

Update

2008 WELCH
CONFERENCE
ON CHEMICAL
RESEARCH

Biological Macromolecules *From Structure to Function*

To answer fundamental questions in chemistry, many researchers look to the structure of molecules to glean a better understanding of their function. By determining these structure-function relationships, scientists are gaining insights that have an array of implications, including better identifying the mechanisms of disease and generating therapeutic agents for them.



William N. Lipscomb, Jr.
CONFERENCE CO-CHAIRMAN

The 2008 Welch Conference on Chemical Research, “Biological Macromolecules: From Structure to Function,” will feature a diverse group of top-tier researchers and scientists with insights into this intriguing field of study. Slated for Oct. 27–28 at the Wyndham Greenspoint Hotel in Houston, this year’s gathering marks the 52nd annual conference staged by the Foundation. The conference agenda this year (see page 7 for complete agenda and speakers) will include developments in critical areas of imaging and visualization that underlie this field of research: Theory and computation for complexity, macromolecular function, as well as a session on research from cells to consciousness.

“Increasing numbers of scientists are entering this field in large part due to its astounding possibilities and potential implications,” said Conference Co-Chairman Dr. William N. Lipscomb, Jr. of Harvard University. “We expect the conference this year to attract an unusually large attendance, given the popularity and interest in this area of study, as well as the top-caliber speakers.”

This year, conference attendees will hear from researchers at leading academic and medical institutions across the nation.

“Especially given the quick progression of the study of biological macromolecules, scientific collaboration is the key to the future of this exciting field of

science,” said Conference Co-Chairman Dr. Jianpeng Ma of Baylor College of Medicine. “Gatherings such as this conference play a vital role in terms of fostering the exchange of ideas and providing an



Jianpeng Ma
CONFERENCE CO-CHAIRMAN

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Dennis Hendrix Named Chairman of Welch Board

DENNIS HENDRIX, a long-time member of The Welch Foundation's Board of Directors, was named chairman of the Board in December 2007. He succeeds J. Evans Attwell who passed away last October. Mr. Hendrix has served on the board since April 1992 and has been vice chairman since 2006.

"It has been an honor to serve on the Welch Board and I'm pleased to have been selected chairman to

follow in the footsteps of my close friend Evans Attwell, with whom I had worked alongside for many years," said Mr. Hendrix. "All five Board members really share equally in looking after the legacy of the Foundation and ensuring Mr. Welch's wishes are carried out to advance chemistry and improve life."

Mr. Hendrix grew up in Tennessee near Memphis. He earned a bachelor's degree in business at the University

of Tennessee and a master's degree in business administration at Georgia State University.

While Mr. Hendrix started as an auditor for Arthur Andersen & Company in Atlanta, he has spent most of his career in the energy industry, beginning in 1973 with Texas Gas Resources Corporation. He held a number of positions at Texas Gas and became CEO in 1978. Following Texas Gas Resources' acquisition by CSX Corporation in 1984, Mr. Hendrix served as vice chairman and director of CSX and later as executive vice president and director of the Halliburton Company, Dallas. In 1985, he joined Texas Eastern Corporation as president and CEO and in 1997 became CEO of PanEnergy Corporation. He retired from PanEnergy in 1997.

He and his wife, Jennie, have three grown daughters and eight grandchildren.

In addition to The Welch Foundation, Mr. Hendrix has served on a number of corporate boards including Allied Waste, Inc., CSX, First City Bancorporation, First Kentucky Corporation, Grant Prideco, Inc., Halliburton, National Power, PanEnergy, Pool Energy



Dennis Hendrix

Services, Provident Life and Accident, Stokley Van Camp, Texas Commerce Bank, Texas Eastern, and United Foods. He also has been active in several civic and professional organizations including the Greater Houston Partnership Board, Texas Gulf Coast United Way, Houston Museum of Fine Arts, National Junior Achievement, the Texas Medical Center, National Petroleum Council and the Interstate Natural Gas Association of America. He currently serves on the boards of Spectra Energy and Newfield Exploration Company.

His business background and extensive experience correlate well with his service on the Welch Board, even though Welch is a private foundation instead of a corporate entity.

