and J.R. Schrieffer for his studies on the theory of superconductivity, completed when he was in his twenties. The Thomas J. Watson, Sr. Professor of Science at Brown University when he gave his talk, Dr. Cooper was born and bred in New York City, attending the Bronx High School of Science and Columbia University (B.A. '51, Ph.D. '54). Just before he received the Nobel Prize, he moved into neurobiology, where he had been doing leading work on animal nervous systems and the human brain.

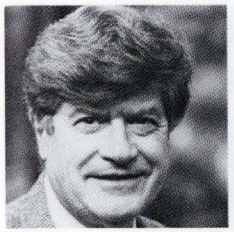
## GILBERT STORK

*Synthetic Organic Chemist*

***"Quinine, a Forty-Year Construction Problem***
April 27, 1991

Born in Brussels and educated in France before receiving his Ph.D. from the University of Wisconsin, Dr. Stork taught at Harvard for several years, then moved to Columbia, where he was Eugene Higgins Professor of Chemistry at the time of his talk at Bard. Dr. Stork has received numerous prizes and awards in recognition of his exploration of new and interesting methods in the designs for syntheses of complex natural products. He is a member of both the National Academy of Sciences and the American Academy of Arts and Sciences.

## KURT MISLOW

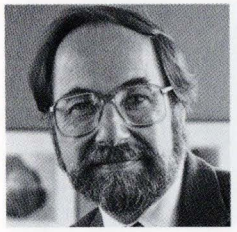


*Organic Chemist*

***"On Quantifying Chirality"***
March 16, 1991

At the time of his lecture at Bard, Dr. Mislow was Hugh Stott Taylor Professor of Chemistry Emeritus at Princeton University. Widely known for his theories of stereochemistry, he had recently become interested in the concept of quantifying chirality. Dr. Mislow has served on the advisory boards of seven journals, and has received many awards for his work, including the Prelog Medal and the William H. Nichols Medal. He is a member of both the National Academy of Sciences and the American Academy of Arts and Sciences.

## DAVID BALTIMORE

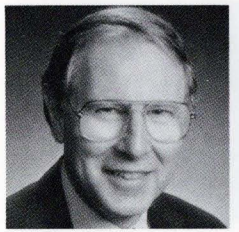


*Molecular Biologist*

***"Antibody Gene Formation"***
December 8, 1990

Shortly before speaking at Bard, Dr. Baltimore had been appointed President of Rockefeller University. He shared, with Renato Dulbecco and Howard Temin, the 1975 Nobel Prize in Physiology or Medicine for the discovery of reverse transcriptase, an enzyme found in retroviruses that has had great utility in genetic engineering. Dr. Baltimore is a member of the National Academy of Sciences, the American Academy of Arts and Sciences, and the Institute of Medicine.

## WINSTON J. BRILL



*Biotechnologist*

***"Biotechnology and Plant Agriculture"***
November 17, 1990

Shortly before speaking at Bard, Dr. Brill formed Winston J. Brill and Associates to assist corporations in improving research productivity and creativity. Dr. Brill has published extensively and has several patents in the area of agricultural applications of biotechnology, particularly in the use of genetic engineering to understand and manipulate nitrogen fixation in plants. Dr. Brill has served on several national committees concerning recombinant DNA and was elected to the National Academy of Sciences in 1989.

## ARTHUR M. JAFFE

*Mathematical Physicist*

***"Towards the Reunification of Modern Mathematics and Physics"***
October 27, 1990

At the time of his lecture, Dr. Jaffe was dividing his time between mathematics and physics as the Landon T. Clay Professor of Mathematics and Theoretical Science at Harvard University. Especially known for his work in field theory, Dr. Jaffe has received major awards in mathematics and physics, including the Dannie Heinemann Prize, and is chief editor of *Communications in Mathematical Physics*, editor of *Progress in Physics*, and editor of *Selecta Mathematica*.

## SIDNEY ALTMAN

*Molecular Biologist*

***"Understanding Life in the Laboratory"***
September 8, 1990

The year before speaking at Bard, Dr. Altman had been serving as ninth dean of Yale College when he received the 1989 Nobel Prize in Chemistry for his work on ribozymes (enzymes that use RNA for their catalytic functions). While dean he worked to broaden the role of science in the liberal arts curriculum. At the time of his talk, he had returned to the faculty as Sterling Professor of Biology at Yale. In addition to the Nobel Prize, Dr. Altman has received many awards, including election to the National Academy of Sciences in 1990.

## STEPHEN SMALE

*Mathematician*

***"The Nature of the Computer: A Non-Traditional Point of View"***
April 28, 1990

A Fields Medalist for his fundamental contributions to the field of differential topology, Dr. Smale has made equally significant contributions to the fields of dynamical systems and computational complexity. A former member of the Institute for Advanced Study at Princeton and visiting professor in South America, Paris, and New Haven, at the time of his talk Dr. Smale had been on the mathematics faculty of the University of California, Berkeley, for twenty-six years. Dr. Smale has received many awards for his wide-ranging and incisive research.

## ROBERT GALLO

*Medical Researcher*

***"Retroviruses in Cancer and AIDS"***
April 7, 1990

Dr. Gallo is one of the foremost virologists in the United States and a noted leader in cancer and AIDS research. At the time of his talk Dr. Gallo was Chief of the Laboratory of Tumor Cell Biology of the National Cancer Institute. Dr. Gallo has served on many international boards and has represented the United States in international meetings on AIDS. By studying reverse transcriptases in human cancer cells and in retroviruses, Dr. Gallo's lab played a critical part in clarifying the role of a retrovirus in causing AIDS.

## SAUL WOLFE

*Organic Chemist*

***"Drug-Receptor Interactions: A Chemist's Approach"***
March 17, 1990

Author of more than 200 scientific papers and holder of more than thirty patents (including one for the commercial production of the drug ampicillin), Dr. Wolfe had been at Queen's University, Canada, for twenty-eight years at the time of his talk. He has pioneered strategies using biotechnology to reduce the time involved in the synthesis of new drugs and has also addressed theoretical aspects of drug-receptor interactions. He has received the Merck Award for outstanding achievement in organic chemistry and the Queen's University Prize for Excellence in Research.

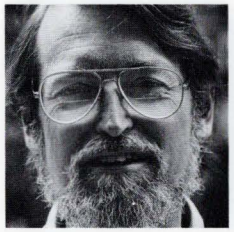
## NORMAN F. RAMSEY

*Physicist*

***"Time and the Physical Universe"***
November 18, 1989

In the month before his talk at Bard, Dr. Ramsey received the Nobel Prize in Physics for his contributions to both theoretical and experimental developments in particle physics and molecular beams, including the invention of the hydrogen maser. He was Higgins Professor of Physics at Harvard at the time of his talk. Executive secretary of the group of scientists who established Brookhaven National Laboratory, for many years he was also president of the Universities Research Association, which operates Fermilab.

## DAVID BRYANT MUMFORD



*Mathematician*

***"What Is 'Seeing' and How Come Computers Can't Do It While We Can?"***
October 14, 1989

At the time of his lecture, Dr. Mumford was a MacArthur Foundation Fellow and Higgins Professor of Mathematics at Harvard University. He has also been a member of the Institute for Advanced Study at Princeton and a visiting professor in Tokyo, Bombay, and Paris. Among the many honors for his important contributions to the field of algebraic geometry, Dr. Mumford received the Fields Medal in 1974. He had recently undertaken a study of the complex mechanisms underlying avian and human visual perception.

