ALBERT-LUDWIGS-
UNIVERSITÄT FREIBURG

NOBEL LAUREATES

OF THE ALBERT-LUDWIG UNIVERSITY

STATION AND SCIENTIFIC HOME
OF TEN NOBEL LAUREATES

CONTENTS

Page 6 **Heinrich Otto Wieland**, 1927 NOBEL PRIZE IN CHEMISTRY

Page 8 **Adolf Otto Reinhold Windaus**, 1928 NOBEL PRIZE IN CHEMISTRY

Page 10 **Hans Spemann**, 1935 NOBEL PRIZE IN PHYSIOLOGY OR MEDICINE

Page 12 **Georg von Hevesy**, 1943 NOBEL PRIZE IN CHEMISTRY

Page 14 **Hermann Staudinger**, 1953 NOBEL PRIZE IN CHEMISTRY

Page 16 **Hans Adolf Krebs**, 1953 NOBEL PRIZE IN PHYSIOLOGY OR MEDICINE

Page 18 **Friedrich August von Hayek**, 1974 NOBEL MEMORIAL PRIZE IN ECONOMIC SCIENCES

Page 20 **Georg Wittig**, 1979 NOBEL PRIZE IN CHEMISTRY

Page 22 **Georges Köhler**, 1984 NOBEL PRIZE IN PHYSIOLOGY OR MEDICINE

Page 24 **Harald zur Hausen**, 2008 NOBEL PRIZE IN PHYSIOLOGY OR MEDICINE

THE ALBERT-LUDWIG UNIVERSITY –
Station and Scientific Home of Nine Nobel Laureates

The Albert-Ludwig University in Freiburg has been the workplace of nine scientists who received the most prestigious award available to men and women in their fields: **the Nobel Prize.**

The Nobel Prize is only awarded in a handful of selected disciplines. This brochure can thus only focus on a few of the outstanding researchers who have called the Albert-Ludwig University their scientific home. The many researchers of the University of Freiburg who have won other prestigious national and international accolades receive recognition in the rector's yearly report as well as in other university publications (the "Freiburger Uni-Magazin" and the "Freiburger Universitätsblätter"), in their departments, and in the "Uniseum Freiburg".

Even to this day, the names of former professors such as Edmund Husserl, Martin Heidegger, Walter Eucken, and Hugo Friedrich contribute – as do those of the Nobel laureates – to the reputation of the University of Freiburg.

The Nobel laureates described in this brochure taught and researched in the fields of medicine and physiology, chemistry, and economics. As professors of the University of Freiburg, they had a close bond with the university, a haven of knowledge which still promotes and inspires innovative research and instruction today.

ALBERT-LUDWIG UNIVERSITY OF FREIBURG

NOBEL LAUREATES OF THE ALBERT-LUDWIG UNIVERSITY OF FREIBURG

HEINRICH OTTO WIELAND, born 1877 in Pforzheim, died 1957 in Munich

1927 Nobel Prize in Chemistry
“for his investigations of the constitution of the bile acids and related substances”

ADOLF OTTO REINHOLD WINDAUS, , born 1876 in Berlin, died 1959 in Göttingen

1928 Nobel Prize in Chemistry
“for the services rendered through his research into the constitution of the sterols and their connection with the vitamins”

HANS SPEMANN, born 1869 in Stuttgart, died 1941 in Freiburg

1935 Nobel Prize in Physiology or Medicine
“for his discovery of the organizer effect in embryonic development”

GEORG VON HEVESY, born 1885 in Budapest, died 1966 in Freiburg

1943 Nobel Prize in Chemistry
“for his work on the use of isotopes as tracers in the study of chemical processes”

HERMANN STAUDINGER, born 1881 in Worms, died 1965 in Freiburg

1953 Nobel Prize in Chemistry
“for his discoveries in the field of macromolecular chemistry”

HANS ADOLF KREBS, born 1900 in Hildesheim, died 1981 in Oxford

1953 Nobel Prize in Physiology or Medicine
“for his discovery of the citric acid cycle”

FRIEDRICH AUGUST VON HAYEK, born 1899 in Vienna, died 1992 in Freiburg

1974 Nobel Prize in Economic Sciences
“for their pioneering work in the theory of money and economic fluctuations and for their penetrating analysis of the interdependence of economic, social and institutional phenomena” (with Gunnar Mydral)

GEORG WITTIG, born 1897 in Berlin, died 1987 in Heidelberg

1979 Nobel Prize in Chemistry
“for their development of the use of boron- and phosphorus-containing compounds in important reagents in organic synthesis” (with Herbert C. Brown)

GEORGES J. F. KÖHLER, born 1946 in Munich, died 1995 in Freiburg

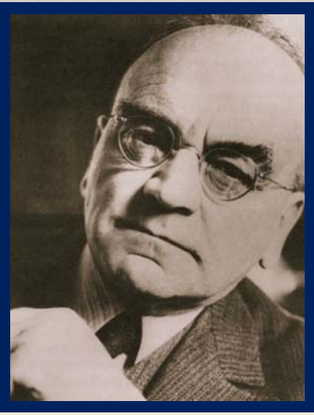
1984 Nobel Prize in Physiology or Medicine
“for theories concerning the specificity in development and control of the immune system and the discovery of the principle for production of monoclonal antibodies” (with Niels Kaj Jerne and César Milstein)

