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THE NATIONAL MEDAL OF SCIENCE 2003

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

OFFICE OF THE
DIRECTOR

March 28, 2002

Dear Colleague:

It is with great pleasure that I introduce the nomination packet for the 2003 National Medal of Science, the Nation's highest honor for scientists and engineers presented annually by the President of the United States.

The Medal was established by the 86th Congress in 1959 as a Presidential Award to be given to individuals "deserving of special recognition by reason of their outstanding contributions to knowledge in the physical, biological, mathematical, or engineering sciences." And in 1980 Congress expanded this recognition to include the social and behavioral sciences.

Since its establishment, the Medal has been awarded to 386 distinguished scientists and engineers whose careers spanned decades of research and development. The nomination procedures and guidelines, as well as instructions for submitting an electronic nomination, renomination, or support letter, are detailed in this brochure. Questions concerning the procedures or requests for additional nomination forms should be directed to the Committee's Program Manager, Mrs. Susan E. Fannoney (703-292-8096).

There are numerous younger American scientists and engineers, many of them women and minorities, now reaching the point where their contributions are worthy of recognition. Your efforts to identify worthy nominees for the Medal in this public recognition of outstanding contributions are critical to its success. On behalf of the President's Committee on the National Medal of Science, I want to thank you in advance for those efforts.

Sincerely,

Rita R. Colwell
Director

2003
National Medal of Science

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I. CRITERIA

The Committee has established the following guidelines for selection of candidates.

- The total impact of an individual's work on the present state of physical, biological, mathematical, engineering or social and behavioral sciences is to be the principal criterion.
- Achievements of an unusually significant nature in relation to the potential effects of such achievements on the development of scientific thought.
- Unusually distinguished service in the general advancement of science and engineering, when accompanied by substantial contributions to the content of science at some time.
- Recognition by peers within the scientific community.
- Contributions to innovation and industry.
- Influence on education through publications, students, etc.
- Must be a U.S. citizen or permanent resident who has applied for citizenship.

II. NOMINATION PROCEDURES AND DEADLINE FOR SUBMISSION

Nominations must be postmarked by June 30, 2002.

- Nominations remain active for **four years**, including the year of nomination. After that time, candidates must be renominated with a new nomination package for them to be considered by the Committee.
- If the enclosed form or a facsimile is used, it must be single spaced typewritten using a font no smaller than 12 characters per inch.
- Additional information on active nominations may be submitted via a letter or an updated nomination form submitted to the committee by the established deadline.

III. NARRATIVE STATEMENT – NOMINATION FORM

- It is important that the narrative statement address the selection criteria in Section I and include a description of the nominee's qualifications that is informative to a non-specialist.
- The most successful nominators explain the work clearly, place it in context, and underscore its importance in a relatively jargon-free manner. Nominators should aim to communicate with a variety of scientific experts in fields as diverse as biology, engineering, mathematics, sociology, etc.

IV. LETTERS OF SUPPORT FOR NOMINATIONS

Letters of support must be postmarked by June 30, 2002.

- Nominators are responsible for securing three letters supporting the candidate.
- Letters should only be mailed, faxed, or sent via the World Wide Web (WWW) electronic form (see Section V). Email does not protect confidentiality and should not be used for this purpose.
- Letters may accompany the nomination form or be sent separately to

Mrs. Susan E. Fannoney, Program Manager
National Medal of Science Committee
National Science Foundation
4201 Wilson Blvd, Rm 1220
Arlington, VA 22230

V. ELECTRONIC SUBMISSION OF NOMINATIONS AND LETTERS OF SUPPORT

Nominations and letters of support may be submitted electronically via the Internet. Using a World Wide Web (WWW) browser such as Netscape or MS Internet Explorer, access the electronic nomination system at location:

http://www.fastlane.nsf.gov

or access PDF:

http://www.nsf.gov/nsb/awards/nms

VI. ADDITIONAL INFORMATION

For further information concerning nominations, the Program Manager for the National Medal of Science can be reached by email, phone, fax or at the address previously listed under Section IV, above.

Email: nms@nsf.gov
Phone: (703) 292-8096
Fax: (703) 292-9008

The National Science Foundation administers the National Medal of Science on behalf of the President of the United States.

Form Approved
OMB NO. 3145-0035

Privileged Information

NOMINATION FOR NATIONAL MEDAL OF SCIENCE

Nominee	Nominator
Name:	Name:
Address:	Address:
Telephone:	Telephone:

Biographical Data:

1. Date and place of birth:

   If naturalized citizen, please check box: ☐

2. Education:

3. Positions Held:

4. Honors:

Nominee:_____ Privileged Information

Proposed Citation (limit to 1-2 sentences)
Narrative statement (limited to this space) describing nominee's qualifications as described in Section III.

Nominee: _____

List of pertinent publications (limit to this page)

Nominee: _____

References: (identify 3 individuals not from the nominee's home institution who will provide letters of support). References **must be requested by the nominator** and can be sent electronically through http://www.fastlane.nsf.gov.

Name: Title: Address: Telephone:	Name: Title: Address: Telephone:
Name: Title: Address: Telephone:	The information requested on this nomination form and the letters of support is solicited under the authority of the National Science Foundation Act of 1950, as amended, and will be used and disclosed to reviewers and the White House in connection with the selection of qualified applicants. See Privacy Act/Public Burden statement on last page of this solicitation brochure.

_____ Nominator's Signature

_____ Date

Mail to:

Program Manager
National Medal of Science Committee
National Science Foundation
4201 Wilson Blvd, Rm 1220
Arlington, VA 22230

NATIONAL MEDAL OF SCIENCE RECIPIENTS
1962-2000

2000

Nancy C. Andreasen, University of Iowa College of Medicine
For her pivotal contributions to the social and behavioral sciences, through the integrative study of mind, brain, and behavior, by joining behavioral science with the technologies of neuroscience and neuroimaging in order to understand mental processes such as memory and creativity, and mental illnesses such as schizophrenia.

John D. Baldeschwieler, California Institute of Technology
For his imaginative development of new methods for determining the properties, structures, motions and interactions of molecules and molecular assemblies, the translation of these advances into practical pharmaceutical and instrumentation products for the public benefit, and extensive service to his government and the scientific community.

Gary Becker, The University of Chicago
For his pioneering the economic analysis of racial discrimination, inventing the economics of human resources, producing the major modern innovations in economic demography and in economic criminology, and leading recent developments in how social forces shape individual economic behavior.

Yuan-Cheng B. Fung, University of California at San Diego
For his pioneering research and leadership in the fields of bioengineering and aeroelasticity. As author, teacher, editor, and leader, his work and enthusiasm have founded the rigorous study of biomechanics, particularly of the lungs and arteries.

Ralph F. Hirschmann, University of Pennsylvania
For his seminal contributions to organic and to medicinal chemistry including the synthesis in solution of an enzyme (ribonuclease), his stimulation of peptide research in the Pharmaceutical Industry and for his leadership role in fostering interdisciplinary research in academia and in industry, which led to the discovery of several widely prescribed medications for human and animal health.

Willis E. Lamb, Optical Sciences Center, University of Arizona
For his towering contributions to classical and quantum theories of laser radiation and quantum optics, and to the proper interpretation of quantum mechanics.

Jeremiah P. Ostriker, Princeton University
For his bold astrophysical insights, which have revolutionized concepts of the nature of pulsars, the "ecosystem" of stars and gas in our Galaxy, the sizes and masses of galaxies, the nature and distribution of dark matter and ordinary matter in the Universe, and the formation of galaxies and other cosmological structures.

Peter H. Raven, Missouri Botanical Garden and Washington University in St. Louis
For his contributions to the dynamics of plant systematics and evolution, the introduction of the concept of coevolution, and his major contribution to the international efforts to preserve biodiversity.

John Griggs Thompson, University of Florida
For his profound and lasting contributions to the mathematical sciences, providing fundamental advances for the study of finite simple groups, the inverse Galois problem and connections between group theory and number theory.

Karen K. Uhlenbeck, University of Texas at Austin
For her many pioneering contributions to global geometry that resulted in advances in mathematical physics and the theory of partial differential equations. Her research accomplishments are matched by her leadership and passionate involvement in mathematics training and education.

Gilbert F. White, Institute of Behavioral Science, University of Colorado
For outstanding leadership and scientific contributions to geography and other Earth and environmental sciences, and for helping shape cooperative efforts to assess the Nation's floodplain, water use, and natural disaster policies for more than five decades.

Carl R. Woese, University of Illinois at Urbana-Champaign
For his brilliant and original insights, through molecular studies of RNA sequences, to explore the history of life on Earth. His vision has revolutionized our view of life's evolution and diversity.

1999

David Baltimore, California Institute of Technology
For his fundamental discoveries in virology, tumor biology and immunology, notably the discovery of how tumor-causing viruses multiply; for his devotion to building excellence in scientific institutions; and for his statesmanship in fostering communication between scientists and the general public.

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*Awarded Posthumously
Note: Institutions listed are those with which the recipients were affiliated at the time of the Award.

Felix E. Browder, Rutgers University, Piscataway, and The University of Chicago
For his pioneering work in nonlinear functional analysis and its applications to partial differential equations, and for leadership in the scientific community.

Ronald R. Coifman, Yale University
For his fundamental contributions to pure mathematics in the field of harmonic analysis, and for his achievements in the adaptation of that field to the capabilities of the digital computer to produce a family of fast, robust computational tools that have substantially benefited science and technology.

James W. Cronin, The Enrico Fermi Institute, The University Of Chicago
For his fundamental contributions to the fields of elementary particle physics and astrophysics and his leadership in creating an international effort to determine the unknown origins of very high-energy cosmic rays.

Jared Diamond, University of California Medical School, Los Angeles
For his exceptionally creative scholarship, including seminal research in physiology, ecology, conservation biology, and history; for his outstanding role in communicating science by explaining technical advances in widely understandable terms, and for his overwhelming dedication to science's role in building a better future.