## MILDRED S. DRESSELHAUS

*Physicist*

***"Frontiers of Materials Research"***
September 23, 1989

Institute Professor at MIT at the time of her lecture, Dr. Dresselhaus has held many positions there and has been a visiting professor at universities around the world. She has received many honors, has been President of the American Physical Society and a member of the editorial board of *Physical Review B*, and has served on boards and committees concerned with women in science and engineering. Dr. Dresselhaus has developed and used a wide range of techniques to study condensed matter physics.

## JIN H. KINOSHITA

*Biochemist*

***"A New Approach to Control Diabetic Complications"***
May 20, 1989

Dr. Kinoshita was Scientific Director of the National Eye Institute of the National Institutes of Health at the time he gave his lecture. A 1944 Bard College, Columbia University graduate, his research interests have focused on the biochemistry of the lens of the mammalian eye, in particular the relationship of lens carbohydrate metabolism to the development of cataracts.

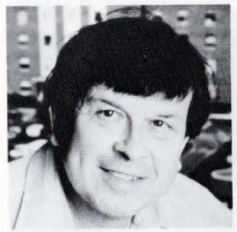
## RAUL J. FLEISCHMAJER

*Biochemist, Dermatologist*

***"Collagen: The Great Biological Architect"***
March 11, 1989

At the time he spoke at Bard, Dr. Fleischmajer was chairman of and a professor in the department of dermatology of the Mount Sinai School of Medicine, New York City. His research has focused on the biochemistry of skin, particularly its lipid metabolism and protein structure. He has served as chief editor of *Progress in Diseases of the Skin*, and the *International Journal of Dermatology*.

## DANIEL CARLETON GAJDUSEK



*Virologist*

***"The Ordered and Disordered Brain in Isolated, Primitive Populations"***
December 3, 1988

Dr. Gajdusek was a co-recipient of the Nobel Prize in Physiology or Medicine in 1976 in recognition of his study of viruses, particularly slow and unconventional viruses. His research has also encompassed protein physical chemistry, autoimmune diseases, neurological degenerative disorders, human evolution, child behavior, and learning in primitive cultures. At the time of his lecture, he was chief of the Laboratory of Central Nervous System Studies.

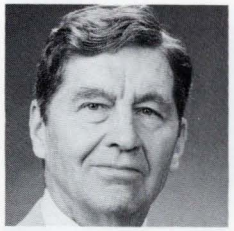
## ANTHONY S. FAUCI

*Immunobiologist*

***"Current Issues and Future Directions in the Scientific Response to the AIDS Epidemic"***
November 12, 1988

Dr. Fauci is a leading AIDS researcher and has been instrumental in developing strategies for the therapy and immune reconstitution of patients with this disease. At the time of his lecture he was Director of the National Institute of Allergy and Infectious Diseases of the National Institutes of Health.

## WALTER H. STOCKMAYER



*Physical Chemist*

***"Dynamics of Chain Molecules"***
October 15, 1988

At the time of Dr. Stockmayer's lecture, he was the Albert W. Smith Professor Emeritus at Dartmouth College. He has worked on a variety of theoretical problems in the dynamics and statistical mechanics of macromolecules, including light scattering, chain transformations, and chain dynamics. Dr. Stockmayer is associate editor of *Macromolecules*, has been elected to the Academy of Arts and Sciences (1946), and in 1987 received the National Medal of Science.

## DANIEL E. KOSHLAND, JR.

*Biochemist*

***"Chemistry of a Simple Behavioral System"***
April 30, 1988

When he lectured at Bard, Dr. Koshland was a professor of biochemistry at the University of California at Berkeley, editor of *Science* magnazine, and chairman of the editorial board of the *Proceedings of the National Academy of Sciences*. As a founding member and chairman of the Academy Forum, a committee of the National Academy of Sciences, he helped develop policy on issues that pose dilemmas between science and society.

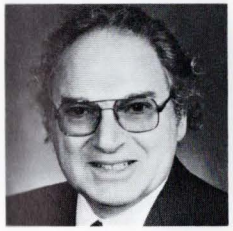
## SIR HANS KORNBERG

*Biochemist*

***"The Bacterial Cell Membrane: Berlin Wall of the Cell"***
April 9, 1988

Dr. Kornberg was the Sir William Dunn Professor of Biochemistry, University of Cambridge, and Master of Christ's College, Cambridge, when he lectured at Bard. Among Dr. Kornberg's career accomplishments was the School of Biological Sciences, which he established during his fifteen years at the University of Leicester. At the time of his lecture, he was also academic governor of the Hebrew University of Jerusalem and Scientific Governor of the Weizmann Institute. Dr. Kornberg was honored with a knighthood in 1978.

## HERBERT A. HAUPTMAN

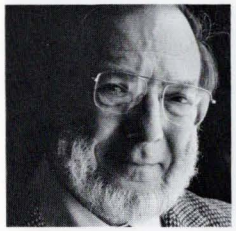


*Mathematician*

***"The Phase Problem of X-Ray Crystallography"***
March 12, 1988

At the time of his lecture, Dr. Hauptman was president and research director of the Medical Foundation of Buffalo and Research Professor of Biophysical Sciences at SUNY-Buffalo. Dr. Hauptman and Jerome Karle received the Nobel Prize in Chemistry in 1985 for work in the "direct method," an analytical technique to determine the three-dimensional structure of molecules. His awards include the Norton Medal and the Gold Plate Award of the American Academy of Achievement. Dr. Hauptman has written extensively on crystallography and phase determination.

## MICHAEL ELLIS FISHER



*Physicist*

***"What's Mathematical Physics to Physics?"***
February 27, 1988

Dr. Fisher had recently been appointed the Wilson H. Elkins Professor in the Institute for Physical Science and Technology of the University of Maryland at the time of his lecture. Honors for Dr. Fisher's work include the Wolf Prize in Physics, two Guggenheim fellowships, the Irving Langmuir Prize in Chemical Physics, and the Guthrie Medal and Prize of the Institute of Physics (United Kingdom).

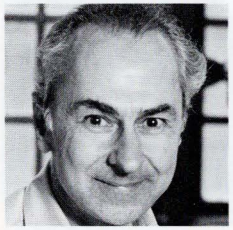
## GEORGE E. PALADE

*Biologist*

***"Traffic Problems and Their Solution in Animal Cells"***
February 13, 1988

Palade was senior research scientist and special advisor to the dean at Yale University School of Medicine when he spoke at Bard. In 1974 he received the Nobel Prize in Physiology or Medicine for his discoveries with A. Claude and C. DeVue on the structural and functional organization of the cell. Honors for Dr. Palade's work include the National Medal of Science, the Henry Gray Award, the Schleiden Medaille, the Brown Hazen Award, the Dickson Prize, and the Horowitz Prize.

## SERGE LANG



Mathematician

***"Concrete Cases Purveying Political Opinions as Science"***
October 31, 1987

At the time of his lecture, Dr. Lang had been a professor of mathematics at Yale University since 1972 and had taught at Columbia University, the University of Chicago, Princeton, and Harvard. A member of the National Academy of Sciences and the American Mathematical Society, he received the Prix Carriere from the Academie des Sciences, Paris, and the Cole Prize from the American Mathematical Society. Dr. Lang has published more than sixty articles and written thirty-two mathematical books. His research has been primarily in algebraic geometry and number theory.

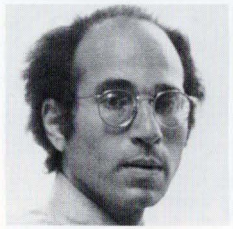
## HERBERT C. BROWN

Chemist

***"Discovering and Exploring the New Borane Continent"***
October 17, 1987

Dr. Brown was Wetherill Research Professor Emeritus at Purdue University at the time of his lecture. He received the 1979 Nobel Prize in Chemistry for his explorations of organic boranes. Other honors include the Nichols Medal, the ACS Award for Creative Research, the Linus Pauling Medal, the National Medal of Science, the Priestley Medal, and the Perkin Medal. *Hydroboration, Boranes in Organic Chemistry,* and *The Nonclassical Ion Problem* are among the books Dr. Brown has written.