HARALD ZUR HAUSEN, born 1936 in Gelsenkirchen-Buer

2008 Nobel Prize in Physiology or Medicine
“for his discovery of human papilloma viruses causing cervical cancer“

ALBERT-LUDWIG UNIVERSITY OF FREIBURG

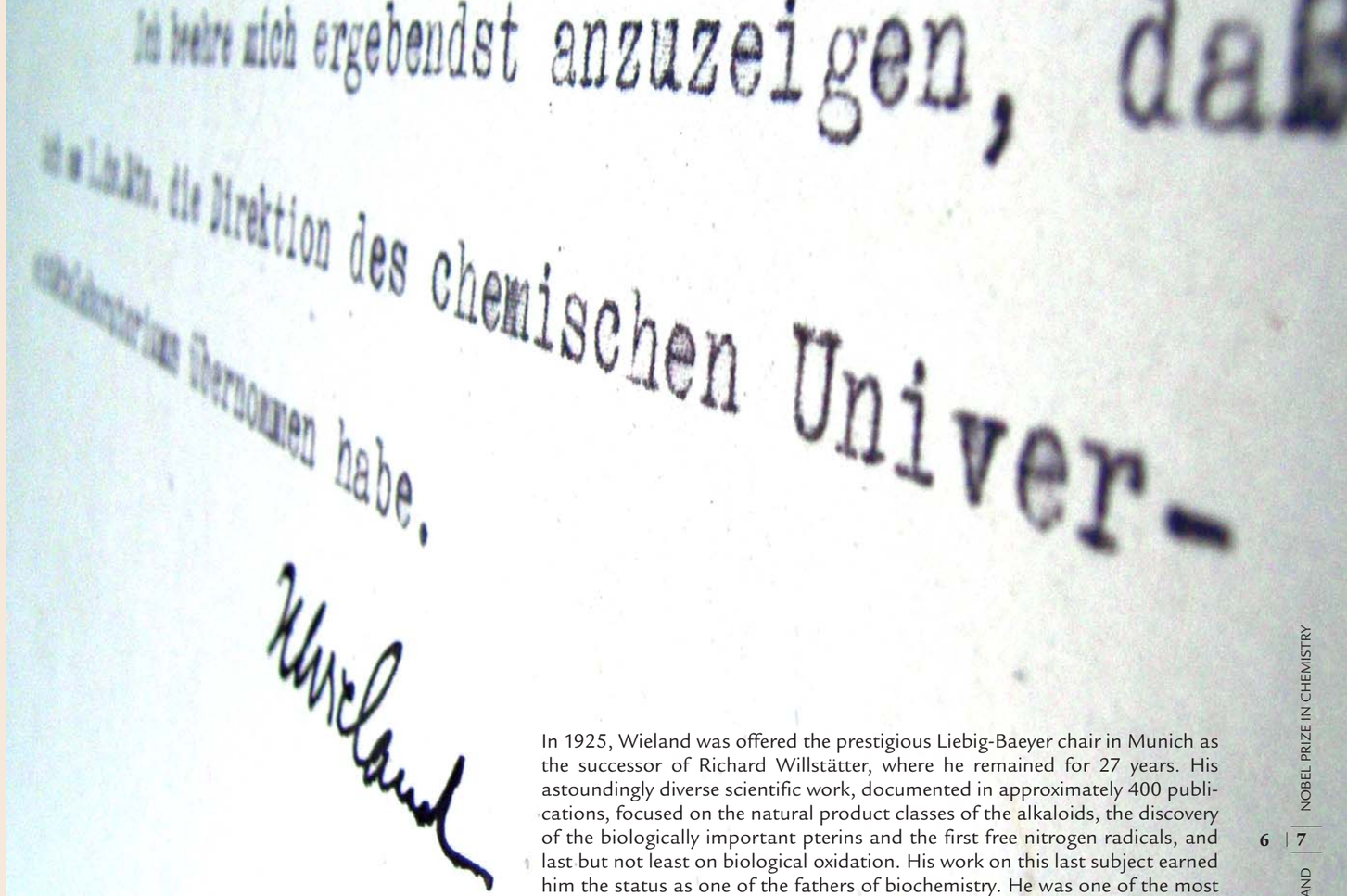
CHEMISCHES LABORATORIUM
DER UNIVERSITÄT



HEINRICH WIELAND

1927 Nobel Prize in Chemistry, 1877–1957

Heinrich Wieland was born in Pforzheim and studied chemistry in Munich, Berlin, and Stuttgart. In 1901 he received his doctorate at Adolf von Baeyer's renowned Bavarian State Laboratory, where he remained for several years as a young scientist. In 1917 he received a full professorship at the Technical College in Munich, and in 1921 he was offered a chair in Freiburg. During his four years in Freiburg, which he referred to as "some of the most pleasant in my scientific career", he laid the foundation for his Nobel Prize winning clarification of the constitution of the bile acids, members of the most important natural product class of steroids, which includes cholesterol and Vitamin D (A. Windaus), the sex hormones (A. Butenandt), and the synthetic contraceptive substances.



