The Nobel Prize Internet Archive

2005

The prize is being awarded jointly to:

YVES CHAUVIN, **ROBERT H. GRUBBS** , and **RICHARD R. SCHROCK** for the development of the metathesis method in organic synthesis.

2004

The prize is being awarded jointly to:

AARON CIECHANOVER, **AVRAM HERSHKO** , and **IRWIN ROSE** for the discovery of ubiquitin-mediated protein degradation

2003

The prize is being awarded

for discoveries concerning channels in cell membranes

with one half of the prize to:

PETER AGRE, for the discovery of water channels

and the other half of the prize to:

RODERICK MACKINNON for structural and mechanistic studies of ion channels.

2002

The prize is being awarded

for the development of methods for identification and structure analyses of biological macromolecules

with one half jointly to:

JOHN B. FENN, and KOICHI TANAKA, for their development of soft desorption ionisation methods for mass spectrometric analyses of biological macromolecules

and the other half to:

KURT WÜTHRICH for his development of nuclear magnetic resonance spectroscopy for determining the three-dimensional structure of biological macromolecules in solution.

2001

The prize is being awarded with one half jointly to:

WILLIAM S. KNOWLES, and RYOJI NOYORI, for their work on chirally catalysed hydrogenation reactions

and the other half to:

K. BARRY SHARPLESS for his work on chirally catalysed oxidation reactions.

2000

The prize is being awarded with one half jointly to:

ALAN J. HEEGER, ALAN G. MACDIARMID, and HIDEKI SHIRAKAWA for the discovery and development of conductive polymers.

1999

AHMED ZEWAIL for his studies of the transition states of chemical reactions using femtosecond spectroscopy.

1998

The prize was awarded for pioneering contributions in developing methods that can be used for theoretical studies of the properties of molecules and the chemical processes in which they are involved. The prize was divided equally between:

WALTER KOHN for his development of the density-functional theory

and

JOHN A. POPLE for his development of computational methods in quantum chemistry.

1997

The prize was divided, one half being awarded jointly to:

PAUL D. BOYER and **JOHN E. WALKER** for their elucidation of the enzymatic mechanism underlying the synthesis of adenosine triphosphate (ATP)

and with one half to:

JENS C. SKOU for the first discovery of an ion-transporting enzyme, Na^+, K^+-ATPase.

1996

The prize was awarded jointly to:

ROBERT F. CURL, Jr. , **SIR HAROLD W. KROTO** , and **RICHARD E. SMALLEY** for their discovery of fullerenes.

1995

The prize was awarded jointly to:

PAUL CRUTZEN , **MARIO MOLINA** , and **F. SHERWOOD ROWLAND** for their work in atmospheric chemistry, particularly concerning the formation and decomposition of ozone.

1994

GEORGE A. OLAH for his contribution to carbocation chemistry.

1993

The prize was awarded for contributions to the developments of methods within DNA-based chemistry equally between:

KARY B. MULLIS for his invention of the polymerase chain reaction (PCR) method.

and

MICHAEL SMITH for his fundamental contributions to the establishment of oligonucleiotide-based, site-directed mutagenesis and its development for protein studies.

1992

RUDOLPH A. MARCUS for his contributions to the theory of electron transfer reactions in chemical systems.

1991

RICHARD R. ERNST for his contributions to the development of the methodology of high resolution nuclear magnetic resonance (NMR) spectroscopy.

1990

ELIAS JAMES COREY for his development of the theory and methodology of organic synthesis.

1989

The prize was awarded jointly to:

SIDNEY ALTMAN and THOMAS R. CECH for their discovery of catalytic properties of RNA.

1988

The prize was awarded jointly to:

JOHANN DEISENHOFER , ROBERT HUBER and HARTMUT MICHEL for the determination of the three-dimensional structure of a photosynthetic reaction centre.

1987

The prize was awarded jointly to:

DONALD J. CRAM , JEAN-MARIE LEHN and CHARLES J. PEDERSEN

for their development and use of molecules with structure-specific interactions of high selectivity.

1986

The prize was awarded jointly to:

DUDLEY R. HERSCHBACH , YUAN T. LEE and JOHN C. POLANYI for their contributions concerning the dynamics of chemical elementary processes.