## RICHARD AXEL



Molecular Biologist

***"Genes Mediating a Complex Behavior in a Simple Organism"***
April 25, 1987

Dr. Axel was a professor in the Department of Pathology and Biochemistry at Columbia University when he lectured at Bard. His work has focused on the control of gene expression in normal and transformed cells. He has received the Young Scientist Award of the Passano Foundation, the Alan T. Waterman Award, and the Eli Lilly Award for his achievements. Since 1976 he had been associate editor of *Cell* magazine.

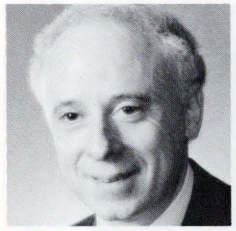
## WILLIAM A. FOWLER

*Astrophysicist*

***"The Quest for the Origin of the Elements"***
March 7, 1987

Dr. Fowler was the Institute Professor of Physics Emeritus at the California Institute of Technology at the time of his lecture. In 1983 he was awarded the Nobel Prize for Physics for his studies of nuclear reactions important in forming the chemical elements of the universe. He has chaired the Physics Section of the National Academy of Sciences and the Nuclear Science Advisory Committee of the National Science Foundation. In addition to the Nobel Prize, his other awards include the National Medal of Science and the NASA Apollo Achievement Award.

## JOSEPH L. GOLDSTEIN



*Biochemist*

***"Toward a Molecular Understanding of Cholesterol and Atherosclerosis"***
February 21, 1987

Dr. Goldstein was Regental Professor, Professor of Internal Medicine, and Chairman of the Department of Molecular Genetics at the Health Science Center of the University of Texas at the time of his lecture. In 1985 he and Michael S. Brown were co-recipients of the Nobel Prize in Physiology or Medicine for their work in characterizing the genetics and molecular biology of low-density lipoproteins and their role in atherosclerosis. His other honors include the Pfizer Award, the New York Academy of Sciences Award, and the Albert D. Lasker Award.

## MARIAN KOSHLAND

*Immunologist*

***"The Immune System: A Model for Studying Differentiation"***
December 13, 1986

Dr. Koshland was a professor of bacteriology and immunology at the University of California at Berkeley when she lectured at Bard. She has also been a fellow in bacteriology and immunology at Harvard University, a member of the executive committee of the National Science Board, and a member of the 1975 President's Biomedical Research Panel in immunology and microbiology. Her research has focused on the mechanisms of antibody synthesis.

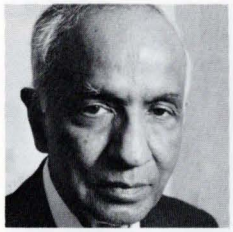
## JOHN WILLARD MILNOR

*Mathematician*

***"Some Simple Dynamical Systems"***
November 15, 1986

Dr. Milnor held the Veblen Chair at the Institute for Advanced Study, Princeton, at the time of his lecture. Honors for his work in algebraic topology have included the Fields Medal, the National Medal of Science, and the Steele Prize. Formerly Henry Putnam University Professor at Princeton University, he has been a member of the Institute since 1963.

## SUBRAHMANYAN CHANDRASEKHAR

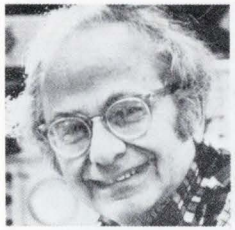


*Astrophysicist*

***"On Gravitational Collapse, Black Holes, and Colliding Waves"***
October 25, 1986

Distinguished Service Professor at the Yerkes Observatory when he lectured at Bard, Dr. Chandrasekhar was awarded the Nobel Prize in 1983 for his important theoretical studies of the physical processes in the structure and evolution of stars. He has also received the Gold Medal of the Royal Astronomical Society, the National Medal of Science, and the Heinemann Prize of the American Physical Society. It has been said that his research has "made black holes possible."

## DAVID HUNTER HUBEL

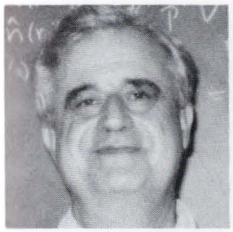


*Neurophysiologist*

***"The Visual Pathways and Perception: Evidence for Distinct Subsystems in Vision"***
October 11, 1986

At the time of his lecture, Dr. Hubel was the John Franklin Enders University Professor in the Department of Neurobiology at Harvard University. In 1981 he received the Nobel Prize in Physiology or Medicine with Torsten Weisel for their work on information processing in the visual system. Recognition for his work has also included Harvard's Ledlie Prize, the Horwitz Prize of Columbia University, and the Friedenwalk Award.

## MARSHALL NICHOLAS ROSENBLUTH

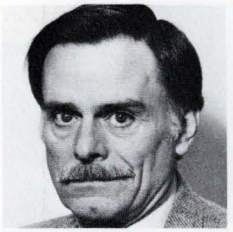


*Theoretical Physicist*

***"Fusion: Our Energy Future"***
April 26, 1986

Dr. Rosenbluth was the director of the Institute for Fusion Studies at the University of Texas at Austin when he lectured at Bard. He has been instrumental in developing the foundations of plasma physics and its relationship to magnetohydrodynamics, and his work has led to a variety of applications in the field of controlled fusion research. Dr. Rosenbluth has been awarded the E.O. Lawrence Prize, the Albert Einstein Award, and the James Clerk Maxwell Prize in Plasma Physics.

## JOHN STEWART WAUGH



*Chemist*

***"Prospects for NMR Spectroscopy at Very Low Temperatures"***
April 19, 1986

Dr. Waugh was the Albert Amos Noyes Professor at the Massachusetts Institute of Technology when he spoke at Bard. Known for his fundamental contributions to the field of high-resolution nuclear magnetic resonance spectroscopy in solids, he has received the Irving Langmuir Award and fellowships from the Sloan and Guggenheim Foundations, and he has been a fellow of the American Academy of Arts and Sciences and the American Physical Society. He is the author of *New NMR Methods in Solid State Physics* and an editor of numerous technical journals.

## GERALD MAURICE EDELMAN

*Biochemist*

***"The New Embryology: Molecules Regulating Animal Forms"***
March 8, 1986

At the time of his lecture, Dr. Edelman was the Vincent Astor Distinguished Professor at the Hospital of Rockefeller University. He received the Nobel Prize for Medicine or Physiology in 1972 for his research into the chemical structure of antibodies. Among his many other awards are the Regents Medal of Excellence from New York State, the Buchman Memorial Award from the California Institute of Technology, the Eli Lilly Award, and the Albert Einstein Memorial Award.

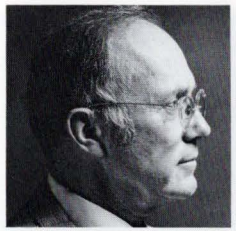
## SHELDON LEE GLASHOW

*Physicist*

***"The Challenge of Particle Physics"***
December 7, 1985

When he lectured at Bard, Dr. Glashow was the Higgins Professor of Physics at Harvard University. In 1979, he was awarded the Nobel Prize in Physics for his research on the Weinberg-Salam theory of weak interaction. In addition to the Nobel Prize, Dr. Glashow received the J.R. Oppenheimer Prize, the George Ledlie Prize, and the Castiglione d'Sicilia Prize. A member of the National Academy of Sciences and the American Academy of Arts and Sciences, he has served as president of the International Sakharov Committee.