In 1925, Wieland was offered the prestigious Liebig-Baeyer chair in Munich as the successor of Richard Willstätter, where he remained for 27 years. His astoundingly diverse scientific work, documented in approximately 400 publications, focused on the natural product classes of the alkaloids, the discovery of the biologically important pterins and the first free nitrogen radicals, and last but not least on biological oxidation. His work on this last subject earned him the status as one of the fathers of biochemistry. He was one of the most important chemists of his time.

Wieland was a strict and principled opponent of National Socialism. He employed Jews and supporters of the White Rose resistance movement in his laboratory as doctorate candidates and even defended them in court.

A OR W

ADOLF OTTO REINHOLD WINDAUS

ADOLF OTTO REINHOLD WINDAUS

1928 Nobel Prize in Chemistry, 1876–1959

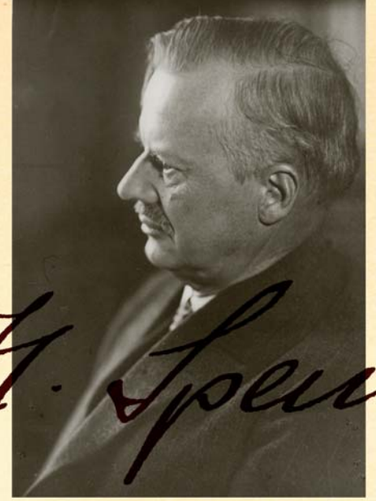
Adolf Windaus was born and raised in Berlin, where he also began his studies of medicine and chemistry, attending, among others, the lectures of 1902 Nobel laureate Emil Fischer. He then came to Freiburg to complete his doctorate (1899) under Heinrich Kiliani.

His dissertation had to do with the cardiac poisons of digitalis plants, which turned out much later to have the structure of steroids. To earn his professorial lecturing qualification, Windaus began studying the structure of cholesterol, molecules found in large amounts in animal cells whose structure and biological function had remained a mystery despite numerous earlier attempts to explain them. Although he received his lecturing qualification in 1903, Windaus did not succeed in explaining the structure of cholesterol until 1932, having received ideal support from his colleague Heinrich Wieland.

From the beginning, Windaus was convinced that there is a connection between the concentration of cholesterol in the blood and atherosclerosis. In his later work, he participated in the discovery of the hormone histamine, described the structure of the plant cell component ergosterol, and explained the structure and function of Vitamin D, also a steroid, in several brilliant studies. In cooperation with an industrial partner, he clarified the structure of Vitamin B1.

After his years as lecturer in Freiburg, Windaus spent several years in Innsbruck (1913–1915) before receiving the prestigious Otto Wallach chair in Göttingen. In 1928 he was awarded the Nobel Prize in Chemistry for his research on the structure of steroids and their connection to the vitamins.

Windaus was critical of National Socialism and expressed his opinions on the topic quite openly. His illustrious career ended in 1944 with his retirement.