"Welch is a bit different since it is a foundation, but many of the responsibilities are the same. Like a company, we have a fiduciary responsibility to ensure the organization is prudent and can continue its charter and ongoing activities," said Mr. Hendrix.

"The Foundation has been doing great work for more than 50 years, helping to support basic research and promote scientific education in the state of Texas. It's an honor to serve on this board," said Mr. Hendrix. ■

2008 Welch Grants

Foundation Provides \$21.7 Million for Basic Research

IN MARCH during its spring meeting, The Welch Foundation announced its contribution of \$21.7 million in grants to support basic research in chemistry at 28 Texas colleges and universities. In addition to renewing support for 98 projects, the Foundation is funding 26 new proposals in 2008.

Each Welch grant provides a minimum of \$50,000 each year in funding for three years to support basic research by a full-time, tenured or tenure-track faculty member who serves as a principal investigator. In all, the Foundation currently supports 431 investigators at Texas institutions. This year, the Foundation received 251 proposals to fund new research projects.

Since its establishment in 1954, The Welch Foundation has contributed more than \$627 million to chemical research in the state of Texas. ■

An Interview with Board Member Charles Tate

WITH AN AVID INTEREST in life sciences and as a staunch advocate of The Welch Foundation's mission to advance chemistry and improve life, Charles W. Tate joined the Foundation's board of directors in early 2008.

Chairman and Founder of Capital Royalty L.P., he also is active on the boards of several applied science organizations. He has received numerous honors including being elected a Distinguished Alumnus of The University of Texas and to the Hall of Fame of the University's McCombs School of Business. He has served on Governor Rick Perry's Council for Science and Biotechnology Development.

The Foundation's newest member shares his thoughts on joining the board.

Q: What attracted you to take this position on the board for The Welch Foundation?

A: The Welch Foundation's board is comprised of very accomplished people in a variety of fields; it is an honor that they invited me

to be a part of something like this. My interests and involvement in the sciences in Texas align perfectly with The Welch Foundation's objectives. Although most of my current activities are healthcare related, I have a deep appreciation for the broad contributions of chemistry for the betterment of humankind. The Welch Foundation's mission plays a key role in supporting

research that enhances people's everyday lives, and its reputation is internationally known.

Q: Why do you think The Welch Foundation's mission is so important?

A: Robert Welch established the Foundation because he believed chemistry to be an area where research could improve people's lives. The Foundation's

funding makes possible the discoveries that do just that. It is research in basic biological chemistry that is giving us new insight into why benign tumors grow and become malignant; or what influences the growth and decline of the body as a result of what happens at the molecular or cellular level. All of this is at the heart of biochemistry. The Foundation's support in such an arena is vital to discovering life-altering enhancements not just in Texas, but around the world. It makes available a wealth of knowledge that may not have otherwise been discovered without this funding.

Q: What are some of the most significant recent breakthroughs you have seen due to basic research in chemistry?

A: Historically, many famous discoveries have come out of research in physical chemistry. However, more recently many of the headline-grabbing discoveries have been in the biological side of chemistry. The greater understanding we now have of molecular and cellular function has paved the way for greater comprehension of how the body works. This knowledge is leading to a better understanding of how various diseases are transmitted within the body, improving scientists' ability to develop new and better drugs and therapies.

Q: What are you most looking forward to accomplishing while serving on the board?

A: This is not something one does to seek personal recognition. Rather recognition should go to the individuals who are doing the research that the Foundation funds. As board members, our primary function is a fiduciary one, and as such, we are responsible for the management of the Foundation's underlying financial assets, and for providing direction to the management. I hope with a combination of my experience in financial matters and a basic understanding of scientific applications, I am able to bring a well-rounded approach to the Foundation's mission. ■



Charles W. Tate

Welch Award Recipient Honored for Trailblazing Career

Alexander Rich Receives \$300,000 Prize for His Contributions to Biochemistry and Molecular Biology

THE TRAILBLAZING CAREER of Dr. Alexander Rich has led the scientific community in exciting new directions. Decades into his work with nucleic acids, his insights on these building blocks of life have inspired new advances in biochemistry and molecular biology.