## CHARLES HARD TOWNES



*Physicist*

***"Evidence for a Black Hole at the Center of Our Galaxy"***
November 2, 1985

Dr. Townes was the University Professor of Physics at the University of California at Berkeley at the time of his lecture. In 1964, he received the Nobel Prize in Physics for his fundamental work in the field of quantum electronics. The recipient of the Comstock Award from the National Academy of Sciences and the Rumford Premium Award from the American Academy of Arts and Sciences, among other prestigious awards, Dr. Townes is a foreign member of the Royal Society of London and a member of the National Academy of Sciences and the American Astronomy Society.

## CLAIRE M. FAGIN

*Nursing Researcher*

***"Consumerism and Health: Whose Body Is It, Anyway?"***
April 27, 1985

Dr. Fagin was the dean of the School of Nursing at the University of Pennsylvania when she lectured at Bard. Her major area of research is the effects of maternal attendance during children's hospitalization; she has also investigated the cost effectiveness of nursing intervention and nurse-consumer collaboration. Her books include *Nursing in Child Psychiatry* and *Family Centered Nursing in Community Psychiatry*, both chosen as Books of the Year by the *American Journal of Nursing*.

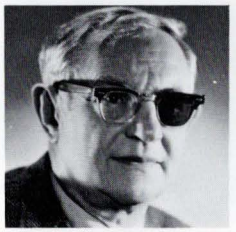
## BENJAMIN WIDOM

*Physical Chemist*

***"The Critical Points of Phase Transformation"***
March 23, 1985

A professor of chemistry at Cornell University at the time of his lecture, Dr. Widom has focused his research on phase transitions and statistical mechanics. Awards for his work include Guggenheim and Fulbright Fellowships and the appointment as National Science Foundation Senior Fellow in 1965. He is a member of the National Academy of Sciences, the American Physical Society, and the American Academy of Arts and Sciences.

## JULIUS AXELROD



*Biochemical Pharmacologist*

***"Neurotransmitters and Drugs that Affect the Mind"***
February 16, 1985

Dr. Axelrod received the 1979 Nobel Prize in Physiology or Medicine jointly with Ulf von Euler for their contributions to the study of the sympathetic nervous system, which have led to an understanding of the actions of many drugs important in cardiology, psychiatry, and neurology. When he spoke at Bard, he was chief of the section on pharmacology, Laboratory of Chemical Science at the Institute of Mental Health in Bethesda, Maryland.

## NICOLAAS BLOEMBERGEN

*Physicist*

***"Lasers in Science and Technology"***
December 1, 1984

Dr. Bloembergen was awarded the 1981 Nobel Prize in Physics jointly with A.L. Schawlow for their work on the development of laser spectroscopy. The Gerhard Gade University Professor at Harvard University at the time of his lecture, he is the author of *Nuclear Magnetic Relaxation* and *Nonlinear Optics*. Other honors for his work include the National Medal of Science and the Lorentz Medal of the Royal Dutch Academy of Science.

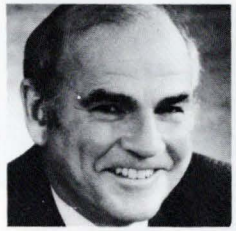
## HAROLD A. SCHERAGA

*Chemist*

***"Molecular Recognition in Proteins"***
November 3, 1984

Dr. Scheraga was Todd Professor of Chemistry at Cornell University at the time of his lecture at Bard. His research has focused on the physical chemistry of proteins and other macromolecules, on the chemistry of blood clotting, and on the structure of water and dilute aqueous solutions. His many distinctions include the American Chemical Society's Eli Lilly Award and memberships in both the National Academy of Sciences and the American Academy of Arts and Sciences.

## BARUCH S. BLUMBERG



*Research Physician*

***"Biology of Hepatitis B Virus"***
October 13, 1984

Dr. Blumberg was awarded the Nobel Prize in Physiology or Medicine in 1976 for his discovery of new mechanisms for the origin and dissemination of infectious diseases. When he delivered his lecture, he had been University Professor of Medicine and Anthropology at the University of Pennsylvania since 1977 and was Eastman Visiting Professor at Balliol College, Oxford University, and associate director for clinical research and senior member of the Institute for Cancer Research in Philadelphia.

## DAVID BOTSTEIN

*Biologist*

***"Mapping the Human Genome with DNA Polymorphisms"***
May 5, 1984

Dr. Botstein was a professor of biology at Massachusetts Institute of Technology when he spoke at Bard. A member of the National Academy of Sciences since 1981, he has received the NIH Career Achievement Award and the Eli Lilly Award in Microbiology and Immunology. Dr. Botstein is the author of *Advanced Bacterial Genetics,* as well as many articles on genetics and molecular genetics.

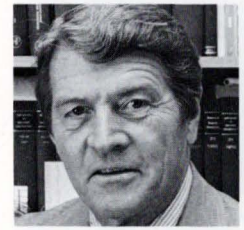
## CHARLES FEFFERMAN

*Mathematician*

***"20th Century Geometry"***
April 14, 1984
***"The Mathematics Behind the Computer"***
October 12, 1985

Herbert Jones University Professor of Mathematics at Princeton University, Dr. Fefferman has focused on Fourier analysis, partial differential equations, and problems involving several complex variables. He was the first recipient of the National Science Foundation's Alan T. Waterman Award and has received the Fields Medal from the International Congress of Mathematicians, among other awards. His honors have come extraordinarily early, beginning with his appointment at the age of twenty-two as full professor at the University of Chicago.

## CHRISTIAN ANFINSEN

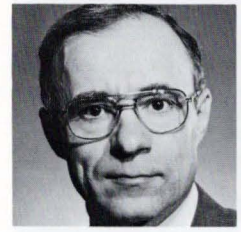


*Biological Chemist*

***"The Formation of Three-Dimensional Structures of Proteins"***
March 13, 1984

Dr. Anfinsen was a professor of biology at Johns Hopkins University when he spoke at Bard. In 1973, he shared the Nobel Prize in Chemistry with Stanford Moore and William H. Stein for their study of the enzyme ribonuclease. He has received the Rockefeller Foundation Public Service Award and a Guggenheim Fellowship, and is a member of the National Academy of Sciences and the Royal Danish Academy.

## ARNO A. PENZIAS



*Astrophysicist*

***"Our Changing View of the Universe"***
February 28, 1984

Dr. Penzias was vice-president of Bell Laboratories Research at the time of his lecture. He is best known for his part in the discovery of evidence supporting the "big-bang" theory of the origin of the universe, for which he shared the 1978 Nobel Prize for Physics. He is a member of the National Academy of Sciences, as well as many other scientific organizations, and is the first American to hold an honorary doctorate from the Paris Observatory.

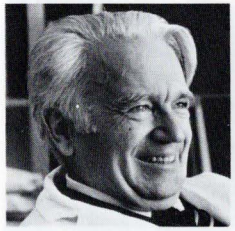
## FREDERICK C. ROBBINS

*Physician*

***"The Impact of Science on Medicine and Health"***
December 3, 1983

President of the Institute of Medicine of the National Academy of Sciences and dean emeritus of the Case Western Reserve University School of Medicine when he delivered his lecture at Bard, Dr. Robbins received the Nobel Prize in Physiology or Medicine in 1954, jointly with John F. Enders and Thomas H. Weller, for their propagation of the poliomyelitis virus in tissue culture, a technique that was to prove important in the development of vaccines for polio.