H. Spemann.

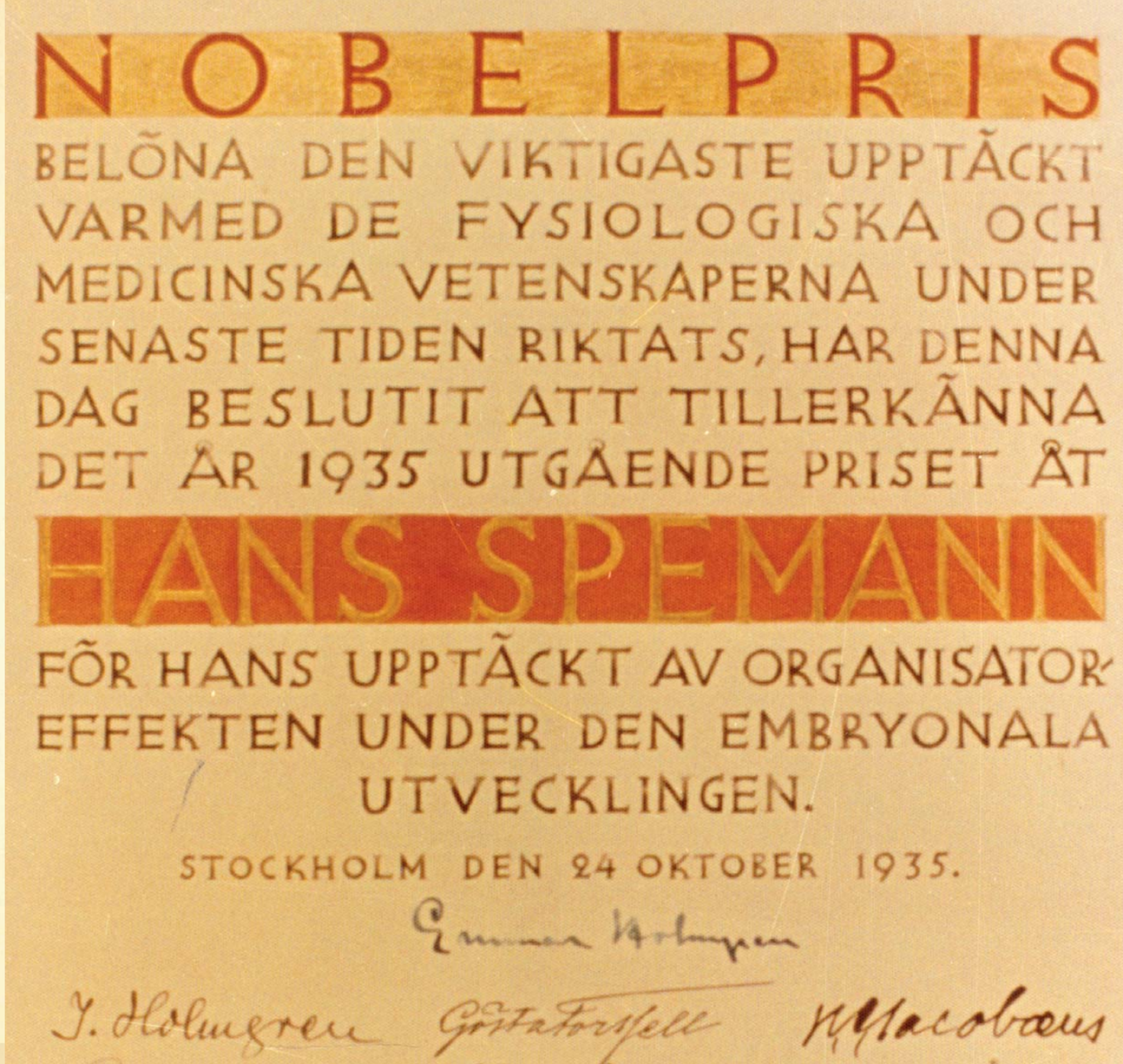
HANS SPEMANN

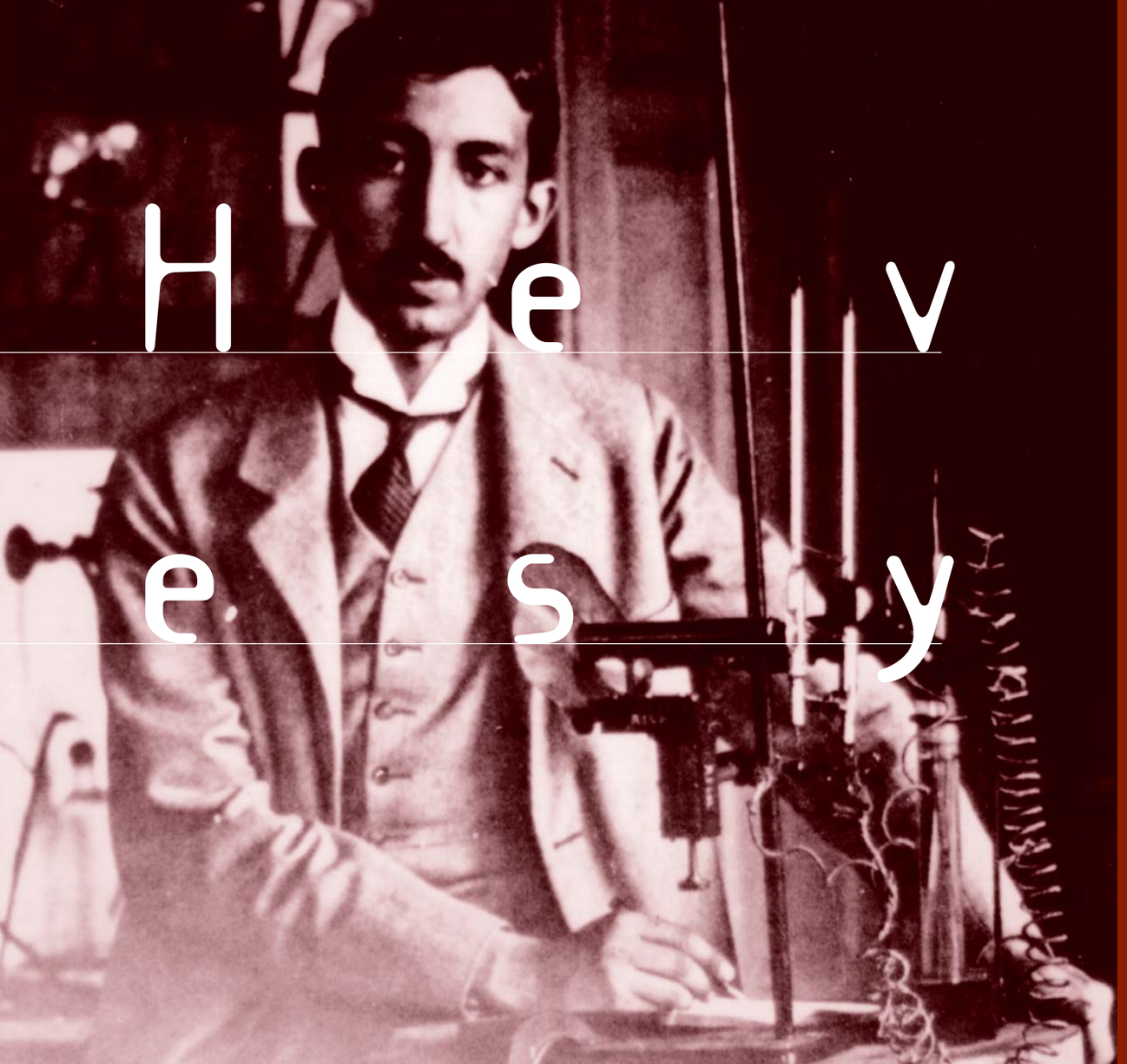
1935 Nobel Prize in Physiology or Medicine, 1869–1941

