Advancing Chemistry.
Improving Life.

ANNUAL REPORT

2015

ROBERT A. WELCH

The Welch Foundation is a legacy to the world from Robert Alonzo Welch, a self-made man with a strong sense of responsibility to humankind, an enthusiastic respect for chemistry and a deep love for the state of Texas.

Born in South Carolina to a prominent family that fell on hard economic times, Mr. Welch came to Houston as a youth and later made his fortune in oil and minerals. Over the course of his career and life, he became convinced of the importance of chemistry for the betterment of the world.

Scientists, geologists and petroleum engineers were among his close friends and associates as were the civic and business leaders of the day. From these associations and his own study, Mr. Welch determined that the pursuit of chemistry and chemical research held great potential for vast good and would continue to have a valuable impact on business, industry, global leadership and the human condition.

Mr. Welch gave serious thought to the disposition of his estate. His decisions reflected his belief in science and the role it would play in the future. In his will, Mr. Welch stated: "I have long been impressed with the great possibilities for the betterment of mankind that lay in the field of research in the domain of chemistry." With his death in 1952, Mr. Welch left a generous portion of his estate to his employees and their families. The balance began what is now The Welch Foundation.

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We are lucky at The Welch Foundation to have a close knit group who celebrate the basic research successes of our principal investigators and grantees, the science generated from their research, and the universities and institutions where they are located. There are also others, like those of you reading these words, who already know and value the contributions basic research in chemistry make to our world. However, this can be a difficult message to convey to a wider audience, from the general public to policy makers, leading to a steady decline in public support and funding for the sciences in recent decades. The Welch Board and our Scientific Advisory Board have been watching this negative trend and have decided to act.

One of our key accomplishments in 2015 has been to develop an invigorated program of outreach and media designed to underscore the importance of science and basic research to our long-term national prosperity. With the enthusiastic support of the Scientific Advisory Board, the Foundation has determined that investing in this effort aligns very much with Mr. Welch's vision. We plan to leverage the Foundation as a platform to promote science and make it more understandable and more accessible to the public. Of course, we will continue to support the main mission to facilitate research and chemical education across the state with our grants for basic chemical research to principal investigators, departmental programs, endowed chairs and other special projects at educational institutions in Texas.

We feel expanding The Welch Foundation's role as a spokesperson and advocate for scientific education and shining a light on the relevance of science in everyday lives is a necessary supplement to our main mission. In this world of NOW, we need to demonstrate a patience in long-term outcomes – *i.e.*, how investments in research today pay off well into the future in terms of better jobs and better lives. Chemistry truly is part of the fabric of our lives and lays

the foundation for new materials, new ideas for growth, new drugs – essentially touching all aspects of our world. We hope to become a more persuasive voice encouraging others to invest in tomorrow by investing today in basic research and to show patience for the long-term returns.

So, after years hiding our light under a bushel, we celebrated the Hackerman Award with ads in ***The*** *New York Times*, *Houston Chronicle* and other influential publications heralding the work of 2016 Hackerman Award recipient Chris Ellison. We will do the same with the Welch Award in Chemistry in the fall. We have revamped and refreshed the website and are becoming more active on social media. Watch this space as additional efforts unfold. We don't expect immediate results, but we do hope to expand the conversation and invite you to be part of that effort. We hope to spur further discussion across our city, our state and our nation.

A new more public role for The Welch Foundation was initiated in 2015, which is also my last year as board chair. Happily I will remain on the board, awed by the incredible work you all do, and hope that some of the seeds we are planting will flourish in the years and decades to come to the benefit of our children and grandchildren.

Wilhelmina E. (Beth) Robertson
CHAIR, BOARD OF DIRECTORS

Fullfilling Founder's Vision

Created from an endowment by Texas oilman and philanthropist Robert Alonzo Welch, The Welch Foundation has grown into one of the nation's largest sources of private funding for basic research in chemistry. For more than 60 years, the Foundation has supported chemistry in Texas through research grants and a variety of other programs.

Following the dictates of Mr. Welch's will, the Foundation remains true to its mission of supporting fundamental scientific exploration that ultimately helps improve our world. The Foundation's endeavors are guided by a Board of Directors, Scientific Advisory Board and professional staff all committed to building a robust scientific community in Texas that advances basic knowledge.

Board of Directors

The Board of Directors serves as stewards of The Welch Foundation, overseeing its financial health, operational direction and support for chemistry.

Wilhelmina E. (Beth) Robertson
Chair and Director

Charles W. Tate
Vice Chair and Diretor

Carin Marcy Barth
Treasurer and Director

Robert C. Robbins, MD
Secretary and Director

Ernest H. Cockrell
Director

Norbert Dittrich
President

Scientific Advisory Board

The Scientific Advisory Board (SAB) advises the Board of Directors on scientific issues related to the Foundation's mission. The board is composed of renowned leaders in chemistry and the related sciences who evaluate proposals for research grants, review and recommend finalists for the Welch and Hackerman Awards, and help oversee the other Foundation programs to promote chemistry in Texas. Each year, one member presides over the annual Conference on Chemical Research.

Peter B. Dervan, Chair
California Institute of Technology

Richard R. Schrock
Massachusetts Institute of Technology

Jennifer A. Doudna
University of California, Berkeley

Peter G. Schultz
The Scripps Research Institute

Marye Anne Fox
University of California, San Diego

James L. Skinner
University of Wisconsin, Madison

Joseph L. Goldstein
The University of Texas Southwestern Medical Center

Ahmed H. Zewail
California Institute of Technology

Roger D. Kornberg
Stanford University Medical School

Xiaowei Zhuang
Harvard University

Foundation Staff

Led by Norbert Dittrich, president and chief operating officer, the staff oversees and implements the day-to-day operations of the Foundation.

Colette Bleasdale
Administrative Assistant/ Coordinator

Kathy Kirk
Administrative Assistant

Norbert Dittrich
President

Reena Cegielski
Senior Accountant

Ron Page
Controller

Carla J. Atmar
Grant Programs Coordinator

Carolyn Kahlich
Senior Accountant

Sherry White
Staff Accountant

Researcher's 'pictures' of viruses advance medicine

Stephen C. Harrison has greatly expanded our understanding of biological functions by creating the chemical "blueprints," or architectural drawings, of complex macromolecular structures. His insights into the workings of viruses and the human immune response system are helping develop better vaccines and treatments of diseases such as the common cold, influenza, HIV, West Nile Virus, dengue and yellow fevers, and Ebola, among others.

For his pioneering work in advancing science to improve life, the Harvard Medical School researcher was named recipient of the 2015 Welch Award in Chemistry. The annual award includes $300,000 and a gold medallion.

Tom Kirschhausen (left) with Debbie and Bobby Robbins, Foundation secretary, and Welch Awardee Steve Harrison.

"Dr. Harrison's deep chemical insights and wide horizons have opened new windows into biology and medicine," says Beth Robertson, chair of The Welch Foundation. "His breakthroughs in basic research have improved our understanding of the chemistry that underlies biological systems and led to important advances in preventing and treating disease. Dr. Harrison epitomizes the mission of The Welch Foundation – to advance chemistry for the improvement of human life."

At a time when most structural scientists were focused on unravelling the structure of a single protein or small biological molecule, Dr. Harrison decided to decode the structure of a virus. Undeterred by the fact that viruses were 10 to 20 times more complex than anything done to date, and that the tools and techniques to do it didn't yet exist, he pushed forward.

He faced challenges at all levels: crystallizing a virus was extremely difficult and once done, collecting the huge amount of resulting data posed an equally difficult problem. Also lacking were the computational tools to analyze the data and refine the structures.

But Dr. Harrison persevered and his work paid off handsomely. The tools and techniques he pioneered have transformed science's understanding of the large macromolecular assemblies essential to the chemistry of life.

"I've always believed that we need to see in order to understand. So I'm the guy who makes the equivalent of the blueprints that allow an engineer to see how a machine is built and how it works; my blueprints are for biologists and chemists to understand how a subcellular assembly works on a molecular level," Dr. Harrison says. "Turning biological problems into chemistry and creating detailed pictures makes it pos-

sible to reverse engineer the molecular machinery. We can figure out how to intervene when something breaks down or how to modify a biological process for therapeutic or production purposes. We turn the black box into a chemical picture of what's going on in an organism."

He succeeded in determining the first atomic-level structure of a virus and, later, the structures of key proteins from viruses that are human pathogens, such as the dengue virus and HIV. He discovered principles of virus assembly and detailed the various mechanisms viruses use to infect cells – for both viruses with membranes, like polio, and those without, like Ebola. His work pinpointed potential targets for antiviral drugs and vaccines.

He also has helped explain how cells control expression of specific genes. In studying protein complexes with DNA, he determined the first atomic structure of sequence-specific protein DNA complexes and deciphered the principles of base-pair recognition. His structural studies helped recognize the sites on DNA where proteins attach and how these interactions affect gene transcription.

Dr. Harrison's long-standing interest in viruses stimulated his recent focus on structural immunology to probe the human immune response to viruses. Advances in genome sequencing have enabled scientists to follow how antibodies are made in response to vaccination and how they recognize and bind with the vaccine's proteins. Structural analysis of how the antibody response changes over time should contribute to more effective vaccines.

Most recently, he has turned his attention to cell division – a challenge even more complex. Dr. Harrison is studying the architecture of kinetochores, organelles critical for accurate cell division. His goal is to paint a detailed picture of how chromosomes attach to the mitotic spindle – the threads that pull apart dividing cells – and how they are assembled. Nature has evolved elaborate control mechanisms so that dividing cells pull apart correctly. Being able to "see" the process can shed light on how to prevent the defects and mutations that can result when something goes wrong and a cell divides before all the chromosomes are attached correctly.

Wendy Skinner (left) with Chair Beth Robertson, SAB members Xiaowei Zhuang and Jim Skinner, and Steve Pierce.

Foundation President Norbert Dittrich (left) with Steve Harrison and SAB Chair Peter Dervan.

"Dr. Harrison has transformed our understanding of large macromolecular assemblies that are essential to the chemistry of life," says Peter Dervan, chair of the Foundation's Scientific Advisory Board. "He has pioneered new methods in data collection and structure determination, tackling increasingly complex molecules. His work has had implications for numerous fields, including virology, DNA transcriptional regulation, signal transduction, vesicular trafficking and cell division."