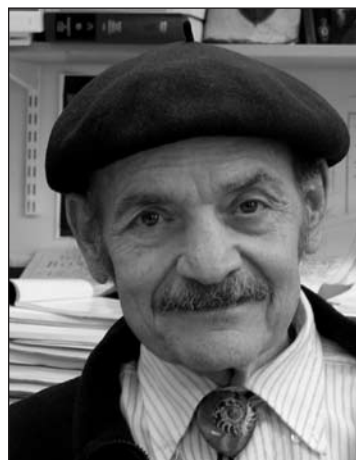
Best known for his discovery of left-handed DNA (or “Z-DNA”) and the three-dimensional structure of transfer RNA, Dr. Rich has left his fingerprints on a myriad of scientific fields and advanced life-improving chemistry. For his wealth of scientific contributions, Dr. Rich was named the 38th recipient of the Welch Award in Chemistry.

The annual Welch Award was created to foster and encourage basic chemical research and to recognize, in a substantial manner, chemical research that benefits humankind as a whole. Dr. Rich’s seminal contributions have provided the basis for much of what is known today about the form and function of DNA and RNA and their roles in protein synthesis.

“Dr. Rich is one of the towering intellects in science of the 20th and 21st centuries,” said Dr. James L. Kinsey, chairman of The Welch Foundation’s Scientific Advisory Board. “The fact that even his earliest insights into nucleic acids remain relevant after 50 years is a testament to the impact and legacy of this scientist.”

When Dr. Rich began his career in the early 1950s, DNA’s double helix had been discovered; however,

very little was known about RNA until Dr. Rich discovered that it could also produce a double helix.



Alexander Rich

“I had the good fortune of beginning my research when it was still possible to ask fundamental questions about the nature of nucleic acids and how information is transferred in living systems. Because of that, I was able to make some important discoveries, which has been exhilarating,” said Dr. Rich, who serves as the William Thompson

Sedgwick Professor of Biophysics at the Massachusetts Institute of Technology. “I am truly honored that my work is being recognized with the Welch Award.”

Dr. Rich joined MIT in 1958, where his groundbreaking research continued. He was first to carry out DNA-RNA hybridization, which opened the door to understanding how information can be transferred from DNA to RNA. He also was responsible for discovering DNA’s presence in organelles, an effort that resulted in the development of an innovative research approach widely adopted by others, and gave rise to a large field of research in organelle DNA. His additional work has provided many insights on the mechanism of protein synthesis.

Another area of research pioneered by Dr. Rich is the discovery of the left-handed form of DNA. The new form, coiled in the shape of a left-handed screw,

was called Z-DNA because of its zigzag backbone. Sixteen years after the initial discovery, Dr. Rich and his team unlocked the biological role of Z-DNA, revealing how the three-dimensional structure of Z-DNA binds to a protein that is involved in editing genetic messages important in a number of brain receptors.

“Dr. Rich’s vast insights have given us a greater understanding of how the machinery of life works and have begun to unlock the door to the prevention and treatment of disease,” said Dennis Hendrix, Chairman, The Welch Foundation.

Dr. Rich’s current research continues to focus on uncovering the biological roles of Z-DNA and the proteins that bind to it. These proteins are active in the immune system and are found in certain



From left: SAB Chairman Jim Kinsey, Board Chairman Dennis Hendrix, Board member Beth Robertson, Alexander Rich, SAB member Dick Schrock and Welch Foundation President Norbert Dittrich at the 2008 Welch Award announcement luncheon.

Investigations into Molecular Machines Earns Young Scientist 2008 Norman Hackerman Award in Chemical Research

USING A MULTI-PRONGED experimental approach and creative techniques, a Baylor College of Medicine researcher's investigation of molecular machines is at the forefront of a very exciting area in structural biochemistry.

Francis T.F. Tsai combines structural biology, molecular biology, biochemistry and protein chemistry

to study how large, energy-dependent molecular machines operate in a cell. His work could someday lead to better understanding protein aggregation disorders and perhaps finding a cure for human

neurodegenerative disorders such as Alzheimer's and Parkinson's.

For his important contributions to structural biology and biochemistry, The Welch Foundation recognized Dr. Tsai's originality and groundbreaking scientific work with the 2008 Norman Hackerman Award in Chemical Research. The Hackerman Award was created to honor research by young scientists at Texas institutions. Dr. Tsai received the award, a \$100,000 check and a crystal sculpture in February.