## GERHARD HERZBERG



*Physicist, Chemist*

***"Spectroscopic Studies of Simple Free Radicals"***
November 5, 1983

Dr. Herzberg was Distinguished Research Scientist at the National Research Council of Canada at the time of his lecture. In 1971, Dr. Herzberg received the Nobel Prize for his study of molecular structure. He is an honorary member or fellow of many scientific societies, including the Royal Societies of Canada and London, and holds honorary degrees from universities in Canada and abroad. Dr. Herzberg is the author of many books on molecular and atomic spectroscopy.

## CHEN NING YANG

*Physicist*

***"Albert Einstein and Contemporary Physics"***
October 15, 1983

Dr. Yang was the Albert Einstein Professor and director of the Institute of Theoretical Physics at the State University of New York at Stony Brook when he spoke at Bard. In 1957, he was named co-recipient of the Nobel Prize in Physics with Tsung-Dao Lee. In addition to the Nobel Prize, his honors include the 1980 Rumford Prize and the 1957 Albert Einstein Commemorative Award.

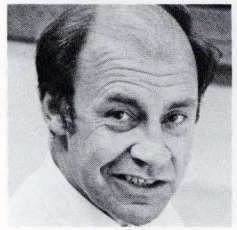
## ROALD HOFFMAN

*Chemist*

***"What Chemists Really Do: The Logical Structure of Modern Chemistry"***
April 16, 1983

Dr. Hoffman shared the 1981 Nobel Prize in Chemistry with Kenichi Fukui. The John A. Newman Professor of Physical Science at Cornell University at the time of his lecture, he was the only person ever to have received the American Chemical Society Award in pure chemistry in two subfields: the A.C. Cope Award in Organic Chemistry in 1973 and the Award in Inorganic Chemistry in 1982.

## DUDLEY R. HERSCHBACH



*Chemist*

***"Single Collision Chemistry"***
April 9, 1983

At the time of his lecture, Dr. Herschbach was the Frank B. Baird, Jr. Professor of Science at Harvard University. The major theme of his research has been the molecular dynamics of chemical reactions. He has received the Pure Chemistry Prize of the American Chemical Society, the Linus Pauling Medal, and the Michael Polanyi Medal; in 1986 he was awarded the Nobel Prize in Chemistry.

## WILLIAM N. LIPSCOMB, JR.

*Chemist*

***"How Do Enzymes Work?"***
March 19, 1983

Dr. Lipscomb won the 1976 Nobel Prize in Chemistry for his original research on the structure and bonding of boron hydrides and their derivatives. The Abbott and James Lawrence Professor at Harvard University when he spoke at Bard, he has long been the dominant figure in the field of boron chemistry. His numerous other honors include the Alexander von Humboldt-Stifung Senior Scientist Award and the Peter Debye Award in Physical Chemistry.

## PHILIP W. ANDERSON

*Physicist*

***"Seeing the World Through Spin Glasses"***
December 4, 1982

Dr. Anderson shared the 1977 Nobel Prize in Physics with Sir Nevill Mott and John H. Van Vleck for their theoretical investigations of the electronic structure of magnetic and disordered systems. At the time of his lecture, he was the Joseph Henry Professor at Princeton and the director of physics principles research at Bell Laboratories.

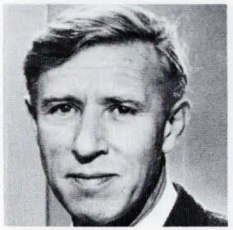
## ILYA PRIGOGINE

*Chemist*

***"Probing Into Time"***
November 13, 1982

In 1977, Dr. Prigogine won the Nobel Prize in Chemistry for his contributions to non-equilibrium thermodynamics, particularly the theory of dissipative structures. A professor at the Free University in Brussels and the director of the International Institutes of Physics and Chemistry when he spoke at Bard, he received numerous honors, including the Rumford Gold Medal of the Royal Society of London and the Descartes Medal of the University of Paris.

## KONRAD E. BLOCH



*Biochemist*

***"On the Evolution of Small Molecules"***
November 6, 1982

Dr. Bloch shared the 1965 Nobel Prize in Physiology or Medicine with Feodor Lynen, for their contributions to our knowledge of the complex pattern of reactions involved in the biosyntheses of cholesterol and fatty acids. He was the Higgins Professor of Biochemistry at Harvard University at the time of his lecture. Among his many awards is the Fritzsche Award of the American Chemical Society.

## SAMUEL C.C. TING

*Physicist*

***"Search for the Fundamental Structures of the Universe"***
October 16, 1982

In 1976, Dr. Ting was named co-recipient of the Nobel Prize in Physics with Burton Richter. Drs. Ting and Richter, working in separate groups, electrified the world of high energy physics in November 1974 with the discovery of a new particle with remarkable properties. The implications of their experiments continue to stimulate reformulation of our basic understanding of matter.

## PAUL BERG

*Biochemist*

***"Gene Isolation and Manipulation: A New Window on Our Heredity"***
May 22, 1982

Dr. Berg won the 1980 Nobel Prize in Chemistry for his studies of the biochemistry of nucleic acids, particularly recombinant DNA. The Willson Professor of Biochemistry at Stanford University Medical Center when he spoke as part of the Distinguished Scientist Lecture Series, he has been active in experimentation designed to explore the chemistry and biology of human and other mammalian chromosomes.

## PAUL DIRAC

*Theoretical Physicist*

***"From Einstein to Anti-Matter"***
May 15, 1982

One of the great mathematical physicists of the twentieth century, the late Professor Dirac was one of a select few, including Albert Einstein, Erwin Schrödinger, and Enrico Fermi, whose theories have transformed our understanding of the physical universe. His pioneering work in the quantum mechanics of the atom led him at the age of thirty-one to share with Schrödinger in 1933 the Nobel Prize in Physics.

## TSUNG-DAO LEE

*Physicist*

***"Is Vacuum a Physical Medium?"***
May 1, 1982

At the age of thirty, Dr. Lee was named co-recipient of the 1957 Nobel Prize in Physics with C.N. Yang, for discoveries that challenged the principle of conservation of parity, on which much of modern physics had been based. They theorized that in certain cases parity need not be conserved; subsequent experiments proved them right. The Enrico Fermi Professor of Physics at Columbia University when he spoke at Bard, Dr. Lee has received the Albert Einstein Award in Science.

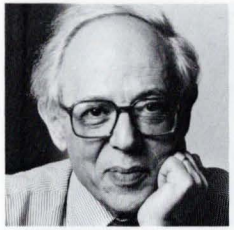
## GEORGE C. PIMENTEL

*Chemist*

***"From Chemical Lasers to the Atmosphere of Mars"***
April 24, 1982

The late Dr. Pimentel was the director of the Laboratory of Chemical Biodynamics and a professor of chemistry at the University of California at Berkeley at the time of his lecture. He received many awards including the Distinguished Service Gold Medal from the National Science Foundation. His pioneering development of rapid scan techniques for infrared spectroscopy led to the design of a unique infrared spectrometer for the 1969 Mariner interplanetary spacecraft to determine the composition of the atmosphere of Mars.

## ABRAHAM PAIS



*Physicist*

***"Einstein: The Science and the Life"***
April 3, 1982

Detlev W. Bronk Professor at the Rockefeller University at the time of his lecture, Dr. Pais had received the J. Robert Oppenheimer Memorial Prize. A founding father of particle physics, he and his colleagues investigated fundamental particle processes at high energies, symmetries of strong and weak interactions, and quantum field theory. He played a leading role in developing an explanation for the behavior of interactions in particle physics.