Dr. Harrison is professor of biological chemistry and molecular pharmacology and of pediatrics, Harvard Medical School and Boston Children's Hospital, and investigator for the Howard Hughes Medical Institute. He earned both his bachelor's and doctoral degrees from Harvard University and served on its faculty for many years. He is a member of the National Academy of Sciences, the American Philosophical Society, a fellow of the American Academy of Arts and Sciences, and a foreign member of European Molecular Biology Organization and of the Royal Society of London. Dr. Harrison's many awards include the Louisa Gross Horwitz Prize (with Don Wiley and Michael Rossmann), the ICN International Prize in Virology, the Paul Ehrlich and Ludwig Darmstaedter Prize (with Michael Rossman), and the Gregori Aminoff Prize of the Royal Swedish Academy of Sciences (with David Stuart).

Dr. Harrison is married to fellow researcher and Harvard faculty member Tomás Kirchhausen.

'Rising star' advances knowledge of nanoparticles

Foundation President Norbert Dittrich (left), Vice Chair Charles Tate, Hackerman Awardee Stephan Link, Secretary Bobby Robbins and SAB Chair Peter Dervan.

Understanding how single nanoparticles, or tiny bits of metal, interact with light to create heat may ultimately prove useful in such diverse areas as cancer treatment, light displays, steam generation, energy-efficient catalysts and diagnostics. For his pioneering contributions to the emerging field of nanophotonics, The Welch Foundation named Stephan Link, associate professor of chemistry at Rice University, recipient of the 2015 Norman Hackerman Award in Chemical Research.

"Dr. Link's colleagues have called him the 'quintessential 21st century physical chemist' and an 'unstoppable force,'" says Beth Robertson, chair of The Welch Foundation. "His commitment to expanding the borders of scientific knowledge to ultimately improve lives is exactly the kind of work this award was created to honor. His major research contributions at a relatively young age make him a true 'rising star,' and we are eager to see what the future holds for him."

Dr. Link draws upon knowledge and techniques from chemistry, physics, engineering and mathematics to better understand how light interacts with nano, or very small, materials. His group uses single-molecule and single-particle spectroscopy techniques to help decipher the physical rules that explain how plasmonic nanoparticles interact with one another and with their environment. His goal is to better understand how to use plasmons, or coherent electron oscillations coupled to light photons, to probe materials and initiate chemical reactions.

"Basic research is absolutely crucial for advancing knowledge. It is the foundation for all the applications that make life longer, better, easier," says Dr. Link. "Mostly thanks to The Welch Foundation, we're able to do this type of work here in Texas, building on past insights to tackle bigger and bigger problems. It takes many different minds and expertise to come together to solve the harder problems – that's where our collaborations and thinking outside the box are really important."

Dr. Link is hailed for his creativity, prolific publications and the rigor of his analysis. He pioneered the plasmon chemistry and physics of aggregated metal nanoparticles, creating novel ways to juxtapose nanoparticles into chains, working out in detail the spectroscopic signatures of these coupled systems, and learning how to use them for applications. He designs original experiments that attack important problems and performs rigorous analysis to understand the results. His work advances fundamental knowledge of the properties of nanomaterials and provides infor-

Charles Tate (right) with Stephan Link.

mation critical for creating plasmonic devices for applications, such as ultra-small logic circuits.

The relatively young plasmonics field incorporates concepts from condensed matter physics, computational electrodynamics, device physics and biotechnology. Dr. Link's work incorporates the rapidly evolving understanding, methods and techniques of the field, drawing upon experimental and theoretical advances to address a range of interesting interactive plasmon systems and active plasmonic structures. His group focuses on using optical absorption and scattering experiments to study the properties of single nanoparticles and aggregates of nanoparticles.

Dr. Link's lab is only one of a handful of groups around the world able to conduct experiments to measure absorption. He then combines absorption studies with research into scattering to provide insights into the nature of the plasmon resonances of the nanostructures. Through Dr. Link's research, science now better understands how the optical properties of metal nanoparticles depend on size and shape.

He also examines aggregates of nanoparticles, typically material created by self-assembly, using optical absorption and scattering measurements with high-level electromagnetic simulations. The goal is to determine how the coupling between particles and between the particles and the substrate affects their spectral response.

"Stephan asks cutting-edge questions and develops innovative experimental approaches to get answers," said Peter Dervan, chair of the Foundation's Scientific Advisory Board. "He combines insights from basic research with practical applications to deliver important advances. He has a flair for effective collaboration and a knack for inspiring the best from his students. He is a wonderful teacher and mentor helping develop a new generation of scientists."

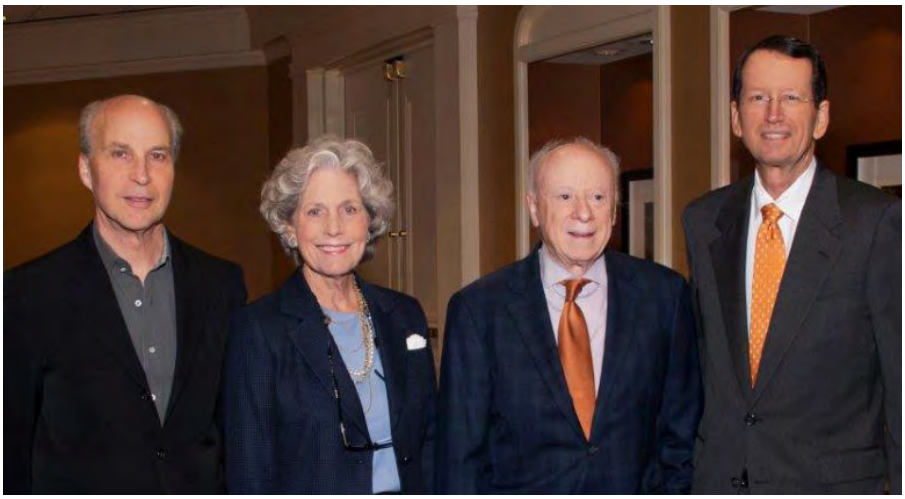
Born in Germany where he earned his undergraduate degree in chemistry, Dr. Link holds a Ph.D. from Georgia Tech and pursued postdoctoral research at The University of Texas at Austin. The associate professor of chemistry joined the Rice faculty in 2006 and has been a Welch Foundation principal investigator since 2007.

In addition to teaching and research, Dr. Link is an active member of the scientific community, giving numerous invited talks at national and international conferences, serving as a paper and grant reviewer and on editorial advisory boards, and helping organize conference sessions. In 2014, he received the inaugural Outstanding Young Scientist Award from the NANOSMAT Conference. Other honors include the International Union of Pure and Applied Chemistry's Prize for Young Chemists, the Oak Ridge Associated Universities' Ralph E. Powe Junior Faculty Enhancement Award, the 3M Nontenured Faculty Award and the National Science Foundation's CAREER Award.

The Hackerman Award is named in honor of Norman Hackerman, a noted scientist and longtime chair of the Foundation's Scientific Advisory Board. It is presented annually when warranted to scientists who are early in their careers and conducting basic research in chemistry in Texas. It includes $100,000, a crystal sculpture and a certificate.

Hackerman Award recipients, from left: Olafs Daugulis (2013), Francis Tsai (2008), Celicia Clementi (2009), Stephan Link (2015), Jason Hafner (2011), Jianpeng Ma (2004) and Andy Barron (2002).

Scientists explore advances in next generation medicine



SAB members Roger Kornberg (left) and Joe Goldstein with Foundation Chair Beth Robertson and President Norbert Dittrich (far right).

As science continues to drive medical advances on many fronts, internationally known biomedical researchers gathered in Houston Oct. 26-27 to share their latest findings related to genetics, neuroscience and common maladies like heart disease and cancer. Close to 1,000 scientists attended the "Next Generation Medicine" conference, representing 18 states and 11 countries. The experienced researchers and medical practitioners were joined by 28 students from Cypress Creek High School, eager to learn about new directions in science.

The annual conference on chemical research has been sponsored by The Welch Foundation since 1957 to share new advances in chemistry across the broader scientific community. Each year the session is chaired by a member of the Foundation's Scientific Advisory Board.

"The 2015 conference provided an opportunity to hear about many of the exciting fundamental research advances happening across broad and diverse areas of biomedicine," says Joseph L. Goldstein, conference chair, Welch Scientific Advisory Board member, and Regental Professor and Chairman of Molecular Genetics, The University of Texas Southwestern Medical Center. "This type of basic knowledge ultimately drives future clinical advances, enabling new approaches to enhancing wellness and treating disease."

"This conference showed how basic research in chemistry links directly to medical advances that improve human life," notes Welch Chair Beth Robertson. "Understanding the detailed chemical picture at the molecular level allows scientists to be much more effective in developing new treatments and new drugs. The conference was a wonderful venue to share new research and cross-fertilize future breakthroughs."

Thirteen distinguished presenters shared their promising new discoveries at the fundamental chemical level. The hope is that this work will ultimately help improve prevention and treatment of disease.

Session leader Huda Zoghbi with confrence presenter Steve McKnight.

The first of the conference's four sessions was chaired by David Botstein of Calico Life Sciences and focused on the genome. Presentations addressed new techniques for working with very small portions of humanity's three billion genes in an effort to eventually be able to "edit" malfunctions that affect health.

Later that day, researchers discussed aspects of neuroscience that hold promise for eventually developing more effective treatments for degenerative diseases. In one exciting area, the scientists detailed a project that has mapped all the neuro circuits in a fly, a precursor to tackling the hundreds of millions of neurons in the human brain. Another presenter reviewed work exploring the neuro-protective chemicals found in mice. The afternoon session was moderated by Huda Y. Zoghbi, Baylor College of Medicine.

Day two sessions, led by Michael S. Brown, The University of Texas Southwestern Medical Center, and Titia de Lange, Rockefeller University, explored research into the pathogenesis of common diseases such as heart, respiratory and cancers. Highlights included promising research that has engineered a type of gene that can be turned off and on by light, affecting behavior, and a new area of immune checkpoint blockades.

Welch awardee Steve Harrison (left) and Tom Kirschhausen (right) confer with conference presenter Kevan Shokat.

In addition, the 2015 Welch Award recipient, Stephen C. Harrison, shared his research into viruses, how they infect cells and how the human immune system responds. Dr. Harrison developed the first detailed chemical picture of a virus, and continues to contribute greatly to our understanding of how viruses infect cells and how to prevent or treat diseases ranging from the common cold and influenza to HIV and Ebola.

The 2016 conference – the Foundation's 60th – will look at "Frontiers of Imaging: Visualization of Matter through Electrons and Photons." Slated for Oct. 24-25, it will be chaired by Ahmed H. Zewail, Linus Pauling Chair Professor of Chemistry and Physics, and Director, Center for Physical Biology at the California Institute of Technology. Imaging is arguably the most fundamental method of visualization at the frontiers of biology and chemistry, from MRI to optical microscopy, and to electron and x-ray probing of matter. This conference will provide a broad perspective on the state-of-the-art techniques and their applications in chemistry, biology and biomedical science.