"Receiving the Hackerman Award was a very special moment," said Dr. Tsai. "I am honored to be recognized by such a prestigious award and also feel it underscores the importance of our work to understand the structure and mechanism of molecular machines."

"Dr. Tsai is a superb scientist, teacher and academic leader," said Foundation Chairman Dennis Hendrix. "He is a good example of someone who has a passion for his work along with a great deal of determination to solve complex biological problems using chemistry."


Dr. Tsai's most notable scientific achievement

was determining the three-dimensional structure of ClpB, a large multi-subunit molecular chaperone that has the remarkable ability to disaggregate previously aggregated, stress-damaged proteins.

In other work, Dr. Tsai and his team are interested in understanding the structural basis of transcription regulation, specifically the RNA Polymerase II system.

"The Welch Foundation was very impressed with Dr. Tsai's devotion to basic chemistry, his originality and his accomplishments in biological chemistry," said Scientific Advisory Board Chairman James L. Kinsey. "He has brought together a number of different and creative techniques to study the structures of complex molecular structures known as molecular chaperones. These remarkable entities assist in making sure critical proteins fold the right way and it is very important, from a cell biology standpoint, to understand their structure because of the impact it has on human disease."

Dr. Tsai received his undergraduate education at the Imperial College of Science, Technology and Medicine where he earned a joint honors degree in chemistry and biochemistry in 1993. He received his doctoral degree from the University of Oxford in 1997 and pursued his postdoctoral training at Yale University and the Howard Hughes Medical Institute. In 2000, he joined the faculty at Baylor College of Medicine and in 2007 was promoted to associate professor in the Department of Biochemistry and Molecular Biology.

Dr. Tsai and his wife, Sukyeong Lee, also a structural biologist and his closest collaborator, have two children, Joshua and Anika. 



Francis Tsai and Board member Beth Robertson at the 2008 Hackerman Award luncheon.



2008 Hackerman Award Recipient Francis Tsai (middle) is congratulated by (from left) Welch Foundation President Norbert Dittrich, Board members Peter Fluor and Beth Robertson, and SAB Chairman Jim Kinsey.

Two New Scientific Advisory Board Members Named as E. J. Corey Retires After 40 Years of Service

FOLLOWING 40 YEARS of service on The Welch Foundation's Scientific Advisory Board (SAB), E. J. Corey officially retired from his position on December 31, 2007.

"E. J. Corey is one of the most prolific and influential synthetic organic chemists of our time. In addition to the deep respect his expertise has earned within the scientific community, Dr. Corey has brought the Foundation an invaluable broad perspective on the field of science," said Dr. James L. Kinsey, chairman of the Scientific Advisory Board. "We feel very fortunate that a scientist of his caliber has given of his time so selflessly for so long."

Dr. Corey joined the board in 1967 as a young scientist who was already well established in the modern synthetic organic chemistry community. Among the numerous awards he received throughout the years for his work was the Nobel Prize in

Chemistry in 1990 for his development of the theory and methodology of organic synthesis. More recently, Dr. Corey was honored with the 2004 Priestly Medal, the American Chemical Society's highest honor.

"Over the past four decades, Dr. Corey contributed greatly to the Foundation's mission, and his absence will be felt greatly," added Dr. Kinsey.

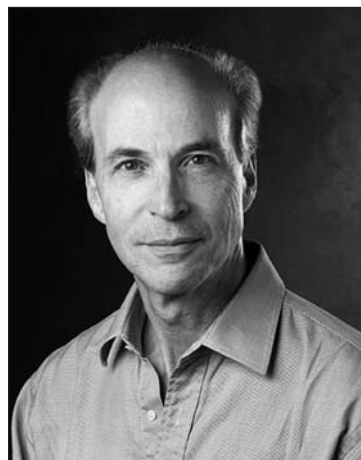
This summer, The Welch Foundation will welcome two new SAB members.

Dr. Roger D. Kornberg, Winzer Professor in Medicine in the Department of Structural Biology at Stanford University, and Dr. Richard R. Schrock, the Frederick G. Keyes Professor of Chemistry at the Massachusetts Institute of Technology, will officially join the SAB on July 1, 2008.