Leo P. Kadanoff, The James Franck Institute, The University of Chicago
For fundamental theoretical research in the areas of statistical, solid state and nonlinear physics and, in particular, for the development of scaling techniques in these fields."

Lynn Margulis, University of Massachusetts, Amherst
For her outstanding contributions to understanding of the development, structure, and evolution of living things, for inspiring new research in the biological, climatological, geological and planetary sciences, and for her extraordinary abilities as a teacher and communicator of science to the public.

Stuart A. Rice, The James Franck Institute, The University of Chicago
For changing the very nature of modern physical chemistry through his research, teaching, a nd writing, using imaginative approaches to both experiment and theory that have inspired a new generation of scientists.

John Ross, Stanford University
For his outstanding contribution and enormous impact in physical chemistry, in particular molecular studies, the kinetics and thermodynamics of nonlinear systems, and new approaches to the determination of complex chemical and biological reaction mechanisms.

Susan Solomon, National Oceanic and Atmospheric Administration, Boulder, Colorado
For key scientific insights in explaining the cause of the Antarctic Ozone "hole" and for advancing the understanding of the global ozone layer; for changing the direction of ozone research through her findings; and for exemplary service to worldwide public policy decisions and to the American public.

Robert M. Solow, Massachusetts Institute of Technology
For his creation of the modern framework for analyzing the effects of investment and technological progress on economic growth, greatly influencing economics and economic policy worldwide.

Kenneth N. Stevens, Massachusetts Institute of Technology
For his leadership and pioneering contributions to the theory of acoustics of speech production and perception, development of mathematical methods of analysis and modeling to study the acoustics of speech production, and establishing the contemporary foundations of speech science.

1998

Bruce N. Ames, University of California, Berkeley
For changing the direction of basic and applied research on mutation, cancer and aging by devising a simple, inexpensive test for environmental and natural mutagens, by identifying causes and effects of oxidative DNA damage, and by translating these findings into intelligible public policy recommendations on diet and cancer risk for the American people.

Don L. Anderson, California Institute of Technology
For his leading contributions to understanding the composition, structure, and dynamics of Earth and Earth-like planets, and his influence on the advancement of Earth sciences over the past three decades nationally and internationally.

John N. Bahcall, Institute for Advanced Study
For his fundamental contributions to areas of modern astrophysics ranging from solar neutrino physics to the structure of the Milky Way Galaxy to cosmology, and for his leadership of the astronomical community, especially his tireless advocacy of the Hubble Space Telescope.

John W. Cahn, National Institute of Standards & Technology
For his pioneering work on thermodynamics and kinetics of phase transitions and diffusion, on interfacial phenomena, and for his contributions to the understanding of periodic and quasi-periodic structures.

Cathleen Synge Morawetz, Courant Institute of Mathematical Sciences
For her many pioneering contributions to the theory of partial differential equations and wave propagation, that resulted in applications in aerodynamics, acoustics, and optics. Her research accomplishments are matched by her leadership and inspiration, judgment and vision, and knowledge and generosity to colleagues and collaborators.

Janet D. Rowley, The University of Chicago
For revolutionizing cancer research, diagnosis, and treatment through her discovery of chromosomal translocations in cancer and her pioneering work on the relationship of prior treatment to recurring chromosome abnormalities, for epitomizing the "bench to bedside" philosophy in her application of basic discoveries to clinical medicine, and for her leadership nationally and internationally in the oncology and biomedical communities.

Eli Ruckenstein, State University of New York at Buffalo
For his pioneering theories of the thermodynamics of microemulsions, hydrodynamics of thin films, interfacial phenomena, nucleation, scaling of transport phenomena, and for imaginative technological and experimental achievements in the areas of catalysis polymer composites, metal-support interactions, and protein separation.

George M. Whitesides, Harvard University
For innovative and far-ranging research in chemistry, biology, biochemistry and material science, pioneering work of technological interest and his extensive involvement with teaching, government and industry.

William Julius Wilson, Harvard University
For his innovative approach to studying urban poverty, his dedication to the proposition that rigorous social science change will improve his fellow American's lives, and his advocacy of policies which reflect more accurately what we have learned from research and which therefore take a broader point of view with respect to the interactions of race, class, and location.

1997

William K. Estes, Harvard University
For his fundamental theories of learning, memory, and decision. His pioneering development and testing of mathematical models of psychological processes have set the standard for theoretical progress in behavioral and cognitive science.

Darleane C. Hoffman, University of California, Berkeley
For her discovery of primordial plutonium in nature and the symmetric spontaneous fission of heavy nuclei; for pioneering studies of elements 104, 105, and 106, and for her outstanding service to education of students in nuclear chemistry and as director of the Seaborg Institute for Transactinium Science of the University of California.

Harold S. Johnston, University of California, Berkeley
For his major contributions to the chemical sciences in the areas of kinetics and photochemistry, and for his pivotal role in providing understanding and conservation of the Earth's atmospheric environment.

Marshall N. Rosenbluth, University of California, San Diego
For his fundamental contributions to plasma physics, his pioneering work in computational statistical mechanics, his world leadership in the development of controlled thermonuclear fusion, and his wide-ranging technical contributions to national security.

Martin Schwarzschild*, Princeton University
For his seminal contributions to the theory of the evolution of stars, and his creative insights into galactic dynamics which form the basis of much of contemporary astrophysics; and his lifetime of dedication to students. His influence on U.S. astronomy in the second half of this Century is unsurpassed.

James D. Watson, Cold Spring Harbor Laboratory
For five decades of scientific and intellectual leadership in molecular biology, ranging from his co-discovery of the double helical structure of DNA to the launching of the Human Genome Project.

Robert A. Weinberg, Massachusetts Institute of Technology
For his contribution to the identification of cellular oncogenes and their role in cancer, which led to a better understanding of the molecular basis for cancer and its diagnosis and therapy

George W. Wetherill, Carnegie Institution of Washington
For his fundamental contributions to understanding measuring geological time scale and understanding how earth-like planets may be created in evolving solar systems through collisional accumulation of smaller planetary bodies.

Shing-Tung Yau, Harvard University
For his fundamental contributions in mathematics and physics. Through his work, the understanding of basic geometric differential equations has been changed and he has expanded their role enormously within mathematics.

1996

Wallace S. Broecker, Lamont-Doherty Earth Observatory
For his pioneering contributions to the understanding of the circulation of the oceans, global carbon cycle, and the record of global climate changes.

Norman Davidson, California Institute of Technology
For his seminal contributions to understanding the informational properties of DNA and for developing new methods for its study.

James L. Flanagan, Rutgers University
For his pioneering contributions to speech communication research, and his leadership in the application to telecommunications technology.

Richard M. Karp, University of Washington
For his pioneering research in theoretical computer science and the development of NP-Completeness, a concept having an important role in the theory and the practice of computation.

Kumar N. Patel, University of California, Los Angeles
For his fundamental contributions to quantum electronics and invention of the carbon dioxide laser, which have had significant impact on industrial, scientific, medical, and defense applications.

Ruth Patrick, Academy of Natural Sciences
For her algal research, particularly the ecology and paleoecology of diatoms, and for elucidating the importance of biodiversity of aquatic life in ascertaining the natural condition of rivers and the effects of pollution.

Paul A. Samuelson, Massachusetts Institute of Technology
For fundamental contributions to economic science, specifically general equilibrium theory and macroeconomics, and to economic education and policy over a period of nearly 60 years.

Stephen Smale, University of California, Berkeley
For his pioneering contributions to mathematics in the fields of differential topology and dynamical systems, and for applications to physics, biology, economics, and the theory of computation.

1995

Thomas R. Cech, University of Colorado
For his discoveries regarding RNA catalysis that have added new dimensions to the understanding of the role of RNA in living systems.

Hans G. Dehmelt, University of Washington
For his pioneering achievements in perfecting electromagnetic traps for precision studies of single ions, electrons, and positrons, culminating in the measurement to unprecedented accuracy of the magnetism of the free electron and positron.

Peter Goldreich, California Institute of Technology
For his profound and lasting contributions to planetary sciences and astrophysics, providing fundamental theoretical insights for understanding the rotation of planets, the dynamics of planetary rings, pulsars, astrophysical masers, the spiral arms of galaxies, and the oscillations of the Sun.

Hermann A. Haus, Massachusetts Institute of Technology
For his fundamental and seminal research contributions to the field of quantum electronics, noise and ultra-fast optics; and for his service to the engineering profession through teaching.

Isabella L. Karle, Naval Research Laboratory
For the development and application of a method for determining essentially equal-atom crystal and molecular structures by x-ray analysis, thereby having a profound effect on the practice of organic and biological chemistry.

Louis Nirenberg, New York University
For his fundamental contributions to linear and nonlinear partial differential equations, and applications, particularly in geometry and complex analysis, thus having a decisive impact on the development of mathematics and its applications over a period of years.

Alexander Rich, Massachusetts Institute of Technology
For his numerous fundamental contributions to our knowledge of the structure and function of DNA and RNA, the central information carriers in living systems.

Roger N. Shepard, Stanford University
For his theoretical and experimental work elucidating the human mind's perception of the physical world and why the human mind has evolved to represent objects as it does; and for giving purpose to the field of cognitive science and demonstrating the value of bringing the insights of many scientific disciplines to bear in scientific problem solving.

1994

Ray W. Clough, University of California, Berkeley
For his outstanding contributions in the fields of finite element analysis, structural dynamics, and earthquake engineering which had extraordinary influence in the development of modern engineering.

John Cocke, IBM T.J. Watson Research Center
For his contributions to computer science in the design and theory of compilers, and for major advances in the theory and practice of high-performance computer systems

Thomas Eisner, Cornell University
For his seminal contributions in the fields of insect behavior and chemical ecology, and for his international efforts on biodiversity.

George S. Hammond, Allied-Signal Corp.
For his seminal contributions in the fields of insect behavior and chemical ecology, and for his international efforts on biodiversity.

Robert K. Merton, Columbia University
For founding the sociology of science and for his pioneering contributions to the study of social life, especially the self-fulfilling prophecy and the unintended consequences of social action.