Close to 1,000 attended the "Next Generation Medicine" Conference.

Spurring Research, Education Initiatives

The Welch Foundation supports basic research in chemistry in Texas through a variety of ongoing programs each year.

"I travel the state regularly to review the progress of the various programs the Foundation supports," says Welch President Norbert Dittrich. "The depth and breadth of the science that is happening in Texas never fails to amaze me. From the eager high school students in our summer program all the way through to the seasoned scientists who hold Welch-endowed chairs, I am inspired by their intelligence, creativity and unrelenting interest in finding out how and why the world works. It is exciting to me to see the types of research and new knowledge the Foundation helps make possible."

President Norbert Dittrich.

Research Grants

The Welch Foundation awarded $25.5 million in grants to 106 researchers at 22 Texas institutions in 2015. Support included funding 26 new proposals and renewing support for 80 projects. Overall, 333 principal investigators currently receive Welch grants and the Foundation's support for chemical research since its inception in 1954 now totals approximately $807 million through August 31, 2015.

Each research grant provides a minimum of $60,000 a year and may be renewed based on the proposal submitted by the principal investigator. The grant supports research in chemistry by a full-time faculty member with tenure or on the tenure track at institutions of higher education in Texas.

A list of principal investigators receiving Welch Foundation grants during its 2015 fiscal year, September 1, 2014, to August 31, 2015, begins on page 18. The listing includes researchers' institutions and the titles of their research projects. More information is available in the research supplement available online at www.welch1.org.

Departmental Research Grants

The Welch Foundation provided funding for 39 chemistry departments at small- and medium-size colleges and universities last year across Texas. The support is designed to help build and strengthen the chemistry programs at these schools and provide opportunities for more students to take part in hands-on research.

"Research is where science comes to life for so many students," says Beth Robertson, board chair. "In many cases, Welch funding is the largest source of discretionary dollars for smaller programs. In fact, some schools might not be able to offer any direct research experience without this support. We have seen how effective an active research program can be in helping

chemistry programs blossom and in inspiring in students a real love of science and of discovery."

Departmental grants allow the schools to offer research opportunities to students, support faculty work and enhance chemistry programs. Experience shows that such research opportunities can play a vital role in encouraging students to pursue advanced degrees and scientific careers.

The departments typically use Welch funding to provide scholarships or stipends for undergraduates and graduates, purchase laboratory supplies and equipment, and underwrite student travel to participate in industry conferences.

Welch Chairs

The Welch Foundation endows 47 chairs at 21 Texas universities. This support is designed to recruit and retain talented chemical researchers and teachers to Texas universities as well as strengthen the quality of higher education programs across the state. The Foundation provides ongoing research funding for chair holders, helping support graduate and postdoctoral students working with the professors.

Two new chair holders were named in 2015: Hongcai Joe Zhou, Welch Chair in Chemistry at Texas A&M University Health Science Center, and John A. Tainer, Welch Chair in Chemistry at The University of Texas M. D. Anderson Cancer Center.

Welch Summer Scholar Program

Each year, the Welch Summer Scholar Program (WSSP) provides bright high school students with the opportunity to conduct hands-on research in a university setting. Thanks to Welch support, the program is free for participants, providing a unique experience for many students and often inspiring interest in careers in science, technology, engineering and mathematics.

Welch scholars also experience on-campus living as part of the program. These students at The University of Texas at Dallas share a meal.

The program has been expanding its advertising efforts to reach more Texas high school teachers, encouraging them to share information about the program with their students. This, combined with a continued focus on digital technology, including online applications and social media outreach, doubled the number of program applicants last year to 240.

From this pool, 42 talented high school students were selected to take part in the program on five university campuses in Texas. Paired with faculty researchers, the students not only gained direct experience in research, but also sampled college life as the program includes room and board on campus during the six-week session. For many bright students, particularly those from families without a tradition of higher education, the WSSP experience often spurs them to pursue further studies in the sciences.

Keith Stevenson, who has overseen WSSP for the past nine years, turned over the reins at year end to Lauren J. Webb, associate chemistry professor, The University of Texas at Austin. She becomes only the third director in the program's history.

Looking back on his nine years of guiding the program, Dr. Stevenson notes: "This program has had an immeasurable impact for more than 30 years that cannot be directly assessed other than by the people that it has impacted. Yet I know with this experience that they will definitely pay it forward. To me, the success of the Welch Summer Scholar program is much in the spirit of Robert Alonzo Welch, a simple man with great ambitions that created and sustains even to this day a great impact for the future generation of chemical enterprise."

"I am honored and excited to be working with The Welch Foundation on this unique and special program," Dr. Webb says. "Introducing talented young people to independent research not only educates and informs their educational and personal development, but benefits all of us who are privileged to work with these extraordinary students. By providing high school students with what is literally a life-altering experience, The Welch Foundation demonstrates tremendous vision in its goals of furthering and strengthening the chemical sciences."

Welch Funding Supports New Science Across Texas

Gary O. Gray

Gary O. Gray

Departmental Grant
Wayland Baptist University

"The Welch departmental grant continues to shape and positively influence the chemistry program at Wayland in long-lasting ways," says Gary Gray, professor and program coordinator. "It also benefits the university as a whole, catalyzing interest in research across the disciplines. An institutional culture that identifies undergraduate research as a core program distinction continues to grow and blossom, due in no small part to The Welch Foundation's support."

Wayland is a small private school with 15 to 18 chemistry majors, most of whom were initially not thinking about graduate school. Each year, three to eight students take part in an eight-week summer research program, with projects occasionally extending into the academic year. Participating students receive a small stipend and benefits, tuition is covered for the summer session, and they are housed and fed on campus. Six undergraduates took part during the 2014-15 academic year, with each of the three department faculty members mentoring two students.

"Welch support provides the springboard that allows us to secure university funding to cover tuition, room and board as well as for the development office to raise additional dollars for the research program," Dr. Gray reports.

Students apply in the fall and, if accepted, take a research literature course in the spring where they develop their research program for the summer. "This allows them to hit the ground running," Dr. Gray says. "Our goal is to give them a master's level experience."

The faculty's backgrounds in organic chemistry, analytics and biochemistry allow them to dovetail projects and pursue complementary research areas. For example, Dr. Gray and fellow professor Adam Reinhart mentored their students in a collaborative project last year to identify, purify and characterize potential breast cancer chemotherapy agents from plants. Dr. Reinhart's students then explored the biochemical processes by which each identified agent induced breast cancer cell death.

"We have the incredible benefit of being able to access Texas Tech labs and their equipment for work samples," Dr. Gray says. "It really expands the sophistication of the research we can do and the experiences we give to our students."

Last summer, faculty member Robert Moore involved his summer students in developing a photo imaging system to be used in research of mutation-prone sites in the tuberculosis genome that leads to drug resistance. Using inexpensive, off-the-shelf materials, they have created a system to detect and analyze chemical techniques with the sensitivity of much more expensive equipment.

Michael J. Krische

Welch Chair in Science
The University of Texas at Austin

Mike Krische, professor of chemistry, has received numerous awards for his innovative work developing a new class of byproduct-free chemical transformations that convert abundant feedstocks to value-added products.

His work focuses on elemental hydrogen, H_2, the most abundant molecule in the universe, and the chemical reactions that add hydrogen to other molecules, known as "hydrogenations" – processes used to form carbon-hydrogen bonds that are applied across all segments of the chemical industry.

Dr. Krische's lab has developed a new class of hydrogenations that promote formation of carbon-carbon (C-C) bonds – a connectivity found in virtually all chemical products ranging from pharmaceuticals to perfumes and agrochemicals. Unlike traditional methods, in Krische's "C-C bond forming hydrogenations," all atoms present in the starting molecules, plus hydrogen, appear in the product, so no byproducts are formed.

In continuing research, Krische further streamlines his chemistry by letting the starting molecules "carry" the hydrogen gas, which

is shared with another reactant molecule as the C-C bond is formed. Again, no byproducts are formed, preventing chemical waste at the source. Using these reactions, his lab has prepared several naturally occurring anti-cancer compounds of dizzying complexity in a manner far more efficiently than previously practiced.


Michael J. Krische

The son of a Gottschee-German immigrant and the first member of his family to go to college, Dr. Krische received his bachelor's degree in chemistry at the University of California, Berkeley. "Undergraduate research introduced me to the thrill of scientific discovery and ignited my passion for organic chemistry – a dynamic field of research, where a hypothesis can be conceived and challenged experimentally within the span of hours," he remembers.

He spent a year abroad as a Fulbright fellow, earned a doctorate at Stanford and pursued postdoctoral studies with Nobel Laureate Jean-Marie Lehn at Université Louis Pasteur. "During my doctoral degree, I was introduced to the power of transition metals in the daunting context of *de novo* chemical synthesis," he says. "My postdoctoral studies led to a greater appreciation of noncovalent and dynamic covalent aspects of chemistry."

His next stop was Texas. "The decision to begin my independent career at UT Austin in 1999 was strongly influenced by the prospect of intensifying my research endeavor under the aegis of Welch Foundation support," he adds. In 2007, he was appointed the Robert A. Welch Chair in Science.

"Thanks in large part to Welch Foundation support, I am better able to fulfill my potential as a research scientist," Dr. Krische says. "In this journey, I've been fortunate to work with many wonderful students and colleagues, many who themselves have benefitted from The Welch Foundation. I remain hopelessly addicted to the intoxicating excitement of chemical research. I'm proud to say Welch Hall on the UT campus is my home away from home!"


Matteo Pasquali

Matteo Pasquali

Principal Investigator
Rice University

Do you like your cookies soft and gooey, or hard and crunchy? Matteo Pasquali says his molecular research is a little bit like baking: The relative proportions of ingredients and how you mix them deliver different consistencies.

The chemistry professor's research focuses on developing a fundamental understanding of the properties of large molecules with tubular or flat shapes, such as carbon nanotubes and graphene. He explores the types of phases these molecules form in liquids. He has found that the resulting liquids can have a spontaneous alignment (called liquid crystals), where the large molecules self-assemble in a fashion that is mediated by their shapes as well as by chemical interactions with each other. Understanding the fundamental chemistry and underlying properties helps his team create useful materials that combine two properties that were thought to be mutually exclusive: softness and high conductivity.

Soft materials, like polymers and biological matter, typically have low conductivity. Highly conductive materials, such as metals, are hard. Dr. Pasquali's research has found it possible to decouple and recombine these molecular properties, creating soft materials that conduct electricity well. "It's almost as if you can have your cake and eat it too," he laughs.

These discoveries have potentially huge practical applications ranging from new materials to treat heart disease and neurological problems to lighter-weight materials for aviation. His research could even lead to creating an "elevator" to space or textile fibers that can weave complicated electronics into clothing.