"We are honored to have two such imminently accomplished individuals join our advisory board," said Dr. Kinsey. "Both Dr. Kornberg and Dr. Schrock have tremendous reputations, and their unique perspectives will benefit the Foundation greatly as we

continue to support Mr. Welch's vision of advancing chemistry to improve life."

Dr. Kornberg received the 2001 Welch Award in Chemistry and the 2006 Nobel Prize in Chemistry for his studies of the process by which genetic information



Roger D. Kornberg

from DNA is copied to RNA (eukaryotic transcription). He earned his bachelor's degree from Harvard University in 1967 and his Ph.D. from Stanford University in 1972, after which he became a postdoctoral fellow and member of the scientific staff at the Laboratory of Molecular Biology in Cambridge, England from 1972 to 1975. During his time in Cambridge, he discovered the nucleosome, the basic unit of DNA coiling in chromosomes. Dr. Kornberg joined the faculty at Stanford in 1978, where he has focused his research on the biochemical transcription process, and devoted two decades to the development of methods to visualize the atomic structure of RNA polymerase and its associated protein components. Dr. Kornberg is an elected member of the National Academy of Sciences and of the American Academy of Arts and Sciences, as well as an honorary member of the Japanese Biochemical Society.

Dr. Schrock was one of three recipients of the 2005 Nobel Prize in Chemistry for his contribution to the metathesis reaction used in organic chemistry. He



Richard R. Schrock

earned his bachelor's degree from the University of California at Riverside in 1967 and his doctorate in inorganic chemistry from Harvard University in 1971. After one year as a National Science Foundation postdoctoral fellow at Cambridge University, he spent three years in the group of George Parshall and was hired to work in the Central Research and Development Department of E. I. duPont de Nemours and Company. Dr. Schrock joined MIT in 1975, where he became full professor



E. J. Corey

BIOLOGICAL MACROMOLECULES

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excellent opportunity for young scientists to learn from the leaders in this field.”


The opening session of the conference, chaired by Dr. Johann Deisenhofer of The University of Texas Southwestern Medical Center at Dallas, will include discussions of microRNAs and their roles in regulating gene expression in vertebrate cells; and mechanisms of small RNA processing and targeting.

Dr. Theodore G. Wensel of Baylor College of Medicine will lead the second session, which will cover topics including ion channels and cell membranes; the structural basis of biological nitrogen fixation; and improving structures of supramolecular complexes and membrane proteins at lower resolutions of X-ray diffraction.

The third session, which will include a discussion on the architectural mobility of the ribosome and its implications, as well as other related topics, will be facilitated by Dr. Florante A. Quijcho of Baylor College of Medicine.

Dr. Alexander Rich of the Massachusetts Institute of Technology will present the 2008 Welch Award lecture, titled “The Role of Z-DNA Binding Proteins in Interferon Induction and Infection.” Z-DNA, the left-handed conformation of DNA’s double helix, is one of Dr. Rich’s numerous discoveries that have opened new fields of science.

The final session will be led by Dr. B. Montgomery Pettitt of the University of Houston. This session will include discussions on mesoscale modeling of macromolecular machines; probing gene expression in live cells at the single molecule level; and 4D microscopy.

The Welch Conference is open to all, and there is no registration fee. Please go to The Welch Foundation Website at www.welch1.org/chemicalconference/ to register. 

2008 Welch Conference on Chemical Research

Biological Macromolecules: From Structure to Function

William N. Lipscomb, Jr., Harvard University, Conference Co-Chairman

Jianpeng Ma, Baylor College of Medicine, Conference Co-Chairman

October 27–28, 2008

Wyndham Greenspoint Hotel — Houston

Monday, October 27, 2008

SESSION I

Discussion Leader: **JOHANN DEISENHOFER**, The University of Texas Southwestern Medical Center at Dallas