Elizabeth F. Neufeld, UCLA School of Medicine
For her contributions to the understanding of the lysosomal storage diseases, demonstrating the strong linkage between basic and applied scientific investigation.

Albert W. Overhauser, Purdue University
For his fundamental contributions to understanding the physics of solids, to theoretical physics, and for the impact of his technological advances.

Frank Press, National Academy of Sciences
For his contributions to the understanding of the deepest interior of the earth and the mitigation of natural disasters, and his service in academia, as a government official, and at the National Academy of Sciences.

1993

Alfred Y. Cho, AT&T Bell Laboratories
For his pioneering work in the development of molecular beam epitaxy, which revolutionized thin film growth, making possible atomically accurate structures for electronic and proelectronic devices, and for the study of new quantum phenomena.

Donald J. Cram, University of California, Los Angeles
For his pioneering research on the chemical foundations of molecular recognition; the understanding of the molecular basis of biological systems; his shaping of scientific thought and development, and guidance to generations of students.

Val L. Fitch, Princeton University
For his pioneering experiments at the frontiers of physics, from his measurement of the properties of mu-mesons in nuclei to his co-discovery that nature violates a fundamental space-time symmetry property; and for his leadership on National science policy.

Norman Hackerman, The Robert A. Welch Foundation
For his seminal contributions in the field of electrochemistry; for his effective and far-seeing vision in higher education; and for his devoted service to the nation and science.

Martin D. Kruskal, Rutgers University
For his influence as a leader in nonlinear science for more than two decades as the principal architect of the theory of soliton solutions of nonlinear equations of evolution.

Daniel Nathans, Johns Hopkins University School of Medicine
For his seminal research in molecular genetics that formed a foundation for contemporary biotechnology.

Vera C. Rubin, Carnegie Institution of Washington
For her pioneering research programs in observational cosmology which demonstrated that much of the matter in the universe is dark and for significant contributions to the realization that the universe is more complex and more mysterious than had been imagined.

Salome G. Waelsch, Albert Einstein College of Medicine
For her lifetime of work on developmental genetics, providing a large body of knowledge on the study of mammalian genetics.

1992

Eleanor J. Gibson, Cornell University
For her conceptual insights in developing a theory of perceptual learning; and for achieving a deeper understanding of perceptual development in children and basic processes in reading.

Allen Newell, Carnegie Mellon University
For his seminal contributions to the development of artificial intelligence, the theory of human cognition and the software and hardware of computational systems for complex information processing.

Calvin F. Quate, Stanford University
For his contributions to microscopy, particularly the scanning acoustic microscope and the atomic force microscope.

Eugene M. Shoemaker, U.S. Geological Survey
For his pioneering research and inspiring leadership in the geological exploration of the solar system; for his entrepreneurial creation and direction of the Branch of Astrogeology of the U.S. Geological Survey; and for his research on earth-approaching asteroids and comets and their potential impact effects.

Howard E. Simmons, Jr., E.I. du Pont de Nemours
For his fundamental contributions to synthesis, molecular structure, and the theory of organic chemistry, and for his productive management of the premier industrial chemical research program in the United States.

Maxine F. Singer, Carnegie Institution of Washington
For her outstanding scientific accomplishments and her deep concern for the societal responsibility of the scientist.

Howard M. Temin, University of Wisconsin
For his demonstration of the existence of RNA-directed DNA synthesis, leading to the discovery of proto-oncogenes within eukaryotic cells and the role of such genes in oncogenesis by viruses and other agents, laying the foundation for our knowledge of the replication of HIV, changing our ideas about evolution, and providing vital technology for genetic engineering and human gene therapy.

John Roy Whinnery, University of California, Berkeley
For his research contributions to microwaves, lasers, and quantum electronics; for his excellence as a teacher and author; and for his extensive services to government and professional organizations.

1991

Mary Ellen Avery, Harvard Medical School
For her discovery of the major cause of respiratory distress syndrome of premature infants and the strategies for treatment and prevention.

Ronald Breslow, Columbia University
For his incisive work on enzyme mimics that has built bridges between chemistry and biochemistry, and for his seminal work on novel conjugated molecules and a new class of anticancer agents.

Alberto P. Calderon, The University of Chicago
For his ground-breaking work on singular integral operators leading to their application to important problems in partial differential equations, including his proof of uniqueness in the Cauchy problem, the Atiyah-Singer index theorem and the propagation of singularities of non-linear equations.

Gertrude B. Elion, Burroughs Wellcome Company
For her basic research which enhanced the sciences of chemistry and medicine by elucidating fundamental principles of drug-receptor interactions for nucleic acid antagonists.

George Heilmeier, Bellcore
For his major contributions to the technological competitiveness of the United States and the cause of national defense.

Dudley R. Herschbach, Harvard University
For his seminal contributions to the fundamental understanding of reactions of atoms and molecules, collision by collision.

G. Evelyn Hutchinson*, Yale University
For his role in the emergence of ecology as a modern science, and introducing American geochemists to the importance of living organisms in the cycles of the elements. His work has proved the importance of environmental studies for society in general.

Elvin A. Kabat, Columbia University
For his seminal contributions in the field of immunology, and for bringing the field to its present prominence.

Robert W. Kates, Brown University
For his fundamental contributions to the understanding of natural and man-made hazards, global environmental change, and the prevalence and persistence of world hunger.

Luna B. Leopold, University of California, Berkeley
For his contribution to the hydromechanics of rivers; for influencing the direction and content of physical geography, and for outstanding service to the field of water resources.

Salvador E. Luria*, Massachusetts Institute of Technology
For a lifetime devoted to applying genetics to viruses and bacteria and for guiding the development of generations of students who have helped create the modern power of molecular biology.

Paul A. Marks, Memorial Sloan-Kettering Cancer Center
For his contribution to hematology in defining the genetic basis for G6PD deficiency and thalassemia, and discovery of an approach to control cancer cell proliferation with new inducers of differentiation.

George A. Miller, Princeton University
For his innovative leadership in the scientific study of language and cognition, and for his commitment to improved education for literacy.

Arthur L. Schawlow, Stanford University
For his role in the conception of the laser and in advancing its applications, especially in laser spectroscopy.

Glenn T. Seaborg, University of California, Berkeley
For his outstanding work as a chemist, scientist and teacher in the field of nuclear chemistry.

Folke K. Skoog, University of Wisconsin
For his pioneering work on plant hormones, including discovery of cyotkinins (a major class), chemical induction of organ formation and regulation of morphogenesis in plants, and contributions to the development of plant tissue culture as an experimental technique of fundamental importance in biotechnology.

H. Guyford Stever, Washington D.C.
For his scientific and engineering leadership in applying new results of scientific research and technological development to the purposes of government, industry, and academe.

Edward C. Stone, California Institute of Technology
For his outstanding leadership as Project scientist for the Voyager Space Mission and its exploration of the outer Solar System.

Steven Weinberg, University of Texas at Austin
For his contributions to the discovery of the structure of the fundamental forces of nature; the development of the standard model, and the unification of the weak and electromagnetic forces.

Paul C. Zamecnik, Worcester Foundation for Experimental Biology
For his contributions to the discovery of the structure of the fundamental forces of nature; the development of the standard model, and the unification of the weak and electromagnetic forces.

1990

Baruj Benacerraf, Harvard Medical School
For his fundamental contributions to the understanding of the immune system, including much of the work which forms the basis of knowledge of transplantation immunology and regulatory function in the immune response.

Elkan R. Blout, Harvard School of Public Health
For his pioneering studies of protein conformation and devotion to the scientific enterprise of this Nation.

Herbert W. Boyer, University of California, San Francisco
For his contributions to the basic research of the development of recombinant DNA technology. This seminal breakthrough has opened new vistas in experimental biology, and it has led directly to the development of the biotechnology industry.

George F. Carrier, Harvard University
For his achievement and leadership in the mathematical modeling of significant problems of engineering science and geophysics, and their solution by the application of innovative and powerful analytical techniques.

Allan M. Cormack, Tufts University
For his scientific work including the development of computer assisted tomography; and as a scholar and teacher, especially of undergraduates.

Mildred S. Dresselhaus, Massachusetts Institute of Technology
For her studies of the electronic properties of metals and semimetals, and for her service to the Nation in establishing a prominent place for women in physics and engineering.

Karl Folkers, University of Texas at Austin
For his discoveries and leadership in combining basic chemical research and clinical medicine to achieve new treatments of diseases which have enhanced the quality of life and extended survival rates for countless people.

Nick Holonyak, Jr., University of Illinois
For his contributions as one of the Nation's most prolific inventors in the area of semiconductor materials and devices, and for his role as research mentor while working at the forefront of solid-state science and technology.

Leonid Hurwicz, University of Minnesota
For his pioneering work on the theory of modern decentralized allocation mechanisms.

Stephen C. Kleene, University of Wisconsin
For his leadership in the theory of recursion and effective computability and for developing it into a deep and broad field of mathematical research.

Daniel E. Koshland, Jr., University of California, Berkeley
For profoundly influencing the understanding of how proteins function through his induced-fit model of enzyme action. His incisive analysis of bacterial chemotaxis has led to a deeper understanding of the molecular basis of memory and adaptation.

Edward B. Lewis, California Institute of Technology
For his demonstration and exploration of the genetic control of the development of body segments by homeotic genes.

John McCarthy, Stanford University
For his fundamental contributions to computer science and artificial intelligence, including the development of the LISP programming language; the mathematical theory of computation; the concept and development of time-sharing; the application of mathematical logic to computer programs that use commonsense knowledge and reasoning; and the naming and thus the definition of the field of artificial intelligence itself.

Edwin M. McMillan, University of California, Berkeley
For his scientific achievements including the identification of the first transuranic element (neptunium) and the invention of the phase stability principle incorporated in the synchrotron.

David G. Nathan, Harvard Medical School
For his contributions to the understanding of the pathophysiology, diagnosis and treatment of thalassemia; for his contributions to the understanding of disorders of red cell permeability; for his contributions to the understanding of the regulation of erythropoiesis; and for his contributions to the raining of a generation of hematologists and oncologists.