"The potential is amazing, but we need to keep our focus on the basic principles to reach that potential. We approach this work in a very step-by-step manner," Dr. Pasquali says. "An understanding of the fundamental chemistry is critical to directing the next experiments and guiding the path forward."

He says that this is where Welch support has been essential. "These problems are difficult and require concerted, continuing effort over long periods of time; Welch Foundation support allows us to keep moving down that path as long as we continue to make progress and generate new basic understanding and fundamental discoveries. I can focus on putting my nose down and doing the work with my students instead of having to roll the dice every couple of years and having to propose a totally different area of work."

Dr. Pasquali adds, "Welch has my back. Its support has made me more daring. I also can keep my eyes open for new, unexpected discoveries and then follow through in these new directions. What a special privilege."

Margaret A. Phillips

Margaret A. Phillips

Principal Investigator
The University of Texas
Southwestern Medical Center

Meg Phillips hopes her research will save lives. The professor of pharmacology at UT Southwestern studies parasitic protozoa so that an understanding of their structure and function can lead to new drugs and help fight drug resistance. Her research focuses on the parasites that cause malaria and African sleeping sickness, diseases prevalent in the Tropics and in countries with less resources to fight disease.

An enzymologist and biochemist by training, Dr. Phillips says she has always been interested in drug discovery. Her goal is to explore enzymatic targets and find compounds that inhibit them. "Many of these enzymes are also found in humans, so the challenge is to find a way to inhibit the parasite enzymes in a way that prevents them from reproducing, but still are safe in humans," she notes.

Despite progress in recent years, malaria still kills 500,000 people a year, primarily children under five, pregnant women and travelers to the region. And there is evidence that the parasites are developing drug resistance, which is why, she says, it is important to continually have new drugs in the development pipeline.

Today, one inhibitor she discovered, working with collaborators in Washington, Melbourne and Geneva, is currently in phase two clinical trials in Peru, hoping to demonstrate its effectiveness.

Dr. Phillips' work on African sleeping sickness also explores metabolic pathways and their regulation within the protein needed for reproduction with the hope of finding a target that can be selectively inhibited by a drug. Fifty million people are at risk from the disease, which is fatal if not treated.

"I enjoy working in collaborations with chemists, biochemists, biologists, pharmacologists and others in this process," she says. "In the end, we may actually help people, which is very inspiring." Dr. Phillips notes that UT Southwestern, under the leadership of Steven McKnight, has been a pioneer in a collaborative approach that takes basic biological and chemical research through to drug development.

Dr. Phillips has been a Welch principal investigator since 1993, shortly after joining the medical center. "I am so grateful for Welch support," she says. "It lets me start the more risky projects and bring them up to speed. Each grant gives me three years to work on new things I want to tackle, and if the work develops a new direction or spawns a new project, I can pursue it. For all of us here at UT Southwestern lucky enough to have Welch support, it is vital in keeping our research vibrant and letting us explore new ideas."

James C. Sacchettini

The Roger J. Wolfe-Welch Chair in Science
Texas A&M University

"What really drives me is the possibility of going from basic science to a patient," Jim Sacchettini confides. "I love seeing if we can really make a difference in people's lives using discoveries in chemistry and biochemistry."

The Welch chair holder leads a lab of about 60 people – enzymologists, structural biologists and medicinal chemists including graduates, postdocs and senior scientists – to explore the proteins involved in disease to understand how they function and then synthesize new molecules to inhibit them.

The opportunity to occupy a Welch chair was part of what first drew him to A&M in 1997. "The flexibility and the ability to get research started in new areas – Welch support has been invaluable in this way," Dr. Sacchettini says.

Over the years, he has put that funding to good use. "My lab uses X-ray crystallography to better understand the relationship between proteins, their substrates and inhibitors. Tiny differences in the structure of a molecule can radically change its interactions with a protein and we are only beginning to understand all of the factors that play a role in these interactions," Dr. Sacchettini explains.

With formal training in structural biology and x-ray crystallography, Dr. Sacchettini started his research career seeking to understand at the atomic level the structures and functions of proteins that play important roles in infectious diseases. How do they function, what is their importance to the organism, can we create a crystal structure to see atomic details? Then how do we inhibit the protein, what does this do to the cell and what is the impact on human proteins that are similar to the protein from the infectious agent? He notes that advances in the field over the last 15 years have opened up the opportunity

James C. Sacchettini

to take this basic research all the way through to clinical trials for new therapies.

"This fundamental understanding of our drug targets means we are no longer shooting in the dark with a trial-and-error approach to drug discovery; it truly is rational drug design and Texas A&M is a fantastic place to pursue this type of work with access to both a range of talented scientists and students as well as the advanced technology being developed," Dr. Sacchettini says. He points to the university's resources in synthetic chemistry, computational chemistry and biochemistry as well as the vet school and downstream pre-clinical and clinical study capabilities.

Dr. Sacchettini's first interest was in infectious diseases such as tuberculosis, malaria and those caused by parasites. In more recent years he also is looking at breast and ovarian cancers and non-Hodgkin's lymphoma. "There's a lot of overlap in how we discover drugs for both infectious disease and cancer. Ultimately we're trying to figure out how to kill the bad cells while keeping the good ones alive," he says. "The problem of drug resistance is another common thread."

He reports that his lab has two discoveries being readied for clinical trials, one for ovarian cancer and one for the parasite cryptosporidium, which kills about 100,000 people, mostly children, a year. Other molecules that may be effective against TB are being optimized to produce clinical candidates.

"In so many ways, The Welch Foundation has been a catalyst for research," he says. "Chemists across the country are jealous about what we have in Texas, thanks to Mr. Welch."

Treacy L. Woods

Treacy L. Woods

Departmental Grant
Houston Baptist University

2016 marks the 27th year Houston Baptist has benefited from a Welch departmental grant, allowing the school to provide hands-on research experiences to 120 students as of May 2015. Most students choose to participate in the program for multiple semesters.

"Welch has made it possible for us to bring chemistry to so many students, meshing perfectly with our teaching mission," says professor and chemistry department chair Treacy Woods. "The research opportunity has spurred recruitment to the chemistry program and inspired many of the participants to pursue scientific careers."

Dr. Woods, who was on the faculty at the time of the first grant and helped develop the program, has watched it grow the department over the years to the current 56 chemistry majors. HBU now has six full-time chemistry faculty members as well as the college dean, an analytical chemist instrumental in bringing the research program to HBU in 1989.

The program format has stayed consistent throughout the years. HBU invites its chemistry majors to become Welch Undergraduate Chemistry Scholars and approximately 60 percent participate. They commit to four hours each week (in addition to normal course work) to work on a research project with mentoring by a faculty member. Occasionally, some enthusiastic students continue their research projects on a more intensive basis in the summer.

Dr. Woods points proudly to some students' recent accomplishments: both first and second place finishers in last year's college-wide Celebration of Scholarship symposium; winning an award for posters at an American Chemical Society conference; former Welch scholars on the faculty of other Houston universities; another recently successfully defending her doctoral thesis; a former student completing a master's program and now working for the Harris County crime lab; many pursuing graduate studies or landing good jobs in industry. Her list goes on.

"That's been the joy of it," she says. "You see students get up close and personal with matter and fall in love with the beauty of it. Welch funding lets us cherish doing basic research and trying new things. The students and faculty inspire each other about doing chemistry and stoke each other's enthusiasm. It is a wonderful dynamic. Welch helps make all these great things possible."

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
John M. Abrams	The University of Texas Southwestern Medical Center	Apoptosome Caspase Control by Tango7
Alfred K. Addo-Mensah	Texas A&M International University	The Design, Synthesis, Characterization and Binding Studies of Multivalent Polypyridine Based Macrocyclic Carbohydrate Receptors in Aqueous Solutions
Jung-Mo Ahn	The University of Texas at Dallas	Tailoring Small Molecules to Mimic Protein Helical Surfaces
Erez Lieberman Aiden	Baylor College of Medicine	Mapping Chromatin Loop Dynamics in Differentiating Hematopoetic Cells
William R. Alley, Jr.	The University of Texas at San Antonio	Synthesis of Liquid-Chromatographic Columns to Isolate Glycoproteins and Glycopeptides with Highly-Branched Glycans
Hal S. Alper	The University of Texas at Austin	Diversification of Biologically-Derived Oleochemicals through a Combinatorial Approach
Neal M. Alto	The University of Texas Southwestern Medical Center	Post-Translational Modification of Host Enzymes by Bacterial Effector Proteins
Andrea Alù	The University of Texas at Austin	Enhanced Optical Magnetism and Chirality in Plasmonic Metamaterials: Strong Molecular Sensitivity and Broadband, Giant Circular Dichroism
Vaibhav Bahadur	The University of Texas at Austin	Role of Surface Chemistry and Interfacial Charge on Methane Hydrate Nucleation
Aaron B. Baker	The University of Texas at Austin	Nanodisc-Based Delivery of Membrane Protein Therapeutics
Kenneth J. Balkus, Jr.	The University of Texas at Dallas	Zeolite Encapsulated Metal Complexes
Zachary T. Ball	Rice University	New Strategies for Catalytic Bond Formation
Jiming Bao	University of Houston	Understanding Nanocrystalline CoO as an Efficient Photocatalyst for Solar Water Splitting
David P. Barondeau	Texas A&M University	Fluorescent Probes for Interrogating Fe-S Cluster Transfer Chemistry
Jeffrey E. Barrick	The University of Texas at Austin	Comparing the Chemical Utility of Alternative Genetic Codes
Bonnie Bartel	Rice University	Novel Peroxisomal Processes in Plants
Mikhail A. Belkin	The University of Texas at Austin	Plasmonic-Enhanced Nanoscale Mid-Infrared Microscopy with Monolayer Sensitivity
Nicole A. Benedek	The University of Texas at Austin	Understanding the Crystal Chemistry of Bi-Based Perovskites
Matthew R. Bennett	Rice University	Dynamical Consequences of Protein Chemistry in Synthetic Gene Circuits
David E. Bergbreiter	Texas A&M University	Thermally Responsive Multiphase Catalyst Systems
Ricardo A. Bernal	The University of Texas at El Paso	Elucidation of a Novel Mechanism Used by a Virus Encoded Chaperonin
John W. Bevan	Texas A&M University	Structure and Dynamics of Prototypical Hydrogen Bonded and Related Interactions