Hans Spemann, born on June 27th 1869 in Stuttgart, initially followed in the footsteps of his father, the founder of Das Neue Universum, a well-received annual series of books for adolescents. In 1891 he began studying medicine in Heidelberg. After his first medical examination he shifted to natural sciences and continued his studies in Munich, where cell biologist Theodor Boveri, a friend of Wilhelm Conrad Röntgen, became his doctoral adviser and mentor. Upon completing his dissertation on developmental stages of parasitic worms, Spemann chose to focus on the embryonic development of amphibians as his principal area of research. He began by describing the anatomy of various developmental stages of frogs and then developed new microsurgical procedures to study the mechanisms of embryonic development in newts (salamanders). His experiments soon yielded the famous "hair loop twins" (1901), two complete - yet smaller - larvae developing in a single egg constricted by a loop of baby hair. This achievement earned Spemann widespread recognition.

In the following years, Spemann accepted professorships in Rostock (1908), Berlin (1914), and Freiburg (1919). In 1921, numerous transplantation experiments performed together with his doctoral student Hilde Mangold (née Pröschold) demonstrated that a small piece of tissue from a certain area of the egg cell, when implanted in the belly region, can "organize" there the formation of a secondary embryonic body! The discovery of this "organizer effect" earned Spemann the Nobel Prize in 1935. Hilde Mangold, with whom he most likely would have shared the prize, had tragically died in an accident years before.

In later years, Spemann together with Otto Mangold (Hilde´s husband) successfully extended this transplantation technique to other regions of the embryo, thereby sparking an international wave of new research in embryonic development. In the decades following his death (1941) Spemann´s renown faded somewhat, partly due to the biochemical orientation of those years. Yet since the mid-1970s, the rise of molecular biology has led to an unprecedented renaissance in the reception of his work.





H

GEORG VON HEVESY

1943 Nobel Prize in Chemistry, 1885–1966

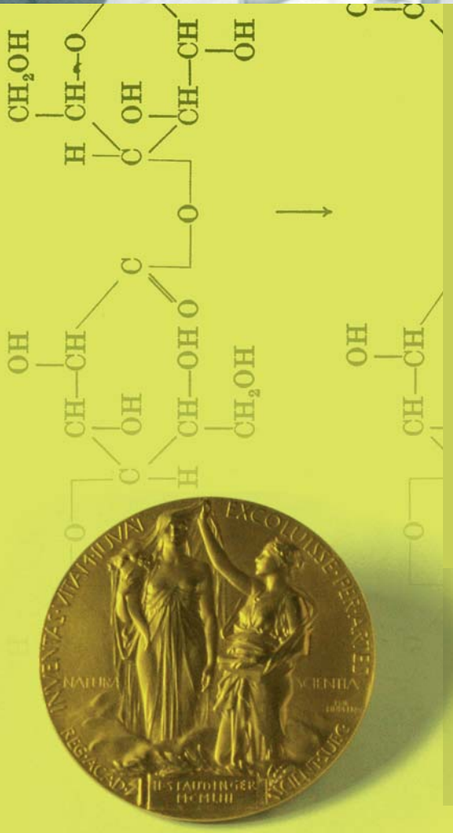
Georg von Hevesy, born in 1885 in Budapest, studied in Budapest, Berlin, and Freiburg, where he received his doctorate in 1908 with a dissertation on a topic in physical chemistry. He then worked in Karlsruhe under Haber and in Manchester under Rutherford, where he was introduced to the newest methods and concepts in nuclear physics and nuclear chemistry. In Vienna, he conducted experiments with Paneth which used radioactive methods to determine the solubility of sparingly soluble salts. After World War I, he worked at Niels Bohr's institute in Copenhagen, where he and Dirk Costner discovered the element hafnium using x-ray fluorescence.

From 1926 to 1934, Hevesy was professor for physical chemistry at the University of Freiburg. In these years, he continued his work on x-ray fluorescence, for example to determine the age of minerals, and began studies on the implementation of radioactive indicators in biochemistry and physiology. Being of Jewish descent, he left Germany in 1934 due to the political developments following the Nazis' seizure of power.
Hevesy remained active until 1961, first in Copenhagen and later in Stockholm. In this later phase of his career, he began focusing more on biochemical, physiological, and medical topics, which he studied with the help of radioactive isotopes.

Von Hevesy received numerous scientific awards and honorary degrees, including an honorary doctorate from the University of Freiburg. He conducted pioneering work in the field of x-ray fluorescence and laid the foundations for the use of radioactive isotopes as indicators in biology and medicine. He is regarded as the father of nuclear medicine. He received the Nobel Prize in Chemistry in 1943 for his development of isotope tracing. Von Hevesy saw himself as a Freiburger: He studied here, was a professor here, and two of his children were born here. One of his daughters lives in Freiburg. He died in Freiburg on July 5th 1966.