## FRANK H. WESTHEIMER

*Chemist*

***"Photoaffinity Labeling: Marking the Receptors for Biological Molecules"***
March 20, 1982

Dr. Westheimer was Morris Loeb Professor of Chemistry at Harvard University when he spoke as part of the Distinguished Scientist Lecture Series. Among the distinctions received for his work is the National Academy of Sciences Award in Chemical Science. Dr. Westheimer has done research on the mechanisms of the hydrolysis of phosphate esters, photoaffinity labeling, and biochemical oxidation-reduction reactions.

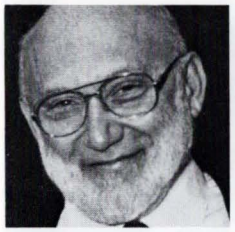
## PAUL J. FLORY

*Chemist*

***"Spatial Configurations of Macromolecules"***
February 13, 1982

Leader in the field of polymer behavior, the late Dr. Flory was the sole recipient of the 1974 Nobel Prize in Chemistry. The J.G. Jackson-C.J. Wood Professor of Chemistry at Stanford University at the time of his lecture, Dr. Flory also received the American Physical Society's High Polymer Physics Prize and the National Medal of Science. His research was in the chemistry and physics of giant molecules, or polymers, which make up such materials as natural and synthetic rubber, fibers, and plastics.

## JOSHUA LEDERBERG

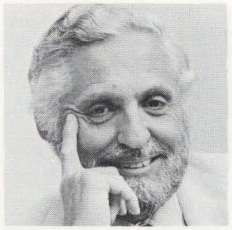


*Geneticist*

***"Styles and Patterns in Biomedical Research"***
October 10, 1981

At the age of thirty-three, Dr. Lederberg was named a co-recipient of the Nobel Prize in Physiology or Medicine along with E.L. Tatum and George Beadle. The president of the Rockefeller University at the time of his lecture, Dr. Lederberg pioneered in the field of bacterial genetics with his revolutionary discovery that bacterial strains could be crossed to produce an offspring containing a new combination of genetic factors.

## CARL DJERASSI

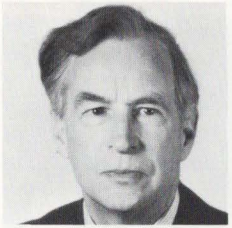


*Chemist*

***"The Politics of Contraception"***
May 23, 1981

Dr. Djerassi was professor of chemistry at Stanford University, a Bard Center Fellow, and president of Zoecon Corporation when he lectured at Bard. Among his awards are the American Chemical Society Award in Pure Chemistry and the Baekeland Medal. An authority on fertility control in humans and insects, he played a major role in the development of the first oral contraceptive.

## E. BRIGHT WILSON

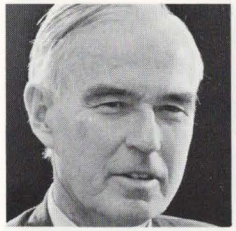


*Chemist*

***"Recent Developments in Molecular Spectroscopy and Some of Their Implications"***
May 9, 1981

Dr. Wilson was professor emeritus at Harvard at the time of his lecture. Since 1977, he had been the chairman of the Committee on Radioactive Waste Management of the National Academy of Sciences. For the past several decades he has worked on the microwave spectroscopy of large molecules and is continuing his studies of the internal and overall rotational motion of chemical structures in gases. Among his many awards is the National Medal of Science.

## WILLIS E. LAMB



*Physicist*

***"Simple Problems in Physics"***
April 25, 1981

Dr. Lamb was awarded the 1955 Nobel Prize in Physics with Polykarp Kusch for his discoveries regarding the structure of the hydrogen spectrum. A professor of physics and optical sciences at the University of Arizona when he spoke at Bard, he has won the Rumford Premium of the American Academy of Arts and Sciences and the Guthrie Award from the Physical Society of London.

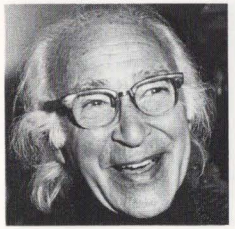
## ROSALYN YALOW

Medical Researcher

***"Radioactivity in the Service of Man"***
April 11, 1981
***"Radiation and Society"***
April 15, 1989

Recipient of the 1977 Nobel Prize in Physiology or Medicine, Dr. Yalow was senior medical investigator for the Veterans Administration Medical Center and chairman of the Department of Clinical Sciences at Montefiore Medical Center at the time of her first lecture. She has received awards from the American Diabetes Association and the World Federation of Nuclear Medicine and Biology. Dr. Yalow has been a pioneer in the use of the radioimmunoassay (RIA) in medical research and diagnosis.

## GEORGE WALD



Biologist

***"Life in the Universe"***
March 28, 1981

Dr. Wald won the 1967 Nobel Prize in Physiology with Haldan K. Hartline and Ragner Granit. A professor emeritus at Harvard University when he spoke at Bard, he has also received awards from the American Public Health Association and the American Academy of Arts and Sciences. Dr. Wald is an expert on the chemistry and physiology of the human eye, especially the chemical process by which light is transmuted into sight.

## I.I. RABI

Physicist

***"Molecular Beams, Experimental Discovery, and Theoretical and Mathematical Insights"***
March 14, 1981

The late Dr. Rabi received the 1944 Nobel Prize in Physics for developing the molecular beam resonance technique, a major tool in nuclear research. A professor of physics at Columbia University when he delivered his lecture at Bard, he served on the U.S. Atomic Energy Commission, conducted research at Brookhaven National Laboratories on peacetime uses of atomic energy, and advised the government on science under a succession of presidents.

## ARTHUR KORNBERG

*Biologist*

***"DNA Replication"***
February 21, 1981

Dr. Kornberg, who won the 1959 Nobel Prize in Physiology or Medicine with Dr. Severo Ochoa, was a professor of medicine at the Stanford University School of Medicine at the time of his lecture. His most notable achievements have grown out of his research into the structure and dynamics of DNA. In 1967, working with a team of biochemists at Stanford, he became the first to synthesize biologically active DNA outside a living cell.

## EDWARD TELLER

*Physicist*

***"The Persian Gulf—If It's Still There"***
December 13, 1980

When he spoke at Bard, Dr. Teller was director emeritus of the Lawrence Livermore Radiation Laboratory and a senior research fellow at the Hoover Institution on War, Revolution and Peace. He has received the Joseph Priestley Memorial Award, the Albert Einstein Award, and the Fermi Award. Dr. Teller is interested in the application of nuclear energy, particularly as part of a comprehensive energy plan for the United States.

## EUGENE WIGNER

*Physicist*

***"Problem of Quantum Mechanics Measurement Process"***
November 1, 1980

Dr. Wigner won the 1963 Nobel Prize in Physics. He is best known for his pioneering work in nuclear structure, especially the application of the mathematical system of group theory to atomic and nuclear problems. While at the University of Chicago, he participated with Enrico Fermi in the experiment that produced the first controlled nuclear reaction. He has received the Fermi Award, the Albert Einstein Award, and the National Medal of Science.

## MARK KAC

*Mathematician*

***"Chance and Regularity"***
October 18, 1980

The late Dr. Kac was professor of mathematics and theoretical physics at the Rockefeller University. He twice won the Chauvenet Prize of the Mathematical Association of America and was the recipient of the 1976 Alfred Jurzykowski Foundation Award in Science and of the 1978 Birkhoff Prize. Dr. Kac was an authority on probability theory, particularly its use in mathematical analysis and statistical physics.