Robert V. Pound, Harvard University
For his pioneering experiments in nuclear magnetic resonance, including the study of quadrupole interactions and negative spin temperatures, and for the demonstration of the gravitational shift of Gamma-ray photons.

Roger R.D. Revelle, Harvard University
For his pioneering work in the areas of carbon dioxide and climate modification, oceanographic exploration presaging plate tectonics, and the biological effects of radiation in the marine environment, and studies of human population growth and global food supplies.

John D. Roberts, California Institute of Technology
For his pioneering studies in nuclear magnetic resonance spectroscopy and reaction mechanisms in organic chemistry.

Patrick Suppes, Stanford University
For his broad efforts to deepen the theoretical and empirical understanding of four major areas: the measurement of subjective probability and utility in uncertain situations; the development and testing of general learning theory; the semantics and syntax of natural language; and the use of interactive computer programs for instruction.

E. Donnall Thomas, Fred Hutchinson Cancer Research Center
For his pioneering work in the science and application of transplantation biology to successful bone marrow transplantation in man for the treatment of cancer and related conditions.

1989

Arnold O. Beckman, California Institute of Technology
For his leadership in the development of analytical instrumentation, and for his deep and abiding concern for the vitality of the Nation's scientific enterprise.

Richard B. Bernstein, University of California, Los Angeles
For his development and use of the technique of molecular beams, which have played a significant role in shaping the field of modern chemical dynamics.

Melvin Calvin, University of California, Berkeley
For his pioneering studies in the mechanism of photosynthesis and bioenergetics, and for the application of scientific theory toward the solution of the most fundamental problems of the age—energy, food, chemical and viral carcinogenesis, and the origin of life.

Harry George Drickamer, University of Illinois
For his discovery of the "pressure tuning" of electronic energy levels as a way to obtain new and unique information on the electronic structure of solids.

Katherine Esau, University of California, Santa Barbara
For her distinguished service to the American community of plant biologists, and for the excellence of her pioneering research, both basic and applied, on plant structure and development, which has spanned more than six decades; for her superlative performance as an educator, in the classroom and through her books; for the encouragement and inspiration she has given to a legion of young, aspiring plant biologists; and for providing a special role model for women in science.

Herbert E. Grier, CER Corporation
For his pioneering scientific contributions and his leadership role in ultra-high-speed electronic stroboscopy, electro-optic innovations, national defense, and aerospace sciences.

Viktor Hamburger, Washington University
For his steadfast work that led to the discovery and understanding of normally occurring neuronal death, nerve growth factor, and competitive relationships in the vertebrate nervous system.

Samuel Karlin, Stanford University
For his broad and remarkable researches in mathematical analysis, probability theory and mathematical statistics, and in the application of these ideas to mathematical economics, mechanics, and population genetics.

Philip Leder, Harvard University Medical School
For his innovative studies that have significantly advanced knowledge and provided new directions for research in molecular genetics, immunology and cancer etiology.

Joshua Lederberg, Rockefeller University
For his work in bacterial genetics and immune cell single type antibody production; for his seminal research in artificial intelligence in biochemistry and medicine; and for his extensive advisory role in government, industry and international organizations that address themselves to the societal role of science.

Saunders Mac Lane, The University of Chicago
For revolutionizing the language and content of modern mathematics by his collaboration in the creation and development of the fields of homological algebra and category theory, for outstanding contributions to mathematics education, and for incisive leadership of the mathematical and scientific communities.

Rudolph A. Marcus, California Institute of Technology
For his fundamental, far-reaching, and eminently useful developments of theories of unimolecular reactions and of electron transfers in chemistry and biochemistry.

Harden M. McConnell, Stanford University
For his original and insightful research that has had a profound impact on twentieth-century mathematics, and for his role as an inspiring teacher to generations of American mathematicians.

Eugene N. Parker, The University of Chicago
For his fundamental studies of plasmas, magnetic fields, and energetic particles on all astrophysical scales; for his development of the concept of solar and stellar winds; and for his studies on the effects of magnetic fields on the solar atmosphere.

Robert P. Sharp, California Institute of Technology
For his research that has illuminated the nature and origin of the forms and formation processes of planetary surfaces and for teaching two generations of scientists and laymen to appreciate them; for his recruitment and leadership of a successful multidisciplinary department of earth and planetary scientists who have gained world recognition.

Donald C. Spencer, Princeton University
For his original and insightful research that has had a profound impact on twentieth-century mathematics, and for his role as an inspiring teacher to generations of American mathematicians.

Roger W. Sperry, California Institute of Technology
For his work on neurospecificity which showed how the intricate brain networks for behavior are effected through a system of chemical coding of individual cells, which has made fundamental contributions to the understanding of human nature.

Henry M. Stommel, Woods Hole Oceanographic Institution
For his original, penetrating and fundamental contributions to the physics of ocean circulation.

Harland G. Wood, Case Western Reserve University
For his pioneering work on the biochemistry of CO_2 fixation, for major contributions to medical education, and for leadership in biochemistry at the national and international levels.

1988

William O. Baker, AT&T Bell Laboratories
For pioneering studies of the complex relationships between the molecular structures and physical properties of polymers, for a distinguished record of leadership in the combined disciplines of science and engineering, and for distinguished service to government and education.

Konrad E. Bloch, Harvard University
For his discovery of the principle of suicide inhibitors for enzymes and for an example of that principle. His discovery points the way to the rational design of therapeutic agents.

D. Allan Bromley, Yale University
For seminal work on nuclear molecules, for development of tandem accelerators and semi-conductor detectors for charged particles, for his contributions to particle-gamma correlation studies, and for his role in founding the field of precision heavy-ion physics.

Michael S. Brown and Joseph L. Goldstein, University of Texas Southwestern Medical Center
For their historic discovery of the basic mechanisms controlling cholesterol metabolism, opening the way to a new pharmacological approach to the treatment of cardiovascular disease, the leading cause of death and disability in the Western world.

Paul (Ching-Wu) Chu, University of Houston
For his wide-ranging contributions in achieving stable superconductivity at -290 degrees F, above the critical temperature of liquid nitrogen (-321 degrees F); and for his participation in the discovery of another superconducting compound, this one stable at a higher temperature (-243 degrees F) and not using rare-earth elements.

Stanley N. Cohen, Stanford University School of Medicine
For his discovery of methods for propagating and expressing the hereditary information of DNA introduced into living cells, thereby enabling the cloning of individual genes and the study of their structure and function.

Elias J. Corey, Harvard University
For his strikingly original contributions to organic synthesis, which have brought the science of organic chemistry to a new level of power and precision.

Daniel C. Drucker, University of Florida
For pioneering contributions to the development of the theory of plasticity and of limit design, for leadership in engineering education and in engineering societies promoting excellence, and for his influential advisory service to the Nation.

Milton Friedman, Stanford University
For his theoretical contributions, and for application, of the principles of scientific empirical and statistical methods to the field of economics and the social sciences, and to problems critical to the Nation in general.

Ralph E. Gomory, IBM Corporation
For his scientific contributions to the mathematics of discrete optimization and its far-reaching influence on information processing; for bringing to a leading position one of industry's most significant research establishments; and for his contributions to public and private scientific enterprise.

Willis M. Hawkins, Lockheed Corporation
For his contributions - through invention, development, management, and advice - to the technical health and competitive status of the United State aeronautical products, sound deterrent weapons systems, and space prowess.

Maurice R. Hilleman, Merck Institute for Therapeutic Research
For his brilliant discoveries in basic research and ingenious inventiveness in creating vaccines that are the foundation for control of infectious diseases through immunological intervention, preventing death and disability in millions of persons worldwide.

George W. Housner, California Institute of Technology
For his profound and decisive influence on the development of earthquake engineering worldwide. His research contributions have guided the development of earthquake engineering and have had an important impact on other major disciplines.

Eric R. Kandel, Columbia University
For discovering the first cellular and molecular mechanisms contributing to simple learning and memory.

Joseph B. Keller, Stanford University
For his outstanding contribution to the geometrical theory of diffraction. This is a major extension of geometrical optics which succeeds, after many centuries, in adding the physics of diffraction to the simple ray concepts of optics and of other wave motions.

Walter Kohn, University of California, Santa Barbara
For his pioneering fundamental contributions to the theory of the electronic structure of solids, including the effective mass approach to defects in semiconductors, the so-called KKR method of band structure, and, most importantly, the density functional approach to the many-electron problem which has led to great advances in the understanding of bulk solids and solid surfaces.

Norman F. Ramsey, Harvard University
For his seminal investigations in broad areas of atomic, molecular, and nuclear physics, and for his dedicated service to the Nation and to the scientific community.

Jack Steinberger, European Center for Nuclear Research (CERN)
For his incisive illumination of the properties of subnuclear particles, including exhaustive measurements of strange particles, neutral kaons, and high-energy neutrino interactions.

Rosalyn S. Yalow, Veteran's Administration Hospital, Brooklyn, NY
For her historic contributions to the discovery and development of radioimmunoassay, a technique that employs radioactive isotopes to detect and measure the levels of insulin and hormones in the blood and body tissues.

1987

Philip H. Abelson, American Association for the Advancement of Science
For his path-breaking contributions in radiochemistry, physics, geophysics, biophysics, and biochemistry and for his vigorous and penetrating counsel on national matters involving science and technology.

Anne Anastasi, Fordham University
For her work in the development of the discipline of differential psychology as a behavioral science, which illuminates the way traits are influenced by heredity and environment and the methods by which traits and human characteristics are measured.

Robert B. Bird, University of Wisconsin
For his profoundly influential books and research on kinetic theory, transport phenomena, the behavior of polymeric fluids, and foreign language study for engineers and scientists.

Raoul Bott, Harvard University
In recognition of his profound studies in the topology of Lie groups and differential geometry over many decades, and in particular for his 'periodicity theorem'

Michael E. DeBakey, Baylor College of Medicine
For his pioneering medical innovations throughout his medical career and his unique ability to bring his vast professional knowledge to bear on public policy as a national and international medical statesman.