HERMANN STAUDINGER

1953 Nobel Prize in Chemistry, 1881–1965



Hermann Staudinger, born in Worms in 1881, studied chemistry in Halle, Darmstadt, and Munich, and earned his doctorate from the University of Halle in 1903. After receiving his professorial lecturing qualification at the University of Strasbourg in 1907 he served for a few years as associate professor for organic chemistry at the Technical University of Karlsruhe before accepting a chair in chemistry at the Swiss Federal Institute of Technology in Zurich (1912–1926). In 1926 he received a professorship at the Albert-Ludwig University in Freiburg, where he remained for the rest of his career. He was director of the chemical laboratory until 1951 and head of the State Research Insitute for Macromolecular Chemistry until 1956 – the first research center in Europe to be devoted exclusively to the study of macromolecules in nature and technology as well as the new research field of polymer science. Staudinger himself had founded the institute in 1940.

Hermann Staudinger is the father of macromolecular chemistry. As early as 1920, he discovered that natural fibers, rubber, and plastics are composed of high-molecular compounds (macromolecules, polymers). His concepts concerning the polymer structures of fibers, plastics, and elastomers were revolutionary and instrumental in bringing about a change in the development of polymeric materials: away from purely empirical optimization towards molecular material design. His work in Freiburg on synthetic and biological macromolecules formed the basis for countless modern innovations in materials research and the life sciences and paved the way for the rapid growth in the industrial production of plastics.

Staudinger received the Nobel Prize in Chemistry in 1953 for his pioneering work on macromolecules. On April 19th 1999 the American Chemical Society paid tribute to his laboratory in Freiburg as the birthplace of polymer sciences and named it an international historic landmark of chemistry.

HANS ADOLF KREBS

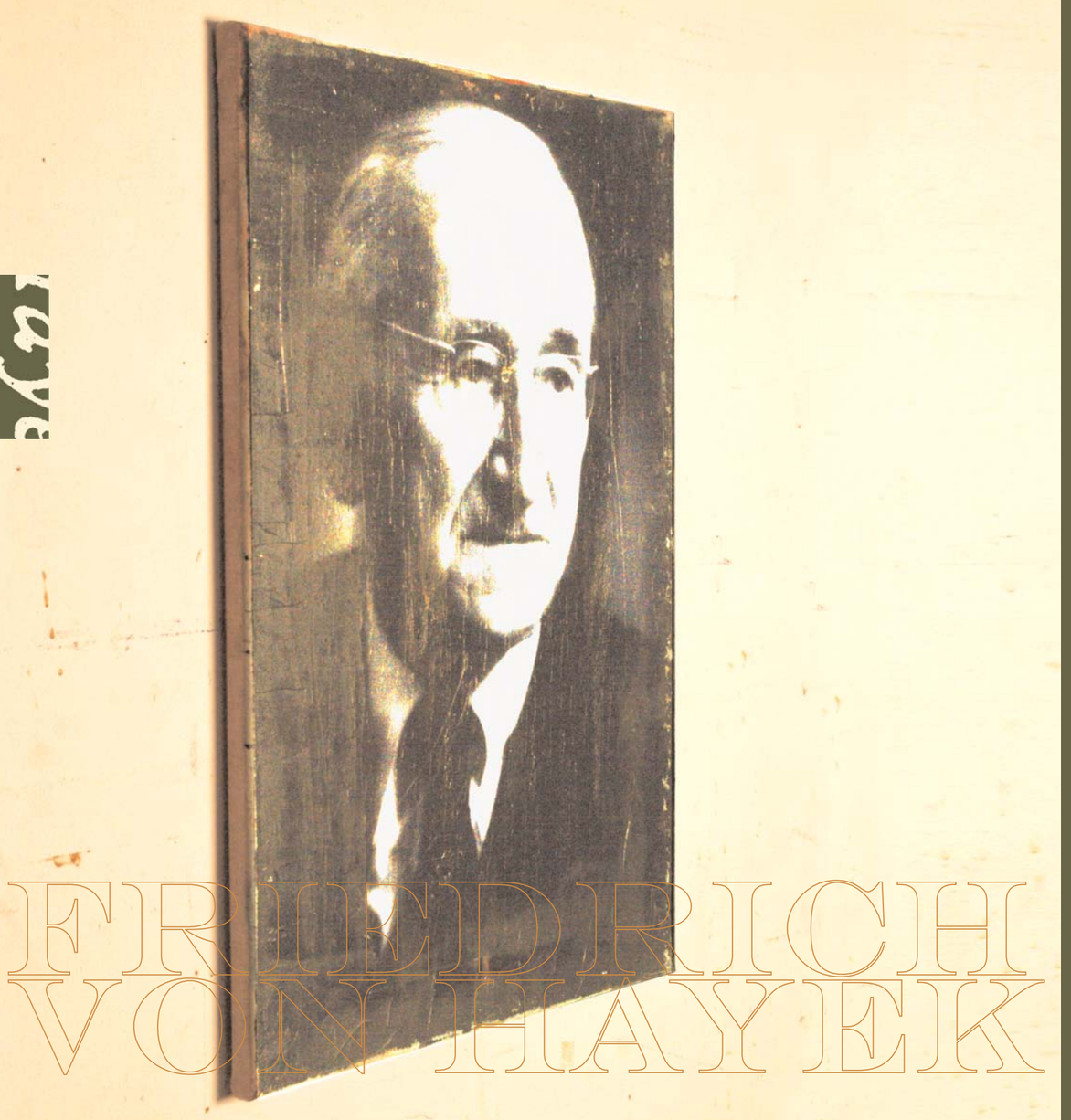
1953 Nobel Prize in Physiology or Medicine, 1900–1981