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
W. E. Billups	Rice University	Chemistry of Carbon Nanomaterials
Eric R. Bittner	University of Houston	Theoretical Studies of Ultrafast and Coherent Charge-Separation Dynamics in Organic Photovoltaic Systems
Paul Blount	The University of Texas Southwestern Medical Center	Determining Lipid-Protein Interactions for a Channel Gated by Membrane Tension
Janet Bluemel	Texas A&M University	The Sonogashira Catalyst System for C-C Coupling Reactions: New Mechanistic Insights and Improved Recyclability
Jennifer S. Brodbelt	The University of Texas at Austin	Fundamentals of Photo- and Electron-Based Activation of Ions in the Gas Phase
Richard K. Bruick	The University of Texas Southwestern Medical Center	Analytical Approaches to Characterize Iron- and Oxygen-Sensing Mechanisms Governing Cellular Iron Homeostasis
Kevin Burgess	Texas A&M University	Hydrogenations of Stereochemically Complex Substrates: The End of a Messy Divorce and the Beginning of a New Romance
Shawn C. Burgess	The University of Texas Southwestern Medical Center	Dysregulation of Intracellular Lipid Synthesis During Disease
Walter G. Chapman	Rice University	Structure and Properties of Complex Fluids in the Bulk and Interfacial Regions
James R. Chelikowsky	The University of Texas at Austin	Simulating Direct Images of the Covalent Bond from Atomic Force Microscopy
Banglin Chen	The University of Texas at San Antonio	Functional Porous Metal-Organic Frameworks for Recognition of Small Molecules
Chuo Chen	The University of Texas Southwestern Medical Center	Development of Anticancer Immunotherapeutic Agents
Zheng Chen	The University of Texas Health Science Center at Houston	Molecular Mechanisms of Action of Clock-Modulating Small Molecules
Zhijian J. Chen	The University of Texas Southwestern Medical Center	Biochemical Mechanism of MAVS Activation by Prion-Like Polymerization
Cheng-Ming Chiang	The University of Texas Southwestern Medical Center	Mechanistic Action of BET Compound Inhibitors in Cancer Therapeutics
Wah Chiu	Baylor College of Medicine	Structural Studies of Viruses by Cryo-EM
Yuh Min Chook	The University of Texas Southwestern Medical Center	Mechanisms of Nuclear Export Cargo Dissociation
David T. Chuang	The University of Texas Southwestern Medical Center	Mitochondrial Signaling by Reversible Phosphorylation
Abraham Clearfield	Texas A&M University	Metal Phosphonates as Crystal Engineered Solids and Platforms for Drug Delivery
Cecilia Clementi	Rice University	Mapping the Free Energy Landscape of Proteins by Combining Theory and Experiment
Melanie H. Cobb	The University of Texas Southwestern Medical Center	Regulatory and Catalytic Properties of MAP Kinase Cascades

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
Jeffery L. Coffer	Texas Christian University	Hollow Semiconductor Nanotubes: Structural and Compositional Control
Don M. Coltart	University of Houston	New Catalytic Asymmetric Carbon-Carbon Bond Forming Methods
Jacinta C. Conrad	University of Houston	Structure and Dynamics of Attractive Nanoparticle Glasses
Nicholas K. Conrad	The University of Texas Southwestern Medical Center	Biochemical Analysis of a Nuclear Poly(A)-Dependent RNA Decay Pathway
Lydia M. Contreras	The University of Texas at Austin	*In Vivo* Structure Characterization of Catalytic RNAs by Fluorescence
David R. Corey	The University of Texas Southwestern Medical Center	Recognition of Chromosomal DNA by Synthetic Oligomers
Anthony Cozzolino	Texas Tech University	Photoisomerizable Ligands for Light Harvesting by Transition Metal Complexes
Luis G. Cuello	Texas Tech University Health Sciences Center	Crystallographic and Functional Studies in KcsA-Kv Channel Chimeras that Differ in C-Type Inactivation Properties
Pengcheng Dai	Rice University	Spin Dynamics in Single Molecular Magnets
Kevin N. Dalby	The University of Texas at Austin	Targeting MELK for Cancer Therapy
Gaudenz Danuser	The University of Texas Southwestern Medical Center	Probing Oncogenic Functions of Vimentin Filaments by Small Molecule Screens
Donald J. Darensbourg	Texas A&M University	Design and Reactivity Studies of Metal Catalysts for the Production of Polycarbonates from Novel Oxiranes and Carbon Dioxide
Marcetta Y. Darensbourg	Texas A&M University	Synthetic Analogues and Reactivity Studies of Iron, Nickel, and Zinc Biomimetic Complexes Containing Histidine, Cysteine, and Nitric Oxide as Ligands
Olafs Daugulis	University of Houston	New Methods for C-H Bond Functionalization
Bryan W. Davies	The University of Texas at Austin	High-Throughput Chemical Screening for the Discovery and Development of Antimicrobial Peptides
Jef K. De Brabander	The University of Texas Southwestern Medical Center	Novel Heterocyclizations for Natural Product Synthesis
Ralph J. DeBerardinis	The University of Texas Southwestern Medical Center	Glutamine-Dependent Reductive Carboxylation: A Metabolic Achilles' Heel in Cancer
George N. DeMartino	The University of Texas Southwestern Medical Center	Regulation of Proteasome Function by Reversible SUMOylation
H. V. Rasika Dias	The University of Texas at Arlington	Metal Complexes of Fluorinated Ligands
Michael R. Diehl	Rice University	Active Spatial Regulation of Intracellular Chemistry
Guangbin Dong	The University of Texas at Austin	Site-Selective C-H Bond Functionalization
Ivan D'Orso	The University of Texas Southwestern Medical Center	Cooperative Assembly of HIV Transcription Elongation Complexes
Michael C. Downer	The University of Texas at Austin	Femtosecond Nonlinear Spectroscopy of Column IV Nano-Interface Chemistry
Michael P. Doyle	The University of Texas at San Antonio	Selective Chemical Oxidations
Rui-Rui Du	Rice University	Microwave and Infrared Spectroscopy of 2D Atomic Crystals and Topological Insulators
Kim R. Dunbar	Texas A&M University	Magnetic and Electronic Properties of Molecular Materials: Investigation of Factors that Effect Bistability

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
F. Barry Dunning	Rice University	Studies Involving Molecules in High Rydberg States
Ron Elber	The University of Texas at Austin	Passive Transport Through Membrane
Andrew D. Ellington	The University of Texas at Austin	Thermostable T7 RNA Polymerase for Diagnostic Applications
Christopher J. Ellison	The University of Texas at Austin	Chemistry and Properties of Self-Assembly Directed Nanomaterials
Stefan K. Estreicher	Texas Tech University	Dynamics of Impurities in Semiconductors
Donglei L. Fan	The University of Texas at Austin	Investigation of a General Mechanism for Rational Synthesis of Three-Dimensional Semiconductor Nanosuperstructures by Designed Chemical Catalysts
Walter L. Fast	The University of Texas at Austin	Chemical Probes for Biological Catalysts
Michael Findlater	Texas Tech University	Base Metal Catalyzed Olefin Metathesis Reactions
Ilya J. Finkelstein	The University of Texas at Austin	Molecular Mechanisms of Replicating Through DNA Lesions
Paul F. Fitzpatrick	The University of Texas Health Science Center at San Antonio	Mechanisms of Oxidative Enzymes
Charles M. Folden III	Texas A&M University	First Chemical Investigation of Element 113
Matthew S. Foster	Rice University	Topological Matter Phases Under Extreme Duress: Dynamics and Disorder
Doug E. Frantz	The University of Texas at San Antonio	Development of Non-Traditional Catalytic Pathways of Stereodefined Enol Triflates
François P. Gabbaï	Texas A&M University	Coordination Non-Innocence of Antimony and Tellurium Ligands
Venkat Ganesan	The University of Texas at Austin	Fundamental Studies of Self-Assembly in Mixtures of Organic and Inorganic Molecules
William T. Garrard	The University of Texas Southwestern Medical Center	Formaldehyde Cross-Linking for Discovery of Novel Regulatory Elements Exhibiting Long-Range Interactions Within and Between Chromosomes
John A. Gladysz	Texas A&M University	Werner Complexes as “Organocatalysts”
Vishal M. Gohil	Texas A&M University	Phospholipid-Protein Interactions in Energy Transformation Reactions
Ido Golding	Baylor College of Medicine	Gene Regulation by Transcription Factors: Single-Molecule Chemistry in the Cell
Elizabeth J. Goldsmith	The University of Texas Southwestern Medical Center	Docking Interactions between the MAP3Ks, ASK1/TAO2 and B-Raf with their Cognate MAP2Ks, MEK6 and MEK1
John B. Goodenough	The University of Texas at Austin	Influence of Counter Cation in Mixed-Metal Oxides
David G. Gorenstein	The University of Texas Health Science Center at Houston	Combinatorial Selection and Design of Next Generation X-aptamers
Paolo Grigolini	University of North Texas	Ergodicity Breaking in Chemical, Biological and Cooperative Systems
Nick V. Grishin	The University of Texas Southwestern Medical Center	Structure Mechanism of Circadian Clock-Mediated Transcription Activation
Arnold M. Guloy	University of Houston	Chemical Bonding and Properties of “Electron-Poor” Intermetallics Along the Zintl Border
Jason H. Hafner	Rice University	Surface Enhanced Spectroscopy for Membrane Structural Biology
Naomi J. Halas	Rice University	Chemical and Photophysical Properties on Complex Nanoparticles and Nanoparticle Complexes