1985

The prize was awarded jointly to:

HERBERT A. HAUPTMAN and JEROME KARLE for their outstanding achievements in the development of direct methods for the determination of crystal structures.

1984

ROBERT BRUCE MERRIFIELD for his development of methodology for chemical synthesis on a solid matrix.

1983

HENRY TAUBE for his work on the mechanisms of electron transfer reactions, especially in metal complexes.

1982

SIR AARON KLUG for his development of crystallographic electron microscopy and his structural elucidation of biologically important nuclei acid-protein complexes.

1981

The prize was awarded jointly to:

KENICHI FUKUI and **ROALD HOFFMANN** for their theories, developed independently, concerning the course of chemical reactions.

1980

The prize was divided, one half being awarded to:

PAUL BERG for his fundamental studies of the biochemistry of nucleic acids, with particular regard to recombinant-DNA

and the other half jointly to:

WALTER GILBERT and **FREDERICK SANGER** for their contributions concerning the determination of base sequences in nucleic acids.

1979

The prize was divided equally between:

HERBERT C. BROWN and **GEORG WITTIG** for their development of the use of boron- and phosphorus-containing compounds, respectively, into important reagents in organic synthesis.

1978

PETER D. MITCHELL for his contribution to the understanding of biological energy transfer through the formulation of the chemiosmotic theory.

1977

ILYA PRIGOGINE for his contributions to non-equilibrium thermodynamics, particularly the theory of dissipative structures.

1976

WILLIAM N.. LIPSCOMB for his studies on the structure of boranes illuminating problems of chemical bonding.

1975

The prize was divided equally between:

SIR JOHN WARCUP CORNFORTH for his work on the stereochemistry of enzyme-catalyzed reactions

and

VLADIMIR PRELOG for his research into the stereochemistry of organic molecules and reactions.

1974

PAUL J. FLORY for his fundamental achievements, both theoretical and experimental, in the physical chemistry of the macromolecules.

1973

The prize was divided equally between:

ERNST OTTO FISCHER and **SIR GEOFFREY WILKINSON** for their pioneering work, performed independently, on the chemistry of the organometallic, so called sandwich

compounds.

1972

The prize was divided, one half being awarded to:

CHRISTIAN B. ANFINSEN for his work on ribonuclease, especially concerning the connection between the amino acid sequence and the biologically active confirmation

and the other half jointly to:

STANFORD MOORE and **WILLIAM H. STEIN** for their contribution to the understanding of the connection between chemical structure and catalytic activity of the active centre of the ribonuclease molecule.

1971

GERHARD HERZBERG for his contributions to the knowledge of electronic stucture and geometry of molecules, particularly free radicals.

1970

LUIS F. LELOIR for his discovery of sugar nucleotides and their role in the biosynthesis of carbohydrates.

1969

The prize was divided equally between:

SIR DEREK H. R. BARTON and **ODD HASSEL** for their contributions to the development of the concept of conformation and its application in chemistry.

1968

LARS ONSAGER for the discovery of the reciprocal relations bearing his name, which are fundamental for the thermodynamics of irreversible processes.

1967

The prize was divided, one half being awarded to:

MANFRED EIGEN

and the other half jointly to:

RONALD GEORGE WREYFORD NORRISH and **LORD GEORGE PORTER** for their studies of extremely fast chemical reactions, effected by disturbing the equlibrium by means of very short pulses of energy.

1966

ROBERT S. MULLIKEN for his fundamental work concerning chemical bonds and the electronic structure of molecules by the molecular orbital method.

1965

ROBERT BURNS WOODWARD for his outstanding achievements in the art of organic synthesis.

1964

DOROTHY CROWFOOT HODGKIN for her determinations by X-ray techniques of the structures of important biochemical substances.

1963

The prize was divided equally between:

KARL ZIEGLER and **GIULIO NATTA** for their discoveries in the field of the chemistry and technology of high polymers.

1962

The prize was divided equally between:

MAX FERDINAND PERUTZ and **SIR JOHN COWDERY KENDREW** for their studies of the structures of globular proteins.