Hans Adolf Krebs, son of a Jewish ear, nose, and throat doctor in Hildesheim, studied medicine in Göttingen, Freiburg, Berlin, and Munich. He earned his doctorate in 1924 in Hamburg and worked as Nobel laureate Otto Warburg's assistant at the Kaiser Wilhelm Institute for Biology in Berlin from 1926 to 1930.

In 1930 Krebs returned to hospital work, first at the Municipal Hospital in Hamburg-Altona and starting in 1931 at the Freiburg University Medical Center under Siegfried Thannhauser. In 1932 Krebs received his professorial lecturing qualification.

In 1933 Krebs was dismissed due to his Jewish descent and went to the University of Cambridge in England on a Rockefeller scholarship. The further stations in his career were the Universities of Sheffield and Oxford. In 1939 Krebs became a British citizen.
In 1958, Krebs was knighted by Queen Elizabeth II and received the title sir. Krebs was one of the few German-Jewish scholars who were able to continue their careers without interruption after banishment from Nazi Germany.
Together with Fritz Albert Lippmann, he received the Nobel Prize in Physiology or Medicine in 1953. Krebs' research dealt mainly with various aspects of cell metabolism. The citric acid cycle in cell metabolism is also called the Krebs cycle in his honor.

Krebs received honorary degrees from numerous universities, such as Chicago, Paris, Berlin, and Jerusalem. In 1955 he was named honorary doctor of the Faculty of Medicine of the University of Freiburg.



FRIEDRICH
VON HAYEK

FRIEDRICH AUGUST VON HAYEK

1974 Nobel Memorial Prize in Economic Sciences, 1899-1992

Friedrich August von Hayek, born in Vienna in 1899, was professor of economics at the Albert-Ludwig University from 1962–1968.

Hayek began his studies at the University of Vienna in 1918, where he earned doctorates in law (1921) and economics (1923). From 1927 on, he served as director of the Austrian Institute for Trade Cycle Research, which he had founded together with Ludwig von Mises. Two years after earning his professorial lecturing qualification (1929) he was appointed as professor at the London School of Economics, where he was seen as the most prominent representative of the Austrian School and opponent of John Maynard Keynes during the 30s and 40s. In 1950 he became professor of social and moral sciences at the University of Chicago, and in 1962 he took a chair in economics at the University of Freiburg, where he also became a member of the board of directors of the Walter Eucken Institute. In 1967 he was given emeritus status, but he continued teaching until 1969.

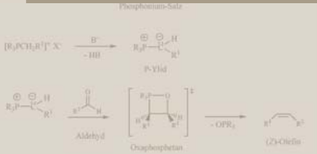
In 1974, von Hayek received (jointly with Gunnar Myrdal) the Nobel Memorial Prize in Economic Sciences for his work on “the theory of money and economic fluctuations” and his “penetrating analysis of the interdependence of economic, social and institutional phenomena”.

After serving, from 1969 to 1977, as honorary professor at the University of Salzburg, he returned to Freiburg, where he was active until his death in 1992. In 1991 he was awarded the Presidential Medal of Freedom, the highest civilian award in the United States.

Hayek was among the most significant liberal thinkers of the 20th century and one of the most influential critics of socialism. He left behind a voluminous legacy of scientific writings which have been translated into numerous languages. His most well-known book is doubtlessly The Road to Serfdom. Although his ideas were long received with skeptical eyes, their relevance has since been confirmed by the downfall of the socialist systems and the modern development of the globalized, liberalized, and deregulated world economy.

AUGUST

GEORG WITTIG



GEORG WITTIG

1979 Nobel Prize in Chemistry, 1897–1987

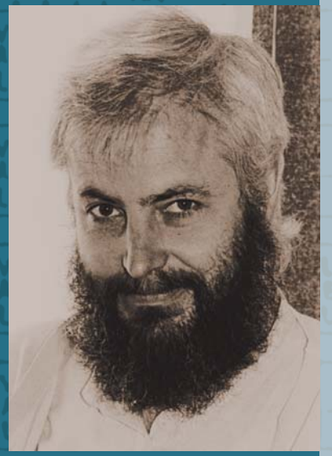
Georg Wittig was born in Berlin and grew up in Kassel. After completing secondary school, he studied chemistry at the universities of Tübingen and Marburg where he was awarded a Ph.D. under K. v. Auwers. In 1926 he habilitated and was appointed private lecturer in 1932. Following a stint at Braunschweig Technische Hochschule, Wittig in 1937 accepted a position as associate professor at Freiburg University. In 1944 he became full professor of chemistry and head of department in Tübingen and in 1956 accepted the same position in Heidelberg.