# BARD COLLEGE DIVISION OF NATURAL SCIENCES AND MATHEMATICS

The faculty of Bard College's Division of Natural Sciences and Mathematics is committed both to the education of the non-scientist in matters scientific, and to the nurturing of a new generation of pre-professional scientists and mathematicians. The division offers a range of courses under the Natural Science rubric designed to excite the interest of the non-scientist through in-depth exposure to theory in the classroom and practical experience in the laboratory. In addition, it provides its majors with a thorough grounding in fundamental knowledge, while leading the students to think and function independently as scientists and mathematicians. The relatively small size of the division permits the faculty to structure each student's education, developing and relating ideas in a particular discipline while remaining attentive to each student's individual needs and interests.

As Juniors and Seniors, students work in small seminar discussion groups, advisory conferences, tutorials, and laboratories as they prepare for the Senior Project. Most projects take the form of original laboratory research, field work, contributions to theory, or an investigation and exposition of a problem in pure or applied mathematics.

Student and faculty research is well supported by laboratories and equipment. The new David Rose Science Laboratories house teaching space, research facilities for student and faculty work, and computer rooms. The recent receipt of two grants from the National Science Foundation and one from the Keck Foundation have helped to equip the new space. The physics department has a broad base of equipment in research electronics, vacuum systems, and optics, including such specialized equipment as particle detector systems, a 30kG magnet system, a liquid helium cryostat, Schlieren apparatus, and argon-ion, nitrogen, and dye laser systems. The chemistry department has an NMR spectrometer, IR and UV-Vis spectrophotometers, a gas chromatograph interfaced with a mass spectrometer, a polarograph, and stopped-flow equipment for chemical kinetics. The biology department is equipped with a cold room, a controlled-environment room, biological containment hoods, an ultra low temperature freezer for the preservation of cells, a refrigerated high-speed centrifuge, a microcentrifuge, gel electrophoresis apparatuses, UV-Vis spectrophotometers, and numerous microscopes.

Bard's Ecology Field Station, an important research center on the Hudson River, is used year round as the headquarters of two professional ecological research and education programs: the Hudson River National Estuarine Research Reserve and Hudsonia, Ltd. Through these programs, Bard students assist in environmental monitoring, manage specimen collections and research facilities, and engage in independent or collaborative research with scientists from other institutions. The Field Station serves as a resource and teaching center for under-graduates enrolled in field biology courses, for under-graduates concentrating in the Community, Regional, and Environmental Studies (CRES) program, and for students of Bard's Graduate School of Environmental Studies.

Students interested in attending medical school have the benefit of an atmosphere that emphasizes cooperation rather than competition among students, and have the help of Bard's entire science faculty as well as a premedical faculty adviser. Students interested in combining study in the liberal arts and sciences with engineering may earn a Bachelor of Arts from Bard and Bachelor of Science in Engineering from Columbia University through the combined plan. With Duke University, Bard offers a combined B.A. and Master of Science in Forestry and Environmental Studies.



## *BIOLOGY*

***John B. Ferguson***
Sc.B., *cum laude*, Brown University; M.Phil., Ph.D., Yale University. NIH Postdoctoral Research Fellowship, Harvard University (1974-76); NSF Graduate Fellowship, Yale University (1969-72). Research in biochemistry, especially enzymology of *Tetrahymena pyriformis*. Reviews and articles published in *Experientia, Journal of Biological Chemistry, Science Books and Films*, and *The New Columbia Encyclopedia*.

***William T. Maple***
B.A., Miami University; M.A., Ph.D., Kent State University. Teaching Assistant, Instructor, Visiting Assistant Professor, Kent State. Director of Natural Sciences for Nantucket Maria Mitchell Association. Board of Directors of Hudsonia, Ltd., and Winnakee Land Trust. Professional interests include the evolution and ecology of reptiles and amphibians.

***Michael F. Tibbetts***
B.S., Southeastern Massachusetts University; Ph.D., Wesleyan University. Peterson Fellowship, Wesleyan University. Adjunct lecturer, postdoctoral fellow, University of Michigan. Professional interests: cellular events that lead to appropriate spatial organization of subcellar material.

***Jane Wolfson***
B.A., Cornell University; Ph.D., State University of New York, Stony Brook. Postdoctoral Research Fellow, University of Kentucky (1979-83); Research Ecologist (Department of Entomology) and Women in Development Coordinator (International Programs in Agriculture), Purdue University (1983-91). Research Scientist in the Bean/Cowpea Collaborative Research Support Program Purdue/Cameroon (1987-91). Articles published in *Environmental Entomology, Entomologia experimentalis et applicata, Journal of Chemical Ecology,* and *Journal of Economic Entomology*. Interests include plant-insect interactions, impact of environmental variables on plant susceptibility to insect pests, insect physiology, and international agriculture.

## *CHEMISTRY*

***Daniel Freedman***
B.A., Macalester College; Ph.D., University of Minnesota. Instructor, Hamline University;

research assistant, teaching assistant, and Lando-Sahio Fellow, University of Minnesota; summer research assistant, 3M, St. Paul, MN. Graduate School Dissertation Fellow, Microelectronic and Information Sciences Fellow. Published in *Inorganic Chemistry*.

***Simeen Sattar***
B.A. *summa cum laude*, Rosemont College; Ph.D., Yale University. Postdoctoral Fellow, University of Pennsylvania (1982-84); Visiting Scientist, Brandeis University (1988-89). Contributor to *Inorganic Chemistry, Journal of Physical Chemistry,* and *Journal of Solid State Chemistry*.

***Hilton M. Weiss***
Sc.B., Brown University; M.S., University of Vermont; Ph.D., Rutgers University. Chemist, U.S. Food and Drug Administration; Chemist, Food Machinery and Chemical Corporation; Consultant, U.S. General Accounting Office, Environmental Protection Agency; Visiting Scholar, Wesleyan University (1989-90). Honorary Research Associate, Harvard University (1977-78). Publications in the *Journal of the American Chemical Society, Journal of Chemical Education*, and other journals.

*MATHEMATICS*

***Ethan D. Bloch***
B.A., Reed College; M.S., Ph.D., Cornell University. Instructor, University of Utah (1983-86). National Science Foundation Contract (1985-87). Articles in *Topology, Transactions of the AMS, Topology and Its Applications, Discrete and Computational Geometry,* and *Fundamenta Mathematicae*. Specialization in geometric topology.

***Peter Dolan***
B.A., University of Massachusetts at Amherst; M.A., Ph.D., State University of New York at Stony Brook. Fulbright Fellowship: Mathematics Institute of the Hungarian Academy of Science and Eötvös Lorand University, Budapest (1987-88). Recent publications in *Random Structures and Algorithms* and *Discrete Applied Mathematics*.

***Mark D. Halsey***
B.A., Hobart College; A.M., Ph.D., Dartmouth College. Assistant Professor, Worcester Polytechnic Institute (1984-89). Articles in *Discrete Mathematics, Discrete Applied Mathematics*, and the *Journal of Combinatorial Theory*. National Science Foundation grant, Pure and Applied Discrete Mathematics Research Experience for Undergraduates (1988-89). Special interests include combinatorics, graph theory, and matroid theory.

*PHYSICS*

***Matthew Deady***
B.S., M.S., University of Illinois; Ph.D., Massachusetts Institute of Technology. Assistant Professor of Physics, Mount Holyoke College. Research experience: MIT-Bates Linear Accelerator Center, nuclear physics research; Laboratory for Nuclear Science, MIT, electron scattering experiments; Nuclear Physics Laboratory, University of Illinois, accelerator operations. Articles published in *Physical Review, Technology Review, Future Directions in Electromagnetic Nuclear Physics*, and elsewhere. Current research in extending the energy range of deep inelastic electron scattering functions for calcium and uranium; electro-production of pions.