1961

MELVIN CALVIN for his research on the carbon dioxide assimilation in plants.

1960

WILLARD FRANK LIBBY for his method to use carbon-14 for age determination in archaeology, geology, geophysics, and other branches of science.

1959

JAROSLAV HEYROVSKY for his discovery and development of the polarographic methods of analysis.

1958

FREDERICK SANGER for his work on the structure of proteins, especially that of insulin.

1957

LORD ALEXANDER R. TODD for his work on nucleotides and nucleotide co-enzymes.

1956

The prize was awarded jointly to:

SIR CYRIL NORMAN HINSHELWOOD and **NIKOLAY NIKOLAEVICH SEMENOV** for their researches into the mechanism of chemical reactions.

1955

VINCENT DU VIGNEAUD for his work on biochemically important sulphur compounds.

especially for the first synthesis of a polypeptide hormone.

1954

LINUS CARL PAULING for his research into the nature of the chemical bond and its application to the elucidation of the structure of complex substances.

1953

HERMANN STAUDINGER for his discoveries in the field of macromolecular chemistry.

1952

The prize was awarded jointly to:

ARCHER JOHN PORTER MARTIN and **RICHARD LAURENCE MILLINGTON SYNGE** for their invention of partition chromatography.

1951

The prize was awarded jointly to:

EDWIN MATTISON MC MILLAN and **GLENN THEODORE SEABORG** for their discoveries in the chemistry of the transuranium elements.

1950

The prize was awarded jointly to:

OTTO PAUL HERMANN DIELS and **KURT ALDER** for their discovery and development of the diene synthesis.

1949

WILLIAM FRANCIS GIAUQUE for his contributions in the field of chemical thermodynamics, particularly concerning the behaviour of substances at extremely low

temperatures.

1948

ARNE WILHELM KAURIN TISELIUS for his research on electrophoresis and adsorption analysis, especially for his discoveries concerning the complex nature of the serum proteins.

1947

SIR ROBERT ROBINSON for his investigations on plant products of biological importance, especially the alkaloids.

1946

The prize was divided, one half being awarded to:

JAMES BATCHELLER SUMNER for his discovery that enzymes can be crystallized.

the other half jointly to

JOHN HOWARD NORTHROP and **WENDELL MEREDITH STANLEY** for their preparation of enzymes and virus proteins in a pure form.

1945

ARTTURI ILMARI VIRTANEN for his research and inventions in agricultural and nutrition chemistry, especially for his fodder preservation method.

1944

OTTO HAHN for his discovery of the fission of heavy nuclei.

1943

GEORGE DE HEVESY for his work on the use of isotopes as tracers in the study of

chemical processes.

1942-1940

The prize money was allocated to the Main Fund (1/3) and to the Special Fund (2/3) of this prize section.

1939

ADOLF FRIEDRICH JOHANN BUTENANDT for his work on sex hormones. (Caused by the authorities of his country to decline the award but later received the diploma and the medal).

and

LEOPOLD RUZICKA for his work on polymethylenes and higher terpenes.

1938

RICHARD KUHN for his work on carotenoids and vitamins. (Caused by the authorities of his country to decline the award but later received the diploma and the medal.)

1937

The prize was divided equally between:

SIR WALTER NORMAN HAWORTH for his investigations on carbohydrates and vitamin C.

and

PAUL KARRER for his investigations on carotenoids, flavins and vitamins A and B2.

1936

PETRUS (PETER) JOSEPHUS WILHELMUS DEBYE for his contributions to our knowledge of molecular structure through his investigations on dipole moments and on

the diffraction of X-rays and electrons in gases.

1935

The prize was awarded jointly to:

FRÉDÉRIC JOLIOT and **IRÈNE JOLIOT-CURIE** in recognition of their synthesis of new radioactive elements.

1934

HAROLD CLAYTON UREY for his discovery of heavy hydrogen.

1933

The prize money was allocated to the Main Fund (1/3) and to the Special Fund (2/3) of this prize section.

1932

IRVING LANGMUIR for his discoveries and investigations in surface chemistry.

1931

The prize was awarded jointly to:

CARL BOSCH and **FRIEDRICH BERGIUS** in recognition of their contributions to the invention and development of chemical high pressure methods.