Theodor O. Diener, U.S. Department of Agriculture
For the discovery of viroids, the smallest known agent of infectious disease. This discovery has opened new avenues of molecular research into some of the most serious diseases afflicting plants, animals, and humans.

Harry Eagle, Albert Einstein College of Medicine
For his research in the development of reproducible conditions for the growth in culture of human and animal cells.

Michael H. Freedman, University of California, San Diego
For his proof of the Poincare Conjecture in dimension four: a topological four-manifold is homeomorphic to S^4 it is homotopy equivalent to S^4, one of the greatest achievements in mathematics in this century.

William S. Johnson, Stanford University
For his outstanding achievements in organic synthesis, notably in the stereoselective total synthesis of steroids by classical and biomimetic pressures.

Har Gobind Khorana, Massachusetts Institute of Technology
For his innovative contributions that significantly contributed to our understanding of gene structure, membrane function and vision and for the work stimulated by his research which has had a major impact on the biological and chemical sciences.

Paul C. Lauterbur, University of Illinois
For first proposing and demonstrating the use of nuclear magnetic resonance to form images, and for his continuing contributions to the development of this method for safely producing exquisitely detailed images of the interior of the body for use in medical research and clinical diagnosis.

Rita Levi-Montalcini, Italian National Research Council
For a major breakthrough in neurobiology by her discovery of the Nerve Growth Factor and its effect on the growth of the sympathetic nervous system which set the stage for worldwide studies of the molecules involved in normal and malignant growth.

George E. Pake, Xerox Corporation
For his commitment to creative excellence in support of institutional purpose. Whether as a research scientist, physics teacher, university administrator, or corporate executive, every institution he has served has been measurably strengthened by his contributions.

H. Bolton Seed, University of California, Berkeley
For his pioneering contributions to the art and science of civil engineering, to the practice of civil engineering at the frontiers of knowledge, to the general understanding of civil engineering methods at all levels, and to the safety and welfare of people throughout the world.

George J. Stigler, The University of Chicago
For his efforts to advance the understanding of industry, its internal organization and relation to government, and for initiating the study of information and markets.

Walter H. Stockmayer, Dartmouth College
For his fundamental contributions to the physical chemistry of high polymers.

Max Tishler, Wesleyan University
For his profound contributions to the Nation's health and for the impact of his research on the practice of chemistry.

James A. Van Allen, University of Iowa
For his central role in the exploration of outer space, including the discoveries of the magnetospheres of Earth, Jupiter, and Saturn.

Ernst Weber, Polytechnic Institute of New York
For his distinguished and pioneering contributions to the profession of electrical engineering and allied areas as educator, academic leader, author, researcher, and entrepreneur which have inspired several generations of students and colleagues around the world.

1986

Solomon J. Buchsbaum, Bell Telephone Laboratories
For his wise contributions to national science and technology policy, and for his studies of solid state plasmas.

Stanley Cohen, Vanderbilt University
For his pioneering discovery and characterization of hormone-like growth factors which specifically control the multiplication of certain cells during growth and development.

Horace R. Crane, University of Michigan
For the first measurement of the magnetic moment and spin of free electrons and positrons.

Herman Feshbach, Massachusetts Institute of Technology
For his distinguished contributions to science as a nationally acclaimed leader in physics education by virtue of his extraordinary interest in teaching and his total commitment to scientific excellence.

Harry B. Gray, California Institute of Technology
For his pioneering research in bioinorganic chemistry and inorganic photochemistry, and for his many contributions to chemical education.

Donald A. Henderson, Johns Hopkins University
For his leading role as chief architect and implementer of the World Health Organization's successful global eradication of smallpox.

Robert Hofstadter, Stanford University
For his discovery and development of the sodium iodide scintillation counter leading to its application to spectroscopy in virtually all branches of science and technology, including imaging in medicine, and for his contributions to the understanding of the structure of elementary particles and atomic nuclei stemming from the development of the electron scattering method.

Peter D. Lax, New York University
For his outstanding, innovative and profound contributions to the theory of partial differential equations, applied mathematics, numerical analysis and scientific computation.

Yuan Tseh Lee, University of California, Berkeley
For his world leadership in the development of molecular beam techniques and their application to the study of chemical dynamics. His work has had an enormous impact on many areas of physical chemistry, especially building up a quantitative bridge between the laws of mechanics and complex macroscopic phenomena.

Hans Wolfgang Liepmann, California Institute of Technology
For his invaluable contributions to the physical sciences and engineering and their impact on the national defense and for his important theoretical and experimental advances in the areas of laminar flow, instability and transition, turbulence, shock-wave boundary layer interaction, transonic flow, aerodynamic noise, magnetofluid dynamics, and the mechanics of liquid helium.

T.Y. Lin, T Y Lin International
For his work as an engineer, teacher and author whose scientific analyses, technological innovation, and visionary designs have spanned the gulf not only between science and art, but also between technology and society.

Carl S. Marvel, University of Arizona
For leading us into the Polymer Age through his researches on polymers, including synthetic rubber; for helping us into the Space Age through his development of thermally stable polymers; for his many services to the chemical profession; and for educating and inspiring three generations of chemists.

Vernon B. Mountcastle, Johns Hopkins University
For his fundamental research on how the brain functions in processing and perceiving the information gathered through the somatic sensory system.

Bernard M. Oliver, National Aeronautics and Space Administration
For translating the most profound discoveries of physical and communication science into the electronic, radio, and computer systems which have improved our culture and enriched the lives of all Americans.

George Emil Palade, Yale University
For pioneering discoveries of a host of fundamental, highly organized structures in living cells through studies combining electron microscopy and biochemistry. These contributions stimulated the growth of the field of cell biology, which he continues to inspire through his own research and leadership active collaboration, and the training of new investigators.

Herbert A. Simon, Carnegie Mellon University
For his fundamental contributions to our understanding of human problem-solving behavior and decision making, particularly in organizations.

Joan A. Steitz, Yale University
For her major contributions to the basic molecular biology of bacterial and mammalian cells. Her discovery of at least six new components of the cellular machinery is an accomplishment of great distinction in both basic molecular biology and in the clinical treatment of autoimmune disease.

Frank H. Westheimer, Harvard University
For his series of extraordinary, original and penetrating investigations of the mechanisms of organic and enzymatic reactions, which have played an unequaled role in the advancement of our knowledge of the ways in which chemical and biochemical processes proceed.

Chen Ning Yang, State University of New York at Stony Brook
For his path breaking research in theoretical physics, which he has influenced for many years by his profound questions and deep mathematical insight. His ideas have had great impact not only on theoretical developments but also on experiments in elementary particles and condensed matter.

Antoni Zygmund, The University of Chicago
For outstanding contributions to Fourier analysis and its applications to partial differential equations and other branches of analysis, and for his creation and leadership of the strongest school of analytical research in the contemporary mathematical world.

1985

No Awards given.

1984

No Awards given.

1983

Howard L. Bachrach, U.S. Department of Agriculture
For his pioneering research in molecular virology, including identification of the immunizing protein, and his collaborative role in the use of gene splicing to produce the first effective protein vaccine for use in animals or humans.

Paul Berg, Stanford University
For fundamental contributions to understanding the mechanisms of gene expression, for the development of recombinant DNA, and for a deep concern for its safe and humane application to medicine.

Margaret Burbidge, University of California, San Diego
For leadership in observational astronomy. Her spectroscopic investigations have provided crucial information about the chemical composition of stars and the nature of quasi-stellar objects.

Maurice Goldhaber, Brookhaven National Laboratory
For his many contributions to all aspects of nuclear physics and more recently particle physics, and for the leadership he has provided the scientific community, as an administrator of science, as a shaper of scientific thought, and as a prolific source of stimulating ideas.

Herman H. Goldstine, Institute for Advanced Study
For his fundamental contributions to the development of the digital computer, computer programming and numerical analysis.

William R. Hewlett, Hewlett-Packard Company
For his pioneering accomplishments in the creation and manufacturing of electronics and semi-conductor devices and electronic test instruments.

Roald Hoffman, Cornell University
His creative applications of theory to organic and inorganic chemistry have brought together the world community of chemists. The magnitude and uniqueness of his contributions to modern chemistry and the scientific process are contributing to an ever-improving understanding of chemistry.

Helmut E. Landsberg, University of Maryland at College Park
In recognition of his outstanding contributions to the advancement of knowledge and the applications of climatology, his furtherance of academic achievement and educational programs in the field; and for the exceptional leadership he gave to the climatological sciences and services of the United States government.

George M. Low*, Rensselaer Polytechnic Institute
For contributions of major dimensions and lasting importance to manned space flight and in university-industry-government relations.

Walter H. Munk, University of California, San Diego
For his unique contributions to the sciences of the geophysics and physical oceanography which have led to a better understanding of the earth's rotation, the complexities of ocean waves, tidal processes and acoustic propagation.

George C. Pimentel, University of California, Berkeley
For his varied and ingenious use of infrared spectroscopy to study chemical bonding and molecular dynamics, and for his discovery of the first chemically pumped laser, which has had strong scientific impact as well as practical applications.

Frederick Reines, University of California, Irvine
For the experimental discovery of the free neutrino and the elucidation of its properties and interactions and the testing of fundamental conservation laws of physics.

Wendell L. Roelofs, Cornell University
For his fundamental contributions to basic and applied biology in the field of insect pheromones, their chemical composition and blends, their biosynthesis, how insects perceive and respond to them, and their use in insect pest management.

Bruno B. Rossi, Massachusetts Institute of Technology
For fundamental contributions to physics and astronomy through his investigations into the nature and origin of cosmic rays and his initiatives that led to the direct detection of the solar wind and to the discovery of extrasolar x-ray sources.

Berta Scharrer, Albert Einstein College of Medicine
For her pioneering contributions to establishing the concept of neurosecretion and the demonstration of the central role of neurosecretion and neuropeptides in the integration of animal function and development.