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
P. Shiv Halasyamani	University of Houston	Advanced Second-Harmonic Generating Materials
Michael B. Hall	Texas A&M University	Computational Chemistry on Transition Metal Systems
John C. Hardy	Texas A&M University	Nuclear Decay Studies
Rasika M. Harshey	The University of Texas at Austin	Structural Characterization of a Novel Regulator of H^+ Flow Across the Bacterial Membrane: A Potential Antimicrobial Drug Target
P. John Hart	The University of Texas Health Science Center at San Antonio	Structure and Action of a *Schistosoma mansoni* Sulfotransferase Implicated in Drug Resistance
Jeffrey D. Hartgerink	Rice University	Synthesis of Nanostructured Organic Materials via Self-Assembly
Kaden Hazzard	Rice University	Ultracold Nonreactive Molecules: From Collision Complexes to Complex Materials
Adam Heller	The University of Texas at Austin	Design of Polymeric Binder-Carbon Particle Composites of Lithium Ion Battery Electrode
Graeme Henkelman	The University of Texas at Austin	Design of Materials for Energy Conversion and Storage
W. Mike Henne	The University of Texas Southwestern Medical Center	Novel Pathways of ER-Endolysosomal Inter-Organelle Communication
Ryan E. Hibbs	The University of Texas Southwestern Medical Center	Structural Basis of Chemical Transmitter Recognition by Pentameric Ligand-Gated Ion Channels
Peter R. Hiesinger	The University of Texas Southwestern Medical Center	The Role of the V0 ATPase in SNARE-Mediated Membrane Fusion
Christian B. Hilty	Texas A&M University	Structure and Folding of Membrane Targeted Peptides
Andrew P. Hinck	The University of Texas Health Science Center at San Antonio	Structural and Mechanistic Studies of TGF-Beta Superfamily Signaling Proteins
David M. Hoffman	University of Houston	Synthesis of Metal Complexes with Sterically Encumbered Ketimide Ligands
Bradley J. Holliday	The University of Texas at Austin	Seeded Growth of Inorganic Materials within Organic Templates
Lora V. Hooper	The University of Texas Southwestern Medical Center	Engineering Antibacterial Lectins for Specific Targeting of Antibiotic-Resistant Bacteria
Jenny Hsieh	The University of Texas Southwestern Medical Center	Chemical Regulation of Adult Hippocampal Neurogenesis and Memory
Julia W.P. Hsu	The University of Texas at Dallas	Sulfur Poisoning of Complex Oxide Catalysts for Nitric Oxide (NO) Oxidation: Effect of Crystal Structure and Stoichiometry
Huey W. Huang	Rice University	Molecular Mechanism of Membrane-Acting Antibiotic Daptomycin
Randall G. Hulet	Rice University	Universal Triatomic Molecules by Association of Ultracold Atoms
Simon M. Humphrey	The University of Texas at Austin	New Poly-Carboxylated Aryl Phosphines for the Designed Synthesis of Coordination Complexes and Polymers
Gyeong S. Hwang	The University of Texas at Austin	First-Principles Investigation of the Structure, Chemistry and Function of Graphene-Like Nanomaterials
Tatyana I. Igumenova	Texas A&M University	A Novel Interaction Within Protein Kinase C Enzyme
Brent L. Iverson	The University of Texas at Austin	Understanding a New Family of Reporting Molecules
Makkuni Jayaram	The University of Texas at Austin	Complex Active Sites for Phosphoryl Transfer: Continued Chemical, Biochemical, Biophysical and Structural Analyses

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
Jean X. Jiang	The University of Texas Health Science Center at San Antonio	Identification of Sodium and Glutamine Binding of SNAT1 Amino Acid Transporter Using Matagenesis Scanning Approach
Jin Jiang	The University of Texas Southwestern Medical Center	Study of Cell Signaling at the Primary Cilium
Ning Jiang	The University of Texas at Austin	Error-Free High-Throughput Gene Sequencing
Qui-Xing Jiang	The University of Texas Southwestern Medical Center	cryoEM Studies of IP_3R in New Chemically Engineered Membranes
Youxing Jiang	The University of Texas Southwestern Medical Center	Structural and Functional Studies of RCK-Regulated Potassium Channel
Jianping Jin	The University of Texas Health Science Center at Houston	Dissection of Mechanisms for Polyubiquitin Chain Synthesis
Kenneth A. Johnson	The University of Texas at Austin	Kinetics of Hepatitis C Viral RNA-Dependent RNA Replication
Keith P. Johnston	The University of Texas at Austin	Tuning Inorganic and Organic Nanoclusters Assembled from Primary Nanoparticles
Richard A. Jones	The University of Texas at Austin	Molecular Precursors for New Functional Materials
Karl M. Kadish	University of Houston	Electrochemistry and Spectroelectrochemistry of Compounds with Multiple Redox Centers
Craig D. Kaplan	Texas A&M University	Biochemistry of the RNA Polymerase II Active Site
Adrian T. Keatinge-Clay	The University of Texas at Austin	Preparative Biocatalytic Synthesis of Complex Polyketides
Sean M. Kerwin	The University of Texas at Austin	Rearrangements of Alkynylazoles
Ching-Hwa Kiang	Rice University	Single Molecule Studies of Molecular Interactions of Biological Macromolecules
Thomas C. Killian	Rice University	Creation of Halo Molecules with an Optical Feshbach Resonance
Nayun Kim	The University of Texas Health Science Center at Houston	Locus-Specific Quantitation of Uracil Associated with Unscheduled DNA Synthesis
Tae-Kyung Kim	The University of Texas Southwestern Medical Center	Biochemical Characterization of a Novel Class of Noncoding RNAs
Douglas J. Klein	Texas A&M University at Galveston	Chemical Models: Classical to Quantum-Theoretic
Steven A. Kliewer	The University of Texas Southwestern Medical Center	Characterization of the Endogenous Ligand for the Immunomodulatory Orphan Nuclear Receptor RORγ
Che Ming Ko	Texas A&M University	Theoretical Studies of Heavy Ion Collisions
Jennifer J. Kohler	The University of Texas Southwestern Medical Center	Discovering Toxin Receptors with Photocrosslinking Sugars
Anatoly B. Kolomeisky	Rice University	Theoretical Understanding of Chemical Mechanisms of Selectivity in Transport through Channels
Junichiro Kono	Rice University	Optical, Infrared, and Terahertz Dynamics of Carbon Nanomaterials
Brian A. Korgel	The University of Texas at Austin	Nanomaterials of Earth Abundant Elements for Energy Storage and Harvesting
Donald J. Kouri	University of Houston	Supersymmetric Quantum Mechanics: Accurate Excited State Energies and Wave Functions
László Kürti	The University of Texas Southwestern Medical Center	Novel Methods and Reagents for C-C and C-N Bond Formation

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
Jaan Laane	Texas A&M University	Molecular Structures and Vibrational Potential Energy Surfaces in Ground and Excited Electronic States
Keji Lai	The University of Texas at Austin	Electrical Imaging of Chemically Intercalated Nano-Materials
David L. Lambert	The University of Texas at Austin	The Chemical Composition of Stars
Alan M. Lambowitz	The University of Texas at Austin	Thermotargetron System for Genome Engineering of Thermophiles
Christy F. Landes	Rice University	Exploiting Molecular Fluorescence to Probe Local Chemical Dynamics
Oleg Larionov	The University of Texas at San Antonio	New Enantioselective Strategies for the Synthesis of HPI Natural Products
Michael Latham	Texas Tech University	Methyl-Based NMR Investigation of a DNA Double Strand Break Repair Complex
Seongmin Lee	The University of Texas at Austin	Developing Potent Solamargine Analogs
T. Randall Lee	University of Houston	Aliphatic Xanthates and Analogs for Tailored Surfaces and Nanoparticle Coatings
Xiangyang Lei	Lamar University	New Nickel(II) σ-Aryl Complexes as Catalysts for Suzuki Cross-Coupling Reactions
Bing Li	The University of Texas Southwestern Medical Center	Biochemical and Functional Analysis of Histone Clipping
Guigen Li	Texas Tech University	Chiral *N*-Phosphonylimines-Controlled Asymmetric Reactions of Halo Enolates
Pingwei Li	Texas A&M University	The Structural Basis of Microbial DNA Sensing in Innate Immunity
Wei Li	Rice University	Nuclear Chemistry at Trillion Degrees
Xiaoqin (Elaine) Li	The University of Texas at Austin	Surface Plasmon Enhanced Spectroscopic Rulers
Roger L. Lichti	Texas Tech University	Muonium Defect Chemistry in Functional Oxides
Paul A. Lindahl	Texas A&M University	Characterization of Low-Molecular-Mass Iron and Manganese Complexes in Eukaryotic Cells
Stephan Link	Rice University	Chemistry Meets Surface Plasmons
Jen Liou	The University of Texas Southwestern Medical Center	Novel Imaging Probes for Investigating ER-Plasma Membrane Junctions
Hung-wen Liu	The University of Texas at Austin	Mechanistic Studies of Novel Enzymes
Jun Liu	The University of Texas Health Science Center at Houston	High-Resolution Structure Determination of Molecular Machines *in situ* by Cryo Electron Tomography
Qinghua Liu	The University of Texas Southwestern Medical Center	Mechanistic Studies of the Drosophila RNA Interference Pathway
Wenshe Liu	Texas A&M University	Biosensors for Small Molecules and Enzymes
Xin Liu	The University of Texas Southwestern Medical Center	Structural Basis and Chemical Modulation of Gene Silencing by Polycomb Repressive Complex 2
Yi Liu	The University of Texas Southwestern Medical Center	Biochemical Analysis of an RNA Interface Pathway
Steve W. Lockless	Texas A&M University	The Structural Basis for Lipid Regulation of Membrane Protein Function
Jun Lou	Rice University	Development of Nanomaterials for Low Cost Solar Energy Harvesting

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
Carl J. Lovely	The University of Texas at Arlington	Total Synthesis of Imidazole-Containing Natural Products
Vassiliy Lubchenko	University of Houston	Predicting the Structure of Complex Inorganic Solids
Robert R. Lucchese	Texas A&M University	Reaction Dynamics Probed by Molecular-Frame Photoionization
Lawrence Lum	The University of Texas Southwestern Medical Center	Modulation of Canonical Wnt Pathway Activity Using Small Molecules
Lloyd L. Lumata	The University of Texas at Dallas	Tracking Amino Acid Metabolism in Cancer in Real-Time Using Hyperpolarized ^{13}C Magnetic Resonance
Jodie L. Lutkenhaus	Texas A&M University	Discovering the Rich Electrochemistry of Nitroxide Radical-Modified Conjugated Polymers
Igor Lyuksyutov	Texas A&M University	Chemical Dynamics of Cold/Ultracold Molecules and Atomic Hydrogen
Jianpeng Ma	Baylor College of Medicine	Biochemical Study of the Fusogenic Conformational Transition of Influenza Hemagglutinin
Allan H. MacDonald	The University of Texas at Austin	Electronic Properties of Graphene
Frederick M. MacDonnell	The University of Texas at Arlington	Proton-Coupled Electron Transfer Mechanisms of DNA Cleavage by Photoexcited and Ground-State Ruthenium Polypyridyl Complexes
John B. MacMillan	The University of Texas Southwestern Medical Center	Role of Non-Enzymatic Transformations in Natural Product Biosynthesis
Dmitrii E. Makarov	The University of Texas at Austin	Theory and Simulations of Single-Molecule Dynamics
David J. Mangelsdorf	The University of Texas Southwestern Medical Center	Ligand Binding Properties of Nematode Orphan Nuclear Receptors
Arumugam Manthiram	The University of Texas at Austin	Synthesis and Properties of Transition Metal Oxides with Unusual Valence States
Edward M. Marcotte	The University of Texas at Austin	A Mass Spectrometry-Based Map of Universally-Shared Animal Protein Complexes
Paul Marshall	University of North Texas	Kinetic and Product Studies of Complex-Forming Reactions in the Gas-Phase
Angel A. Marti-Arbona	Rice University	Ruthenium(II) Photoluminescent Probes for Sensing Amyloid-B Oligomers in Real-Time
Caleb D. Martin	Baylor University	New Powerful Lewis Acids as Metal-Free Catalysts
Stephen F. Martin	The University of Texas at Austin	Synthesis of Biologically Relevant Molecules
Elisabeth D. Martinez	The University of Texas Southwestern Medical Center	Small Molecule Inhibitors Selectively Targeting Malaria Epigenetic Enzymes
Andreas Matouschek	The University of Texas at Austin	Structure and Function of a Nano-Scale Biological Machine
Seiichi P.T. Matsuda	Rice University	Terpene Biosynthesis
Jeremy A. May	University of Houston	The Total Synthesis of Bioactive Natural Products via Novel Strategies
Jennifer A. Maynard	The University of Texas at Austin	Control of Protein Folding Quality: Portable Sequence Determinants of Antibody Stability
Kevin McBride	The University of Texas M. D. Anderson Cancer Center	Small Molecule Inhibitors of Epigenetic Effector Proteins
Ognjen Š. Miljanić	University of Houston	Shape-Persistent Fluorophores Based on Benzimidazoles and Tetrasubstituted Silanes
Delia J. Milliron	The University of Texas at Austin	Plasmonic Transparent Conducting Oxide Nanocrystals: Dopant Chemistry and Heterogeneity