1930

HANS FISCHER for his researches into the constitution of haemin and chlorophyll and especially for his synthesis of haemin.

1929

The prize was divided equally between:

SIR ARTHUR HARDEN and **HANS KARL AUGUST SIMON VON EULER-CHELPIN** for their investigations on the fermentation of sugar and fermentative enzymes.

1928

ADOLF OTTO REINHOLD WINDAUS for the services rendered through his research into the constitution of the sterols and their connection with the vitamins.

1927

HEINRICH OTTO WIELAND for his investigations of the constitution of the bile acids and related substances.

1926

THE (THEODOR) SVEDBERG for his work on disperse systems.

1925

RICHARD ADOLF ZSIGMONDY for his demonstration of the heterogenous nature of colloid solutions and for the methods he used, which have since become fundamental in modern colloid chemistry.

1924

The prize money for 1924 was allocated to the Special Fund of this prize section.

1923

FRITZ PREGL for his invention of the method of micro-analysis of organic substances.

1922

FRANCIS WILLIAM ASTON for his discovery, by means of his mass spectrograph, of isotopes, in a large number of non-radioactive elements, and for his enunciation of the whole-number rule.

1921

FREDERICK SODDY , for his contributions to our knowledge of the chemistry of radioactive substances, and his investigations into the origin and nature of isotopes.

1920

WALTHER HERMANN NERNST in recognition of his work in thermochemistry.

1919

The prize money for 1919 was allocated to the Special Fund of this prize section.

1918

FRITZ HABER for the synthesis of ammonia from its elements.

1917-1916

The prize money for 1917-1916 was allocated to the Special Fund of this prize section.

1915

RICHARD MARTIN WILLSTÄTTER for his researches on plant pigments, especially chlorophyll.

1914

THEODORE WILLIAM RICHARDS . in recognition of his accurate determinations of the

atomic weight of a large number of chemical elements.

1913

ALFRED WERNER in recognition of his work on the linkage of atoms in molecules by which he has thrown new light on earlier investigations and opened up new fields of research especially in inorganic chemistry.

1912

The prize was divided equally between:

VICTOR GRIGNARD for the discovery of the so-called Grignard reagent, which in recent years has greatly advanced the progress of organic chemistry

and

PAUL SABATIER for his method of hydrogenating organic compounds in the presence of finely disintegrated metals whereby the progress of organic chemistry has been greatly advanced in recent years.

1911

MARIE CURIE, née Marie Sklodowska, in recognition of her services to the advancement of chemistry by the discovery of the elements radium and polonium, by the isolation of radium and the study of the nature and compounds of this remarkable element.

1910

OTTO WALLACH in recognition of his services to organic chemistry and the chemical industry by his pioneer work in the field of alicyclic compounds.

1909

WILHELM OSTWALD in recognition of his work on catalysis and for his investigations into the fundamental principles governing chemical equilibria and rates of reaction.

1908

LORD ERNEST RUTHERFORD for his investigations into the disintegration of the elements, and the chemistry of radioactive substances.

1907

EDUARD BUCHNER for his biochemical researches and his discovery of cellfree fermentation.

1906

HENRI MOISSAN in recognition of the great services rendered by him in his investigation and isolation of the element fluorine, and for the adoption in the service of science of the electric furnace called after him.

1905

JOHANN FRIEDRICH WILHELM ADOLF VON BAEYER in recognition of his services in the advancement of organic chemistry and the chemical industry, through his work on organic dyes and hydroaromatic compounds.

1904

SIR WILLIAM RAMSAY in recognition of his services in the discovery of the inert gaseous elements in air, and his determination of their place in the periodic system.

1903

SVANTE AUGUST ARRHENIUS in recognition of the extraordinary services he has rendered to the advancement of chemistry by his electrolytic theory of dissociation.

1902

HERMANN EMIL FISCHER in recognition of the extraordinary services he has rendered

by his work on sugar and purine syntheses.

1901

JACOBUS HENRICUS VAN'T HOFF in recognition of the extraordinary services he has rendered by the discovery of the laws of chemical dynamics and osmotic pressure in solutions.