J. Robert Schrieffer, University of Pennsylvania
In recognition of his insight into cooperative effects in solids and solid surfaces dependent on interacting many-body systems and for his leadership in showing how one couples formal theoretical work with experimental findings to make significant advances in the area of condensed matter physics.

Isadore M. Singer, University of California, Berkeley
For his inspired revival of differential geometry and its connections to analysis; for his contribution to the discovery and applications of the index theorem for differential operators; and for his leadership in using geometric and topological methods in connection with theoretical physics.

John G. Trump*, Massachusetts Institute of Technology
For his introduction of new machines and methods for the widespread beneficial application of ionizing radiation to medicine, industry and atomic physics.

Richard N. Zare, Stanford University
For his seminal contributions to molecular spectroscopy, photochemistry, and chemical reaction dynamics, especially for his incisive theoretical methods and the development of the experimental technique of laser induced fluorescence.

1982

Philip W. Anderson, Bell Telephone Laboratories
For his fundamental and comprehensive contributions to the theoretical understanding of condensed matter.

Seymour Benzer, California Institute of Technology
For elucidating the fine structure of the gene and unifying the classical and molecular concepts of gene structure and function.

Glenn W. Burton, U.S. Department of Agriculture
For outstanding contributions to the biological sciences that have helped to feed the hungry, protect and beautify the environment, and provide recreation for millions.

Mildred Cohn, University of Pennsylvania School of Medicine
For pioneering the use of stable isotopic tracers and nuclear magnetic resonance spectroscopy in the study of the mechanisms of enzymatic catalysis.

F. Albert Cotton, Texas A&M University
For contributions of unique range, depth, and importance to inorganic and structural chemistry, especially the discovery and elucidation of multiple metal-metal bonds and the application of group theory to chemical problems.

Edward H. Heinemann, General Dynamics Corp.
For his outstanding contribution as a creator-designer and engineer responsible for the design and production of a series of famous aircraft for the military forces of the Untied States and allied nations.

Donald L. Katz, University of Michigan
For solving many practical engineering problems by delving into a wide group of sciences and making their synergistic effects evident.

Yoichiro Nambu, The University of Chicago
For seminal contributions to the understanding of elementary particles and their interactions.

Marshall H. Stone, University of Massachusetts at Amherst
For his original synthesis of analysis, algebra, and topology, the new vital area of functional analysis in modern mathematics

Gilbert Stork, Columbia University
For his contributions as one of the world's most innovative and productive organic synthetic chemists who has discovered a variety of important synthetic reactions which have made possible the synthesis of some of the most complicated and important biologically active compounds.

Edward Teller, Stanford University
For his outstanding contribution to molecular physics, understanding the origin of stellar energy, the theory and application of fusion reaction, the field of nuclear safety, and for his continued leadership in science and technology.

Charles H. Townes, University of California, Berkeley
For fundamental contributions to the understanding of matter through its interaction with electromagnetic radiations and the application of this knowledge to the service of mankind, most notably in the invention of the maser and laser.

1981

Philip Handler, National Academy of Sciences
For his outstanding contributions to biochemical research, resulting in significant contributions to mankind, including research that led to a clearer understanding of pellagra, and for his national leadership in furthering the state of American science.

1980

No Awards given.

1979

Robert H. Burris, University of Wisconsin
For numerous original contributions leading to an understanding of the physiology and biochemistry of the process of biological nitrogen fixation.

Elizabeth C. Crosby, University of Michigan
For outstanding contributions to comparative and human neuroanatomy and for the synthesis and transmission of knowledge of the entire nervous system of the vertebrate phylum.

Joseph L. Doob, University of Illinois
In recognition of his work on probability and mathematical statistics, characterized by novel and fruitful ideas of a general character that opened new fields of study which began to be transplanted abroad and now are acclaimed worldwide.

Richard P. Feynman, California Institute of Technology
In recognition of his essential contributions to the quantum theory of radiation and to his illumination of behavior of constituents of the atom, of the atomic nucleus, and of the subnuclear particles.

Donald E. Knuth, Stanford University
For his significant research into the mathematical analysis and design of efficient computer algorithms and for his profoundly influential books which have codified fundamental knowledge at the core of computer programming.

Arthur Kornberg, Stanford University School of Medicine
For accomplishments providing the conceptual and experimental framework for much of our current understanding of the manner in which DNA, the genetic substance, is replicated.

Emmett N. Leith, University of Michigan
For discoveries and developments in wavefront reconstruction and holography, and his pioneering application of these techniques in engineering and science.

Herman F. Mark, Polytechnic Institute of Brooklyn
For his contributions to polymer chemistry, and his role in the introduction of polymer science as an academic discipline in the United States.

Raymond D. Mindlin, Columbia University
For fundamental contributions to applied mechanics, including theory and applications in photoelasticity, package cushioning, piezoelectric oscillators, and ultrahigh frequency vibrations.

Robert N. Noyce, Intel Corporation
For contributions to a variety of semiconductor devices, but especially for the integrated circuit, the cornerstone of modern electronics.

Severo Ochoa, New York University
For important contributions to biochemistry and molecular biology, discoveries that contributed greatly to our understanding of the mechanisms for energy generation within a cell, the mechanism whereby proteins are synthesized within a cell and the elucidation of the genetic code.

Earl R. Parker, University of California, Berkeley
For contributions profoundly influencing materials engineering through research in flow and fracture, and for his development of new alloys with unusual combinations of strength and toughness.

Edward M. Purcell, Harvard University
For contributions to nuclear magnetic resonance in condensed matter and the measurement of interstellar magnetic fields.

Simon Ramo, TRW Inc.
For basic contributions to microwave electronics, and imaginative technical leadership in making large electronic systems available to the country for defense and civilian uses.

John H. Sinfelt, ESSO Research and Engineering Company
For scientific research on the nature of heterogeneous catalysis leading to the development of new catalyst systems for the production of low lead gasoline.

Layman Spitzer, Jr., Princeton University
For important contributions to the theory of star formation and evolving stellar systems and plasma physics, including use of fusion as a source of energy.

Earl Reece Stadtman, National Institutes of Health
For seminal contributions to understanding of the energy metabolism of anaerobic bacteria and for elucidation of major mechanisms whereby the rates of metabolic processes are finely matched to the requirements of the living cell.

George Ledyard Stebbins, University of California, Davis
For his outstanding contributions to the synthesis of an evolutionary theory, particularly as it applies to plants.

Paul A. Weiss, Rockefeller University
For outstanding contributions to cell biology and understanding of the development of the nervous system including the basis for surgical repair of injury to peripheral nerves.

Victor F. Weisskopf, Massachusetts Institute of Technology
For important contributions to our understanding of nuclear matter and nuclear reactions, and early fundamental contributions to our understanding of elementary particles.

1978

No Awards given.

1977

No Awards given.

1976

Morris Cohen, Massachusetts Institute of Technology
For original research and advancement of knowledge of the physical and mechanical metallurgy of iron and steel, and especially for his work on the martensitic transformation in the hardening of steel.

Kurt Otto Friedrichs, New York University
For bringing the powers of modern mathematics to bear on problems in physics, fluid dynamics, and elasticity.

Peter C. Goldmark, Goldmark Communications Corp.
For contributions to the development of the communication sciences for education, entertainment, culture and human service.

Samuel A. Goudsmit, University of Nevada
For the major discovery, together with George E. Uhlenbeck, of the electron spin as the source of a new quantum number.

Roger C.L. Guillemin, Salk Institute of Biological Studies
For demonstrating the presence of a new class of hormones, made in the brain, that regulate the function of the pituitary gland, thereby making possible improved diagnosis and treatment of numerous endocrine disorders.

Herbert S. Gutowsky, University of Illinois
In recognition of pioneering studies in the field of nuclear magnetic resonance spectroscopy.

Erwin W. Mueller*, Pennsylvania State University
For his invention of the field-emission microscope, the field-ion microscope, and the atom-probe microscope, which helped to resolve the atomic structures of solids.

Keith Roberts Porter
For fundamental contributions to the elucidation of the fine structure of cells by electron microscopy, which has inaugurated a new era of cell biology integrating structure and function into a comprehensive picture of the life of cells.

Efraim Racker, Cornell University
For major contributions to understanding the subcellular mechanism whereby oxidative and photosynthetic energy is transformed into the specific form of chemical energy used by living cells.

Frederick D. Rossini, Rice University
For contributions to basic reference knowledge in chemical thermodynamics.

Verner E. Suomi, University of Wisconsin
For providing a new view of the dynamics of our atmosphere, which already has brought substantial benefits to the people of this nation and the world.

Henry Taube, Stanford University
In recognition of contributions to the understanding of reactivity and reaction mechanisms in inorganic chemistry.

George F. Uhlenbeck, Rockefeller University
For the major discovery, together with Samuel A. Goudsmit, of the electron spin as a source of a new quantum number.

Hassler Whitney, Institute for Advanced Study
For founding, and bringing to maturity, the discipline of differential topology.

Edward O. Wilson, Harvard University
For his pioneering work on the organization of insect societies and the evolution of social behavior among insects and other animals.

1975

John W. Backus, IBM San Jose Research Laboratory
For his pioneering contributions to computer programming languages, especially development of the FORTRAN language which made the modern digital computer directly available to countless scientists and engineers.

Manson Benedict, Massachusetts Institute of Technology
For inspired and ingenious leadership in the development of gaseous diffision plants for uranium isotope separation, and for his role in creating the discipline of nuclear engineering.

Hans A. Bethe, Cornell University
For his explanation of the origin of the sun's heat, his many contributions to our understanding of the atomic nucleus and his counsel in matters involving atomic energy

Shiing-shen Chern, University of California, Berkeley
For developing and extending techniques that led to profound discoveries in geometry and topology.

George B. Dantzig, Stanford University
For inventing linear programming and discovering methods that led to wide-scale scientific and technical applications to important problems in logistics, scheduling, and network optimization, and to the use of computers in making efficient use of the mathematical theory.

Hallowell Davis, Washington University
For fundamental research on nerve potentials, electroencephalography, and mechanisms of hearing that have formed the basis for advances in neurophysiology, neurology, otolaryngology, audiology, acoustics, occupational health safety, and pediatrics.