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
Nancy S. Mills	Trinity University	Novel Approaches to the Synthesis of Antiaromatic Dications and Dianions
Hamid Mirzaei	The University of Texas Southwestern Medical Center	Development of a Fully Automated 3D Separation Platform for Deep Proteome Fractionation: Application in Novel Drug Discovery Towards Detection of Low Abundance Targets of Small Molecules
Daniel M. Mittleman	Rice University	Terahertz Spectroscopic Investigation of the Co_2–CH_4 Hydrate Replacement Reaction
Emilia Morosan	Rice University	Novel Phases and Ground States in Valence-Fluctuating Intermetallics
Charles B. Mullins	The University of Texas at Austin	Nano-Structured Materials for Chemistry
Siegfried Musser	Texas A&M University Health Science Center	Signal Peptide Interactions During Transport by the Bacterial Tat Machinery
Yunsun Nam	The University of Texas Southwestern Medical Center	Structure and Function Relationship of microRNA Precursors
Douglas Natelson	Rice University	Novel Single- and Few-Molecule Vibrational Spectroscopies
Joseph B. Natowitz	Texas A&M University	Nuclear Reaction Studies
Donald G. Naugle	Texas A&M University	The Influence of Reduced Dimensionality, Disorder, and Interfaces on the Properties of Solids
Andriy Nevidomskyy	Rice University	Magnetic Anisotropy and Ordering in Molecular and Solid-State Magnets: First-Principles Calculations and Effective Spin Theory
Kyriacos C. Nicolaou	Rice University	Synthesis of Biologically Active Molecules
Deepak Nijhawan	The University of Texas Southwestern Medical Center	Expanding the Druggable Genome
Michael Nippe	Texas A&M University	Synthetic Strategies for the Preparation of Supramolecular and Covalent Cage Structures Containing Carborane Moieties
Qian Niu	The University of Texas at Austin	Band Engineering for Topological Properties in Graphene Like Systems
Peter J.A. Nordlander	Rice University	Theoretical Investigations of Chemical Properties of Nanosystems
Michael V. Norgard	The University of Texas Southwestern Medical Center	Structure and Function of a Novel Bacterial Regulator
Simon W. North	Texas A&M University	Fundamental Imaging Studies of Chemical Reactivity
Kathryn A. O'Donnell	The University of Texas Southwestern Medical Center	Dissecting Novel Mechanisms of Lung Cancer Pathogenesis
John S. Olson	Rice University	Chemical Mechanisms of Ligand Binding to Heme Proteins
Mohammad A. Omary	University of North Texas	Ground- and Excited-State Bonding Assortments in Luminescent Molecules and Corresponding Excitons
José Onuchic	Rice University	Expanding the Protein Folding Landscape Towards Biomolecular Machines
Kim Orth	The University of Texas Southwestern Medical Center	Elucidate the Biochemical Mechanism used by *Vibrio* VopQ to Induce Autophagy
Oleg V. Ozerov	Texas A&M University	Highly Unsaturated Cationic Group 10 Transition Metal Pincer Complexes
Jeremy C. Palmer	University of Houston	Metastable Liquid-Liquid Phase Transitions in Molecular Models of Tetrahedral Fluids

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
Keith H. Pannell	The University of Texas at El Paso	Siloxymethylamines: Masked Amination Reagents for New Metal Ligands
Chandrashekhar Pasare	The University of Texas Southwestern Medical Center	Biochemical Role of IRAK-1 in Regulating Caspase-1 Activation and Cleavage
Matteo Pasquali	Rice University	Physical Chemistry of Graphene Fluids
Margaret A. Phillips	The University of Texas Southwestern Medical Center	Purine Salvage Pathways as Potential Drug Targets in *Trypanosoma brucei*
Lionel W. Poirier	Texas Tech University	New Methodologies for Accurate Quantum Calculations of the Dynamics of Atomic Nuclei
Patrick Ryan Potts	The University of Texas Southwestern Medical Center	Therapeutic Targeting of Melanoma Antigen (MAGE) Genes
B. V. Venkataram Prasad	Baylor College of Medicine	X-ray Crystallographic Studies on Viruses and Viral Proteins
Han Pu	Rice University	Exotic Molecules from Spin-Orbit Coupled Ultracold Atoms
Emily L. Que	The University of Texas at Austin	Exploring the Use of Cu(II) in ^{19}F Magnetic Resonance Contrast Agents for Imaging Biological Redox
Florante A. Quiocho	Baylor College of Medicine	Structure-Function Relationships in Proteins
Arun Radhakrishnan	The University of Texas Southwestern Medical Center	Fluorescent Sensors for Measuring Cholesterol in Live Cells
Mark G. Raizen	The University of Texas at Austin	Molecular Microscopy in Space and in Time
Rama Ranganathan	The University of Texas Southwestern Medical Center	Structural Principles of Protein Robustness and Evolvability
Hai Rao	The University of Texas Health Science Center at San Antonio	The Last Leg of p53's Journey to Death Chamber
Frank M. Raushel	Texas A&M University	Enzyme Reaction Mechanism
Joseph M. Ready	The University of Texas Southwestern Medical Center	Catalytic Synthesis and Application of Substituted Ynol Ethers
Linda E. Reichl	The University of Texas at Austin	Relaxation Processes in Small Molecules and Quantum Coherent Systems
Pengyu Ren	The University of Texas at Austin	Multiscale Modeling of RNA 3D Structure
Peter M. Rentzepis	Texas A&M University	Time and Space Resolved Chemical and Biological Reaction Intermediates
Michael G. Richmond	University of North Texas	Synthesis and Reactivity Studies of Polynuclear Clusters
Jeffrey D. Rimer	University of Houston	Physicochemical Factors Governing Protein Inhibition of Calcium Oxalate Monohydrate Crystallization
Jose Rizo Rey	The University of Texas Southwestern Medical Center	NMR Methods to Study Membrane Proteins in Lipid Bilayers
Sean T. Roberts	The University of Texas at Austin	Mapping Singlet Exciton Fission and Energy Transport Pathways in Perylene Diimide Thin Films and Crystals with Femtosecond Time-Resolved Spectroscopy
Jon D. Robertus	The University of Texas at Austin	Mechanism of Folate-Dependent Methylation
Grigory Rogachev	Texas A&M University	The Origin of Chemical Elements in the Universe
Daniel Romo	Texas A&M University	Novel Strategies for Bioactive Natural Product Synthesis via β-Lactone Intermediates and New Methodology for Asymmetric Alkylations
Michael J. Rose	The University of Texas at Austin	Imparting Precious Metal Properties by Heavy Atom Ligation

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
Michael K. Rosen	The University of Texas Southwestern Medical Center	2D Phase Separated Protein Polymers: Composition, Dynamics and Lipid Interactions
Daniel M. Rosenbaum	The University of Texas Southwestern Medical Center	Structural Studies of Active and Inactive Conformations of G Protein-Coupled Receptors
Joseph H. Ross, Jr.	Texas A&M University	Magnetism and Anharmonic Lattice Vibrations in Clathrates and Related Materials
Rick Russell	The University of Texas at Austin	Investigation of RNA Misfolding during Transcription
Sandra L. Schmid	The University of Texas Southwestern Medical Center	Conformational Dynamics and Regulation of Dynamin
J. Martin Scholtz	Texas A&M University Health Science Center	Forces Involved in Protein Folding and Stability
Hans A. Schuessler	Texas A&M University	Optical Studies of Ultra Cold Molecular Ions Using Femtosecond and XUV Laser Radiation
Marlan O. Scully	Texas A&M University	Quantum Coherence Effects in Chemical and Laser Physics
Laura Segatori	Rice University	Physicochemical Properties of Nanoparticles at the Interface with Biological Systems
Philip Serwer	The University of Texas Health Science Center at San Antonio	Structural Chemistry of Viruses
Jonathan L. Sessler	The University of Texas at Austin	Molecular Recognition and Self-Assembly via Anion Binding
Libo Shan	Texas A&M University	Biochemical and Regulatory Constraints of Immune Sensors
Bryan F. Shaw	Baylor University	Asparagine Deamidation in Motor Neurons: A Molecular Clock or a Ticking Time Bomb?
Jason B. Shear	The University of Texas at Austin	Laser-Mediated Imprinting of Biomaterials for Real-Time Control of Cellular Environments
Matthew Sheldon	Texas A&M University	Hot Carrier Up-Conversion Luminescence in Nanocrystal Heterostructures
A. Dean Sherry	The University of Texas at Dallas	Lanthanide-Based CEST Agents for Molecular Imaging
Xiaobing Shi	The University of Texas M. D. Anderson Cancer Center	Molecular Mechanisms of JARID1B PHD Fingers in Recognition of Histone Methylation
Chih-Kang Shih	The University of Texas at Austin	Quantum Control of Light-Matter Interactions in Metallic Quantum Structures
Qimiao Si	Rice University	Theoretical Studies of Electronic Dynamics and Correlations in Carbon-Based and Related Nanostructures
Daniel J. Siegwart	The University of Texas Southwestern Medical Center	Smart, Linear-Dendritic Block Copolymers to Increase siRNA Release in Response to pH
Alexei V. Sokolov	Texas A&M University	Applications of Molecular Coherence in Ultrafast Optics
Dong Hee Son	Texas A&M University	Dark Exciton in the Energy Transfer Process of Semiconductor Nanocrystals
Zhou Songyang	Baylor College of Medicine	Novel Activity of the Telomere Regulator TIN2 in the Mitochondria
John F. Stanton	The University of Texas at Austin	Studies in Quantum Chemistry
Mihaela C. Stefan	The University of Texas at Dallas	Polythiophene Block Copolymers: A Systematic Investigation of Morphology-Optoelectronic Properties Dependence
Keith J. Stevenson	The University of Texas at Austin	Synthesis of Mesoporous Carbon and Metal Oxide Architectures