THOMAS A. STEITZ

Yale University

The Structural Studies of the Ribosome; A Major Antibiotic Target

ROGER D. KORNBERG

Stanford University

Chromatin Structure and Transcription

JOAN A. STEITZ

Yale University School of Medicine

MicroRNAs: Versatile Regulators of Gene Expression in Vertebrate Cells

JENNIFER A. DOUDNA

University of California, Berkeley

Mechanisms of Small RNA Processing and Targeting

SESSION II

Discussion Leader: **THEODORE G. WENSEL**, Baylor College of Medicine

RODERICK MACKINNON

The Rockefeller University

Ion Channels and Cell Membranes

JIANPENG MA

Baylor College of Medicine

Improving Structures of Supramolecular Complexes and Membrane Proteins at Lower Resolutions of X-ray Diffraction

DOUGLAS C. REES

California Institute of Technology

The Structural Basis of Biological Nitrogen Fixation

Tuesday, October 28, 2008

SESSION III

Discussion Leader: **FLORANTE A. QUIJCHO**, Baylor College of Medicine

WAYNE A. HENDRICKSON

Columbia University

Mechanisms of Action for Molecular Chaperones

ROBERT M. STROUD

University of California, San Francisco

Regulating Ammonia and Water Transport Across Membranes; QED?

JOSEPH D. PUGLISI

Stanford University

Dynamics of Translation

ADA E. YONATH

Weizmann Institute of Science

The Stunning Architectural Mobility of the Ribosome and Its Implication in Initial Protein Folding, Evolution and Therapeutical Effectiveness

2008 WELCH AWARD LECTURE

ALEXANDER RICH

Massachusetts Institute of Technology

The Role of Z-DNA Binding Proteins in Interferon Induction and Infection

SESSION IV

Discussion Leader: **B. MONTGOMERY PETTITT**, University of Houston

MICHAEL LEVITT

Stanford University

Mesoscale Modeling of Macromolecular Machines

XIAOLIANG S. XIE

Harvard University

Probing Gene Expression in Living Cells at the Single Molecule Level

AHMED H. ZEWAİL

California Institute of Technology

4D Microscopy — Visualizing Materials and Biological Function

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TWO NEW SAB MEMBERS

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in 1980, and the Frederick G. Keyes Professor of Chemistry in 1989. Dr. Schrock is perhaps best known for his discovery of α hydrogen abstraction reactions in high oxidation state metal alkyl complexes that yield high oxidation state “carbene” (alkylidene) and “carbyne” (alkykidyne) complexes. He is the recipient of numerous awards and has been elected to the American Academy of Arts and Sciences and the National Academy of Sciences.

“We are extremely pleased to welcome such distinguished additions to the Scientific Advisory Board,” said Dennis Hendrix, chairman, The Welch Foundation. “As the Foundation continues to support Mr. Welch’s vision for improving life through chemistry, we rely greatly on insights from the SAB. We have no doubt that Dr. Kornberg and Dr. Schrock will make tremendous contributions to the Foundation’s efforts.”

WELCH AWARD RECIPIENT

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viruses, such as vaccinia, where they are essential for infectivity. His work in this area has revealed a novel mechanism important to viral diseases such as smallpox, and offers the possibility of a therapy.

Born in Hartford, Conn. in 1924, Rich served with the U.S. Navy from 1943–46 before receiving his bachelor’s degree in biochemical sciences, magna cum laude, from Harvard University in 1947 and his medical degree, cum laude, from Harvard Medical School in 1949. He did his postdoctoral work at Caltech with Linus Pauling and joined the MIT faculty in 1958. From 1969–80, due to his ongoing work with nucleic acids and their role in the origins of life, he was an investigator in NASA’s Viking Mission to Mars, working on experiments designed to look for life on that planet. President Clinton recognized Dr. Rich for his outstanding scientific achievements with the Medal of Science in 1995.

Additional awards include election to the National Academy of Sciences, the American Philosophical Society, the French Academy of Sciences, the Russian Academy of Sciences, and the Pontifical Academy of Sciences. He has received several honorary degrees, as well as the Rosentiel Award in Basic Biomedical Research and the Presidential Award of the New York Academy of Sciences. Dr. Rich has more than 600 publications to his name and currently serves on the editorial board of *Genomics* and the *Journal of Biomolecular Structure and Dynamics*.

Dr. Rich will be honored at a banquet in Houston in October where he will be presented the \$300,000 award and gold medallion.