Paul Gyorgy*, University of Pennsylvania
For his discovery of three vitamins and related research that have greatly improved human nutrition.

Sterling Brown Hendricks, U.S. Department of Agriculture, Beltsville, MD
For the initiation of basic research in the physical and chemical properties of soils and proteins that have profoundly influenced agricultural practices and the production of food plants.

Joseph O. Hirschfelder, University of Wisconsin
For his fundamental contribution to atomic and molecular quantum mechanics, the theory of the rates of chemical reactions, and the structure and properties of gases and liquids.

William H. Pickering, California Institute of Technology
For his leadership of the exploration of the planets of the solar system and his personal contributions to the theory and practice of soft planetary landings and collection of data from deep space.

Lewis H. Sarett, Merck, Sharp & Dohme Research Labs
For his pioneering contributions to the chemical synthesis of cortisone, steroidal hormones, and other chemotherapeutic agents which have contributed to the benefit of mankind.

Frederick E. Terman, Stanford University
For his principal role in creating modern electronics and his ability to document his knowledge so that it could be effectively communicated to his many students who now populate the worlds of industry, academia, and public service.

Orville Alvin Vogel, Washington State University
For outstanding contributions to agronomic research including the development of radically new and improved semidwarf varieties of wheat that now grow on five continents and have made the green revolution a reality.

Wernher Von Braun, National Aeronautics and Space Administration
For his work in making the liquid-fuel rocket a practical launch vehicle and for individual contributions to a series of advanced space vehicles, culminating in the Saturn series that made the Apollo program possible.

E. Bright Wilson, Jr., Harvard University
In recognition of his fundamental theoretical and experimental contribution to our understanding of the structure of molecules.

Chien-Shiung Wu, Columbia University
For her ingenious experiments that led to new and surprising understanding of the decay of the radioactive nucleus.

1974

Nicolaas Bloembergen, Harvard University
For pioneering applications of magnetic resonance to the study of condensed matter and for subsequent scientific investigations and inventions concerning the interaction of matter with coherent radiation.

Britton Chance, University of Pennsylvania
For his contributions to our knowledge of cellular and subcellular physiology made through work on enzyme-substrate complexes, on the kinetics of enzyme action, and on the mechanism and control of membrane-bound electron transfer during cellular respiration.

Erwin Chargaff, Columbia University
For fundamental chemical and biological studies establishing the basis for modern concepts of the mechanisms of protein synthesis and the genetic role of nucleic acids.

Paul John Flory, Stanford University
For his outstanding contributions to our understanding of the modes of formation and structure of polymeric substances.

William Alfred Fowler, California Institute of Technology
For his scientific contributions to nuclear physics and astrophysics, which permitted him to span both disciplines to unravel the nuclear processes that control the evolution of stars.

Kurt Godel, Institute for Advanced Study
For laying the foundation for today's flourishing study of mathematical logic.

Rudolf Kompfner, Stanford University
For his invention of the traveling-wave tube and for major contributions to communication satellites and to optical communications.

James Van Gundia Neel, University of Michigan Medical School
For pioneering achievements in creating the science of human genetics and discovering the genetic basis of several human diseases.

Linus Carl Pauling, Stanford University
For the extraordinary scope and power of his imagination, which has led to basic contributions in such diverse fields as structural chemistry and the nature of chemical bonding, molecular biology, immunology, and the nature of genetic diseases.

Ralph Brazelton Peck, University of Illinois
For his development of the science and art of subsurface engineering, combining the contributions of the sciences of geology and soil mechanics with the practical art of foundation design.

Kenneth Sanborn Pitzer, University of California, Berkeley
For his pioneering application of statistical thermodynamics and spectroscopy to our understanding of the properties of organic and inorganic materials.

James Augustine Shannon, Rockefeller University
For outstanding leadership in biomedical research following an earlier career in distinguished laboratory investigation of kidney function and antimalarial drugs.

Abel Wolman, Johns Hopkins University
For significant improvements in the environment and in the health and prosperity of large populations through the development of better water supply and wastewater systems for cities, regions, and entire nations.

1973

Daniel I. Arnon, University of California, Berkeley
For fundamental research into the mechanism of green plant utilization of light to produce chemical energy and oxygen and for contributions to our understanding of plant nutrition.

Carl Djerassi, Stanford University
In recognition of his major contributions to the elucidation of the complex chemistry of the steroid hormones and to the application of these compounds to medicinal chemistry and population control by means of oral contraceptives.

Harold E. Edgerton, Massachusetts Institute of Technology
For his vision and creativity in pioneering the field of stroboscopic photography and for his many inventions of instruments for exploring the great depths of the oceans.

William Maurice Ewing, University of Texas Medical Branch
For extending and improving the methods of geology and geophysics to study the ocean floor and to understand the last remaining unexplored province of the solid earth—that which lies under the sea.

Arie Jan Haagen-Smit, California Institute of Technology
For his unique contributions to the discovery of the chemical nature and source of smog, and for the successful efforts which he has carried through for smog abatement.

Vladimir Haensel, Universal Oil Products Co.
For his outstanding research in the catalytic reforming of hydrocarbons which has greatly enhanced the economic value of our petroleum natural resources.

Frederick Seitz, Rockefeller University
For his pioneering contributions to the foundations of the modern quantum theory of the solid state of matter, and to the understanding of many phenomena and processes that occur in solids.

Earl W. Sutherland, Jr., University of Miami
For the discovery that epinephrine and hormones of the pituitary gland occasion their diverse regulatory effects by initiating cellular synthesis of cyclic adenylic acid, now recognized as a universal biological "second messenger," which opened a new level of understanding of the subtle mechanisms that integrate the chemical life of the cell while offering hope of entirely new approaches to chemotherapy.

John Wilder Tukey, Princeton University
For his studies in mathematical and theoretical statistics, particularly his pioneering work on broad analysis and synthesis problems of complex systems, and for his outstanding contributions to the applications of statistics to the physical, social, and engineering sciences.

Richard T. Whitcomb, National Aeronautics and Space Administration
For his discoveries and inventions in aerodynamics which have provided and will continue to provide substantial improvements in the speed, range and payload of a major portion of high-performance aircraft produced throughout the country.

Robert Rathbun Wilson, Fermi National Accelerator Laboratory
For unusual ingenuity in designing experiments to explore the fundamental particles of matter and in designing and constructing the machines to produce the particles, culminating in the world's most powerful particle accelerator.

1972

No Awards given.

1971

No Awards given.

1970

Richard D. Brauer, Harvard University
For his work on conjectures of Dickson, Cartan, Maschke, and Artin, his introduction of the Brauer group, and his development of the theory of modular representations.

Robert H. Dicke, Princeton University
For fashioning radio and light waves into tools of extraordinary accuracy and for decisive studies of cosmology and of the nature of gravitation.

Barbara McClintock, Carnegie Institution of Washington
For establishing the relations between inherited characters in plants and the detailed shapes of their chromosomes, and for showing that some genes are controlled by other genes within chromosomes.

George E. Mueller, General Dynamics Corp.
For his many individual contributions to the design of the Apollo system, including the planning and interpretation of a large array of advanced experiments necessary to insure the success of this venture into a new and little known environment.

Albert B. Sabin, Weizmann Institute of Science
For numerous fundamental contributions to the understanding of viruses and viral diseases, culminating in the development of the vaccine which has eliminated poliomyelitis as a major threat to human health.

Allan R. Sandage, California Institute of Technology
For bringing the very limits of the universe within the reach of man's awareness and unraveling the evolution of stars and galaxies—their origins and ages, distances and destinies.

John C. Slater, University of Florida
For wide-ranging contributions to the basic theory of atoms, molecules, and matter in the solid form.

John A. Wheeler, Princeton University
For his basic contributions to our understanding of the nuclei of atoms, exemplified by his theory of nuclear fission, and his own work and stimulus to others on basic questions of gravitational and electromagnetic phenomena.

Saul Winstein*, University of California, Los Angeles
In recognition of his many innovative and perceptive contributions to the study of mechanism in organic chemical reactions.

1969

Herbert C. Brown, Purdue University
For discovery and exploration of the hydroboration reaction and for developing it into a major and powerful tool in chemical synthesis.

William Feller*, Princeton University
For original and definitive contributions to pure and applied mathematics, for making probability available to users, and for pioneering work in establishing Mathematical Reviews.

Robert J. Huebner, National Cancer Institute
For contributions to the modern understanding of the biology of viruses and their role in the induction of diverse diseases.

Jack St. Clair Kilby, Texas Instruments
For original conceptions and valuable contributions in the production and application of integrated circuits.

Ernst Mayr, Harvard University
For notable contributions to systematic, biogeography, and the study of birds, and especially for great work on the evolution of animal populations.

Wolfgang K.H. Panofsky, Stanford University
For classic experiments probing the elementary particles of matter and for contributions to advancing the means of experimentation in this challenging field.

1968

H. Albert Barker, University of California, Berkeley
For his profound study of the chemical activities of microorganisms, including the unraveling of fatty acid metabolism and the discovery of the active coenzyme form of vitamin B12.

Paul D. Bartlett, Harvard University
For his leadership in advancing our understanding of the mechanisms by which chemical reactions take place, and for his success in training younger teachers and researchers.

Bernard B. Brodie, National Institute of Health
For pioneering new qualitative concepts which have revolutionized the development, the study, and the effective use of therapeutic agents in the treatment of human disease.

Detlev W. Bronk, Rockefeller University
For his highly original research in the field of physiology and for his manifold contributions to the advance of science and its institution in the service of society.

J. Presper Eckert, Jr., Sperry Rand Corporation
For pioneering and continuing contributions in creating, developing, and improving the high-speed electronic digital computer.

Herbert Friedman, Naval Research Laboratory
For pioneering work in rocket and satellite astronomy and in particular for his contributions to the field of X-ray astronomy.

Jay L. Lush, Iowa State University
For bringing the science of genetics to bear upon animal breeding, and thus helping to remold the flocks and herds of America and Western Europe.