## SOME RECENT SENIOR PROJECTS

***Burton Brody***
B.A., Columbia College; Ph.D., University of Michigan. Founder, Integrated Research and Technology, Inc.; Systems Analyst, OLI Systems; Research Professor, Columbia University (1981- ). Published in *The Physical Review, Laser Chemistry, Journal of the Optical Society of America, Optics News, The Physics Teacher, Foundations of Physics*, and conference proceedings.

***Peter D. Skiff***
B.A., University of California at Berkeley; M.S., University of Houston; Ph.D., Louisiana State University. Adjunct faculty: Norwich University, Marist College. Consultant, Baylor University College of Medicine; Engineering Enterprises, Inc.; Vice President, Polar Electronics Research Corporation. Morris Grant, University of California. Published in *Foundations of Physics, American Journal of Physics, Choice, American Archaeologist, Computers in Physics*, and *Journal of Dialectics of Nature* (Beijing).

*BIOLOGY*

"Site-Directed Mutagenesis of the Zinc Finger in Aspartate Transcarbamoylase," by Jocelyn E. Krebs, now in a Ph.D. program at the University of California at Berkeley.

"Purification and Characterization of Isocitrate Dehydrogenase from *Tetrahymena pyriformis*," by Rachel S. McGinnis, now in a D.V.M. program at the University of Florida.

"Identification and Characterization of a Gene Essential for Drosophila Development," by Elizabeth C. Woodhouse, now in a Ph.D. program at Johns Hopkins University.

*CHEMISTRY*

"Alkylative Rearrangement of 1,2-Epoxy-3-alkanol Tosylates Using Organocopper Reagents," by Anita W. Chan, now in a Ph.D. program at Cornell University.

"Synthesis of a Signal Peptide for Affinity Purification of Mitochondria," by Andrew R. Ross, now in a Ph.D. program at the University of Chicago.

*MATHEMATICS*

"Symmetry Groups, Perfect Colorings and Compound Designs: Staying within the (Guide) Lines," by Laura J. Muller, now in a Ph.D. Program at the University of Texas at Austin.

*PHYSICS*

"Electron Paramagnetic Resonance," by Phuoc D. Huynh, now in an M.D. program at the Albert Einstein College of Medicine.

"Chaotic Behavior in Relaxation Oscillation," by Fredrik H.O. Österberg, now in a Ph.D. program at Princeton University.

## DISTINGUISHED SCIENTIST SCHOLARS PROGRAM

In conjunction with its Distinguished Scientist Lecture Series, Bard College has made available ten full-tuition, four-year scholarships to be awarded annually to academically outstanding high school seniors who are committed to majoring in biology, chemistry, physics, or mathematics in their undergraduate studies. Recipients of the scholarships will also be eligible for $1,500 stipends for summer research projects following their sophomore and junior years. Candidates whose needs exceed full tuition will be considered for additional financial aid to assist with room and board expenses. Full-tuition scholarships for three years of study are also available to those candidates who enroll in "3-2" programs (in engineering with Columbia University, or in forestry and environmental studies with Duke University).

For more information contact:

Bard College
Office of Admissions
Box D
Annandale-on-Hudson, NY
12504-5000
914-758-7472

## THE BARD CENTER

Established in 1978 as the "public arm" of the College, the Bard Center was recently described by the Rockefeller Foundation's *Report of the Commission on the Humanities* as "a model of mobilizing the resources of the college and the community." Through workshops, national conferences, small group seminars, lecture series, summer institutes, publications, and exhibitions, the Bard Center explores the emerging issues of today in the sciences, arts, humanities, and education—to the benefit of the Bard community, the Hudson Valley region, and educators and policy makers around the country. The Institute for Writing and Thinking, part of the Bard Center, has been recognized as one of the leading institutes for instruction in the methodology of writing. The Center's varied efforts are complemented by the work of Bard Center Fellows, who are distinguished artists, scientists, scholars, and writers appointed annually to serve as a "public faculty."

Inquiries about the Distinguished Scientist Lecture Series and other programs of the Bard Center should be addressed to:

Dimitri B. Papadimitriou
Executive Director
Bard Center
P.O. Box 5000
Annandale-on-Hudson, NY
12504-5000
914-758-7426

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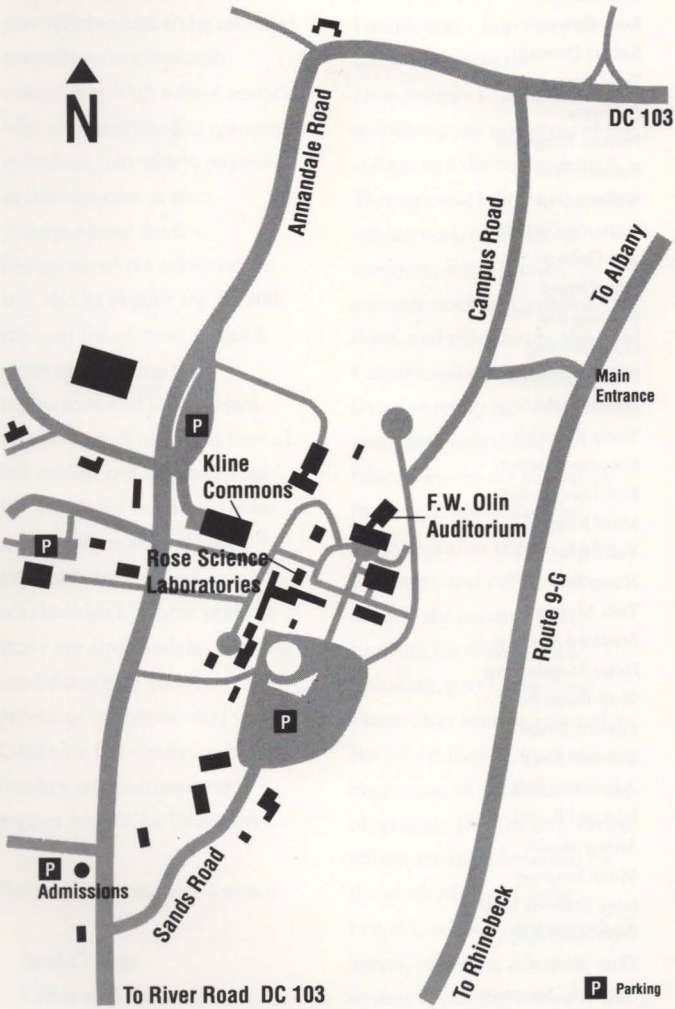
## MAP OF BARD COLLEGE CAMPUS




## DIRECTIONS TO BARD COLLEGE

Bard is located on the eastern shore of the Hudson River, about 100 miles north of New York City and about 50 miles south of Albany, very near the eastern end of the Kingston-Rhinecliff Bridge.

From the New York Thruway take exit 19 (Kingston) and follow signs to the Rhinecliff Bridge. After crossing the bridge take the first left onto Dutchess County 103 (River Road), and follow it north about three miles. At the Annandale triangle DC 103 changes from River Road to Annandale Road as it enters the Bard College campus. The first right after the Annandale triangle (Sands Road) leads to the main parking lot, and the second right off DC 103 is the entrance to the Kline Commons lot. Either lot is convenient.

From the Taconic Parkway take the New York 199 (Red Hook) exit and follow NY 199 west for about 12 miles to its junction with NY 9G at a blinking red light. Turn right onto NY 9G and follow it north for two miles to the main entrance of Bard College. Turn left into the entrance, then left again onto Campus Road, which leads to the main parking lot.

COVER:
Marie Curie (1867-1934)

DESIGN:
Juliet D. Bell

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