Wittig`s wide range of interests in theoretical problems and new methods of synthetic chemisty already became apparent in the early years of his scientific career in Marburg and Freiburg. In these years he introduced new reagents and methods in the area of organometallic chemistry, which were to become the basis of his later accomplishments, which included the discovery of dehydrobenzene and two reactions which now bear his name: the Wittig ether rearrangement and the Wittig reaction. The latter reaction, discovered in 1953, has since gained great significance for the production of compounds with double bonds. Today it is used in the production of vitamin A and related compounds for all kinds of food for people and animals.

For his discovery of the Wittig reaction, which is of great significance for the synthesis of organic compounds as well as for numerous technologies, Wittig was awarded the Otto Hahn Prize in 1967 and the Nobel Prize in 1979 (together with H.C. Brown).

gk

Georges Köhler



GEORGES KÖHLER

1984 Nobel Prize in Physiology or Medicine, 1946–1995

George J. (Jean) F. (Franz) Köhler, born in Munich, received the Nobel Prize at the young age of 38. He was only 48 years old when he died and was at the apex of his scientific career.

Köhler studied biology in Freiburg from 1965 to 1971. In 1974 he earned his doctorate here with a dissertation on immunology. Until 1984, Köhler worked at the Basel Institute for Immunology, founded by Niels Kaj Jerne. Together with Jerne and César Milstein – the three received the Nobel Prize together in 1984 – Köhler developed a procedure for the production of so-called monoclonal antibodies. Köhler and Milstein conducted the decisive experiment in Cambridge in 1975, fusing white blood cells and tumor cells together. The hybrid cells created in this way produced antibodies and divided into genetically identical daughter cells. In the publication of their findings in 1974, Köhler and Milstein referred to the great potential for medical and industrial applications of their discovery. Today, monoclonal antibodies play a vital role in medical diagnostics and therapy.

From 1984 until his untimely death, Köhler served jointly as director of the Max Planck Institute of Immunbiology in Freiburg and as professor of the University of Freiburg. The German Society of Immunology has awarded a Georges Köhler Prize each year since 1998.

HARALD ZUR HAUSEN

HARALD ZUR HAUSEN

2008 Nobel Prize in Physiology and Medicine, 1936-

Harald zur Hausen was born in Gelsenkirchen-Buer on March 11th 1936. After his Abitur in 1955 he studied medicine at the universities of Bonn, Hamburg and Düsseldorf. In 1960 zur Hausen received the degree of Dr. med. from the university of Düsseldorf. He worked for five more years in Düsseldorf and then joined the Virus Laboratories of the Children`s Hospital in Philadelphia. The virology department of the university of Würzburg was the next station in zur Hausen`s academic career, where he finished his Habilitation in 1969. In 1972 zur Hausen became the chairman of the new department of clinical virology in Erlangen and from 1977 to 1983 he was chairman of the department of virology at the university of Freiburg. He joined and reorganized the German Cancer Center (DKFZ) in Heidelberg between 1983 and 2003. Today, Harald zur Hausen is Editor in Chief of International Journal of Cancer.

Zur Hausen represents an outstandingly successful pioneer in the field of tumor virology. In 1970 he demonstrated very convincingly the presence of Epstein-Barr virus (EBV) DNA in Burkitt lymphoma and nasopharynx carcinoma biopsies. This finding represents one of the early and central milestones in human tumor virology. As only a certain fraction of EBV-infected persons acquire EBV-related tumors, these data opened the way for the understanding of role of human tumor viruses in multistage oncogenesis and to the role of defense mechanisms at the cellular and systemic level.

During his time in Freiburg, zur Hausen studied the regulation of EBV in more detail and, in parallel put a lot of efforts into studies that aimed at the clarification of the role of human papillomaviruses in tumor development. These studies showed a brilliant success in the isolation of the first cervical cancer-linked human papilloma virus type (HPV-16) in 1983. First successful attempts to demonstrate papilloma virus DNA in human tumors had been published by zur Hausen`s group already in 1974.

During his time at the DKFZ, zur Hausen and his group demonstrated that HPV- coded regulatory proteins E6 and E7 are indeed expressed in human tumors and that their expression is necessary for the maintenance of the transformed state, cellular proliferation and for the induction of genomic instability. Epidemiological studies ascertained the importance of papillomavirus infections and their prevention. Finally, zur Hausen`s group succeded in the development of a vaccine for the prevention of HPV infection and HPV-associated tumors.

IMPRINT

Published by:
Albert-Ludwig University of Freiburg
Public Affairs Office

Text & Editing:
Rudolf Werner Dreier, Public Affairs Office
Daniela Högerle

Prof. Dr. Klaus Friedrich (Wittig)
Prof. Dr. Peter Gräber (von Hevesy)
Prof. Dr. Karl-Heinz Leven (Krebs, Köhler)
Prof. Dr. Rolf Mülhaupt (Staudinger)
Prof. Dr. Dr. h.c. Christoph Rüchardt (Wieland, Windaus)
Prof. Dr. Klaus Sander (Spemann)
Prof. Dr. Viktor J. Vanberg (von Hayek)
Prof. Dr. Georg Bauer (zur Hausen)

Design:
Bernhard Kunkler Design, Freiburg

Photos:
Freiburg University Library,
Adolf Otto Reinhold Windaus
(Göttingen State and University Library)

February 2009