Nathan M. Newmark, University of Illinois
For contributions to the development of powerful and widely used methods for analyzing complex structural components and assemblies under a variety of conditions of loading.

Jerzy Neyman, University of California, Berkeley
For laying the foundations of modern statistics and devising tests and procedure that have become essential parts of the knowledge of every statistician.

Lars Onsager, Yale University
For a brilliant variety of seminal contributions to the understanding of electrolytes and other chemical systems, especially to the thermodynamics of systems in change.

B. Frederick Skinner, Harvard University
For basic and imaginative contributions to the study of behavior which have had profound influence upon all of psychology and many related areas.

Eugene P. Wigner, Princeton University
For his many unique innovations in the physical, mathematical and engineering sciences ranging from quantum chemistry to nuclear theory and from reactor engineering to civil defense.

1967

Jesse W. Beams, University of Virginia
For sustained and ingenious contributions to the scientific development of high-speed centrifuges, a family of devices that are now widely applied in the physical and biological sciences, in medicine, and in engineering scale isotope-separation.

Francis Birch, Harvard University
For outstanding contributions to geophysics which have immeasurably increased our understanding of the composition and the processes of the interior of the earth.

Gregory Breit, Yale University
For pioneering contributions to the theoretical understanding of nuclear structure and particle dynamics, for highly significant work in atomic and ionospheric physics, and for the inspiration he has given to several generations of American physicists.

Paul J. Cohen, Stanford University
For epoch-making results in mathematical logic which have enlivened and broadened investigations in the foundation of mathematics.

Kenneth S. Cole, National Institute of Health
For highly original experimental and theoretical investigations of the electrical properties of biological membranes that have led to a deep understanding of the functioning of nerves.

Louis P. Hammett, Columbia University
For his joining together physical and organic chemistry, creating new concepts, and replacing intuition by rigor in our growing understanding of chemical reactivity.

Harry F. Harlow, University of Wisconsin
For original and ingenious contributions to comparative and experimental psychology, particularly in the controlled study of learning and motivations, the determinants of animal behavior, and development of affectional behavior.

Michael Heidelberger, New York University
For placing the science of immunology on a quantitative chemical basis, and for showing its power to reveal the structure of molecules found in the living organism.

George B. Kistiakowsky, Harvard University
For contributions to physical chemistry, particularly to the understanding of reaction rates, and for statesmanship in the evolution of relationships between science and public affairs.

Edwin H. Land, Polaroid Corporation
For many discoveries and inventions in the field of polarized light, rapid photography, including quick processing of the final photograph, for the development of a unique theory of color vision, and for contributions to national defense.

Igor I. Sikorsky, United Aircraft Corporation
For pioneering in the development of multi-engined aircraft, both land and seaplanes, and for developing the helicopter as a useful and important device of aerial transportation.

Alfred H. Sturtevant, California Institute of Technology
For a long and distinguished career in genetics during which he discovered and interpreted a number of important genetic phenomena in Drosophila and other organisms.

1966

Jacob A.B. Bjerknes, University of California, Los Angeles
By watching and studying maps he discovered the cyclone-making waves of the air and the climate-controlling changes of the sea.

Subrahmanyan Chandrasekhar, The University of Chicago
For numerous superb contributions to stellar astronomy, physics, and applied mathematics, and for his guidance and inspiration to his many students and colleagues.

Henry Eyring, University of Utah
For contributions to our understanding of the structure and properties of matter, especially for his creation of absolute rate theory, one of the sharpest tools in the study of rates of chemical reaction.

Edward F. Knipling, U.S. Department of Agriculture
For outstanding original contributions involving unique biological approaches to the control of insect vectors responsible for diseases of humans, domesticated animals, and plants.

Fritz A. Lipmann, Rockefeller University
For original discoveries of molecular mechanisms for the transfer and transformation of energy in living cells, and for fundamental contributions to the conceptual structure of modern biochemistry.

John W. Milnor, Princeton University
For clever and ingenious approaches in topology which have solved long outstanding problems and opened new exciting areas in this active branch of mathematics.

William C. Rose, University of Illinois
For the discovery of the essential amino acid threonine and for the subsequent brilliant studies elucidating the qualitative and quantitative amino acid requirements of man and of animals.

Claude E. Shannon, Massachusetts Institute of Technology
For brilliant contributions to the mathematical theories of communications and information processing and for his early and continuing impact on the development of these disciplines.

John H. Van Vleck, Harvard University
For his many contributions to the development of the theory of molecular structure and for his profound influence, through original contributions and through many brilliant students, on the theory of the magnetic and dielectric properties of materials.

Sewall Wright, University of Wisconsin
For original and sustained contributions to the mathematical foundations of the theory of evolution and for basic contributions to experimental and biometrical genetics.

Vladimir K. Zworykin, RCA
For major contributions to the instruments of science, engineering and television, and for his stimulation of the application of engineering to medicine.

1965

John Bardeen, University of Illinois
For his brilliant contributions to the theory of electrical conductivity in solid materials, and especially those which led to the development of a successful theory of superconductivity.

Peter J.W. Debye, Cornell University
For sustained contributions of major concepts of modern chemistry and especially for the application of physical methods to the understanding of large molecules and their interaction in solution.

Hugh L. Dryden*, National Aeronautics and Space Administration
For contributions as an engineer, administrator, and civil servant for one-half century to aeronautics and astronautics which have immeasurably supported the Nation's preeminence in space.

Clarence L. Johnson, Lockheed Aircraft Corporation
For bold innovations in the use of materials and in the design of aircraft of unusual configurations that pioneered new vistas for the possibility of flight.

Leon M. Lederman, Columbia University
For systematic studies of mesons, for his participation in the discovery of two kinds of neutrinos and of parity violation in the decay of mu-mesons.

Warren K. Lewis, Massachusetts Institute of Technology
For contributions as a scientist, teacher, and inventor who as the leader of modern chemical engineering has made the American chemical industry preeminent in the world.

Francis P. Rous, Rockefeller University
For the original discovery and continued elaboration of the relationship between viruses and tumors, which has come to form the biologic base for so much of our present research effort on cancer.

William W. Rubey, University of California, Berkeley
For showing by profoundly original observations and clear physical reasoning how sand grains and mountains move and from whence the oceans come.

George G. Simpson, Harvard University
For penetrating studies of vertebrate evolution through geologic time, and for scholarly synthesis of a new understanding of organic evolution based upon genetics and paleontology.

Donald D. Van Slyke, Brookhaven National Laboratory
For classic studies of the chemistry of blood and of amino acid metabolism, and for the quantitative biochemical methodology underlying much of clinical medicine.

Oscar Zariski, Harvard University
For his creation of a rigorous abstract theory of algebraic geometry, and for his profound influence—especially through many brilliant students—on the algebraic structure of contemporary pure mathematics.

1964

Roger Adams, University of Illinois
For superb contributions [to chemistry] as a scientist, teacher and imaginative leader in furthering the constructive interaction of academic and industrial scientists.

Othmar H. Ammann, Ammann & Whitney
For a half-century of distinguished leadership in the design of great bridges which combine beauty and utility with bold engineering concept and method.

Theodosius Dobzhansky, Rockefeller University
For fundamental studies of the genetic determinants of organ evolution and for penetrating analysis of the genetic and cultural evolution of man.

Charles S. Draper, Massachusetts Institute of Technology
For innumerable imaginative engineering achievements which met urgent National needs of instrumentation, control, and guidance in aeronautics and astronautics.

Solomon Lefschetz, Princeton University
For indomitable leadership in developing mathematics and training mathematicians, for fundamental publications in algebraic geometry and topology, and for stimulating needed research in nonlinear control processes.

Neal Elgar Miller, Yale University
For sustained and imaginative research on principles of learning and motivation and illuminating behavioral analysis of the effects of direct electrical stimulation of the brain.

H. Marston Morse, Institute for Advanced Study
For extraordinary achievement in creating analytic theories in the large, for statesmanship in the world of mathematics, and for distinguished service to his country in war and peace.

Marshall W. Nirenberg, National Institutes of Health
For studies of the genetic control of protein synthesis and, in particular, for deciphering the chemical code relating nucleic acid structures to protein structures.

Julian Schwinger, Harvard University
For profound work on the fundamental problems of quantum field theory, and for many contributions to and lucid expositions of nuclear physics and electrodynamics.

Harold C. Urey, University of California, San Diego
For outstanding contributions to our understanding of the origin and evolution of the solar system and the origin of life on Earth and for pioneering work in the application of isotopes to the determination of the temperatures of ancient oceans.

Robert B. Woodward, Harvard University
For an imaginative new approach to the synthesis of complex organic molecules and, especially, for [his] brilliant syntheses of strychnine, reserphine, lysergic acid, and chlorophyll.

1963

Luis W. Alvarez, University of California, Berkeley
For his inspiring leadership in experimental high energy physics, continuing development of the bubble chamber, discovery of many states of elementary particles, and his contributions to National defense.

Vannevar Bush, Carnegie Institution of Washington
For his distinguished achievements in electrical engineering, in the technology of computing machines, in the effective coupling of the physical and life sciences; and in his mobilizing science, engineering and education in enduring ways in the service of the Nation.

John Robinson Pierce, Bell Telephone Laboratories
For his outstanding contributions to communications theory, electron optics and travelling wave tubes, and for the analysis leading to worldwide radio communications using artificial earth satellites.

Cornelius Barnardus Van Niel, Stanford University
For his fundamental investigations of the comparative biochemistry of microorganisms, for his studies of the basic mechanisms of photosynthesis, and for his excellence as a teacher of many scientists.

Norbert Wiener, Massachusetts Institute of Technology
For his marvelously versatile contributions, profoundly original, ranging within pure and applied mathematics, and penetrating boldly into the engineering and biological sciences.

1962

Theodore Von Karman, California Institute of Technology
For his leadership in the science and engineering basic to aeronautics; for his effective teaching and related contributions in many fields of mechanics, for his distinguished counsel to the Armed Services, and for his promoting international cooperation in science and engineering.

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