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
Paul D. Straight	Texas A&M University	Identification of Antibiotic Resistance and Modifying Enzymes from Bacterial Competitive Interactions
Wu Pei Su	University of Houston	Direct Phasing in Macromolecular Crystallography
Jeffrey J. Tabor	Rice University	Characterizing the Ligand Binding Properties of Bacterial Sensor Histidine Kinases from the Human Gut
Uttam K. Tambar	The University of Texas Southwestern Medical Center	Stereoselective Allylic Functionaliztion of Olefins
Yizhi Jane Tao	Rice University	Catalytic Mechanism of Astrovirus RNA Replication
Thomas S. Teets	University of Houston	Fine Tuning of Molecular Catalysts and Photosensitizers via Synthetic Allostery
Jonathan R. Terman	The University of Texas Southwestern Medical Center	Chemistry and Enzymology of MICAL Family Oxidoreductases
Isabell Thomann	Rice University	Advanced Femtosecond Optical *in situ* Probes for Photocatalysis
Randolph P. Thummel	University of Houston	6-5 Chelators: A New Paradigm in Polypyridine Chemistry
Chin Sen Ting	University of Houston	Study of Superconductivity and Related Subjects in Strongly Correlated Electron Systems
Frank K. Tittel	Rice University	Application of Mid-Infrared Quantum Cascade and Diode Lasers to High-Precision Atmospheric Trace Gas Monitoring
Zachary J. Tonzetich	The University of Texas at San Antonio	Fundamental Coordination Chemistry of Biologically Relevant Small Molecules
Thomas M. Truskett	The University of Texas at Austin	Liquids Near Interfaces: Single-Molecule and Collective Dynamics
Francis T.F. Tsai	Baylor College of Medicine	Structural and Mechanistic Studies of ATP-Driven Protein Machines
Benjamin P. Tu	The University of Texas Southwestern Medical Center	Selective Regulation of Autophagy by Metabolic State
Adam R. Urbach	Trinity University	Protein Recognition and Labeling via Supramolecular Protease Inhibition
Kosaku Uyeda	The University of Texas Southwestern Medical Center	Biochemical Mechanisms of the Glucose Sensing and Regulation of ChREBP Activity
Rafael Verduzco	Rice University	Charge Separation in Well-Defined Donor-Acceptor Block Copolymer Interfaces
Eric J. Wagner	The University of Texas Health Science Center at Houston	Cryo-EM Analysis of the Integrator Complex
Yihong Wan	The University of Texas Southwestern Medical Center	Biochemical Characterization of PAFAH Regulation by Macrophage VLDLR
Jin Wang	Baylor College of Medicine	Plasmon Assisted Photonanomedicines for Cancer Therapies
Qinghua Wang	Baylor College of Medicine	Chemical Mechanisms of Coordinated Epigenetic Regulations in Cells
Yuhong Wang	University of Houston	The Kinetics and Conformational Changes During Peptidyl Transferase Reaction in Single Ribosome
Zhigao Wang	The University of Texas Southwestern Medical Center	Biochemical Identification of Proteases Involved in Necrotic Cell Death
Coran Watanabe	Texas A&M University	*Streptomyces sahachiroi*: A Rich Treasure Trove of Unique Biosynthetic Reactions
Lauren J. Webb	The University of Texas at Austin	The Physical Chemistry of Biological Interfaces

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
R. Bruce Weisman	Rice University	Photostudies of Carbon Nanostructures
Kenneth D. Westover	The University of Texas Southwestern Medical Center	Characterization of Covalent K-Ras Inhibitors
Steven E. Wheeler	Texas A&M University	Harnessing the Power of Non-Covalent Interactions for Organocatalysis
Robert L. Whetten	The University of Texas at San Antonio	Clusters as Molecular Surfaces: Modification of Selected Noble-Metal Thiolates
Michael A. White	The University of Texas Southwestern Medical Center	Analysis of the Functional Significance of Complex Protein/ Protein Interactions
Christian P. Whitman	The University of Texas at Austin	Structure Function Relationships in Enzymes
Kenton H. Whitmire	Rice University	The Chemistry of Nanomolecules
Katherine A. Willets	The University of Texas at Austin	Characterizing Site-Specific Ligand Binding on Metal Nanoparticle Conjugates by High Resolution Far-Field Optical Microscopy
C. Grant Willson	The University of Texas at Austin	Programmed Self-Assembly of Nanostructures
Lon J. Wilson	Rice University	Carbon Nanocapsules for Advanced Imaging Applications
Sebastian E. Winter	The University of Texas Southwestern Medical Center	Metabolism of Salmonella Typhimurium in the Inflamed Gut
Blerta Xhemalce	The University of Texas at Austin	Regulation of Gene Expression Through Chemical Modifications of RNA
Miguel Jose Yacaman	The University of Texas at San Antonio	Tri and Multi Metallic Nanoparticles a Novel Approach to Control Shape, Size, Structure and Properties of Nanoparticles
Boris I. Yakobson	Rice University	Science of Nearly-1D Materials: From Nanotubes to Nanowires
Nan Yan	The University of Texas Southwestern Medical Center	Tail-Anchor of a Critical Innate Immunity Regulator TREX1 on the ER
Ding-Shyue Yang	University of Houston	Ultrafast Structural Dynamics of Molecular Assemblies at Interfaces
Felix Yarovinsky	The University of Texas Southwestern Medical Center	The Structural Basis of Parasite Recognition by TLR11 and TLR12 Receptors
Jin Ye	The University of Texas Southwestern Medical Center	Saturated Fatty Acid-Induced Lipotoxicity
Danny L. Yeager	Texas A&M University	Developments and Studies using Several Complex Scaled Multiconfigurational Methods for Electron Atom/Molecule Resonances
Hsin-Chih Yeh	The University of Texas at Austin	NanoCluster Beacons for Highly Specific DNA Methylation Detection
Sherry J. Yennello	Texas A&M University	The Equation of State for a Two-Component Nuclear System
Hye-Jeong Yeo	University of Houston	Structural Studies of Novel Lipoproteins
Guihua Yu	The University of Texas at Austin	Probing the Charge Storage Mechanisms of Molecularly-Assembled Two-Dimensional Nanochalcogenides
Hongtao Yu	The University of Texas Southwestern Medical Center	Biochemical and Structural Analysis of Sister-Chromatid Cohesion
Yonghao Yu	The University of Texas Southwestern Medical Center	Large-Scale Isolation and Identification of Poly-ADP-Ribosylated Proteins

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
Anvar A. Zakhidov	The University of Texas at Dallas	Electrochemically Tuned Solar Cell Fibers Based on Organic-Inorganic Perovskites
Chengcheng Zhang	The University of Texas Southwestern Medical Center	Small Molecule Modulators of Angptl Receptor for Stem Cell Expansion and Leukemia Treatment
Chun-Li Zhang	The University of Texas Southwestern Medical Center	Biochemical Regulation of the Orphan Nuclear Receptor TLX
David Yu Zhang	Rice University	Native Characterization of DNA and RNA Structure Thermodynamics
Junjie Zhang	Texas A&M University	The Structural Basis of Ribosomal Silencing in Tuberculosis
Renyi Zhang	Texas A&M University	Chemical Kinetics and Mechanism of Hydrocarbon Oxidation Reactions
Xuewu Zhang	The University of Texas Southwestern Medical Center	Structural Basis for the Interaction between Class B Plexins and PDZ-RhoGEF/LARG
Yan Jessie Zhang	The University of Texas at Austin	Chemical Sensors to Determine Proline Isomeric Specificity of RNA Polymerase II
John C.-G. Zhao	The University of Texas at San Antonio	Expeditious Modification of Organocatalyst Structures for Improved Stereoselectivities
Aleksei M. Zheltikov	Texas A&M University	Optical Detection of Ultrafast Electron Dynamics and Electron-Initiated Chemical Processes
Junrong Zheng	Rice University	Multiple-Dimensional Optical Spectroscopy
Qing Zhong	The University of Texas Southwestern Medical Center	Regulation of the Class III PI3K by Nutrient-Sensing Kinases in Autophagy
Hong-Cai Joe Zhou	Texas A&M University	Efficient Carbon Capture with Functionalized Porous Polymer Networks (PPNs)

Abilene Christian University
Angelo State University
Austin College
Hardin-Simmons University
Houston Baptist University
Huston-Tillotson University
Jarvis Christian College
Lamar University
LeTourneau University
Lubbock Christian University
McMurry University
Midwestern State University
Our Lady of the Lake University
Prairie View A&M University
St. Edward's University
St. Mary's University
Sam Houston State University
Schreiner University
Southwestern University
Stephen F. Austin State University
Tarleton State University
Texas A&M University-Commerce
Texas A&M University-Corpus Christi
Texas A&M University-Kingsville
Texas Lutheran University
Texas Wesleyan University
Texas Woman's University
Trinity University
University of Dallas
University of Houston-Clear Lake
University of Houston-Downtown
University of Mary Hardin-Baylor
University of St. Thomas
The University of Texas at Tyler
The University of Texas of the Permian Basin
The University of Texas Rio Grande Valley
University of the Incarnate Word
Wayland Baptist University
West Texas A&M University

ENDOWED CHAIRS

INSTITUTION	CHAIRHOLDER AND CHAIR NAME
Baylor College of Medicine	M. Zouhair Atassi, Welch Chair in Chemistry
Baylor College of Medicine	David D. Moore, The R. P. Doherty, Jr.-Welch Chair in Science
Baylor College of Medicine	Theodore G. Wensel, Welch Chair in Chemistry
Baylor University	John L. Wood, Welch Chair in Chemistry
Rice University	Andrew R. Barron, The Charles W. Duncan, Jr.-Welch Chair in Chemistry
Rice University	Gustavo E. Scuseria, Welch Chair in Chemistry
Rice University	Peter Wolynes, The D. R. Bullard-Welch Chair in Science
Texas A&M University	Tadhg P. Begley, Welch Chair in Chemistry
Texas A&M University	James C. Sacchettini, The Roger J. Wolfe-Welch Chair in Science
Texas A&M University	Karen L. Wooley, The W. T. Doherty-Welch Chair in Chemistry
Texas A&M University	Hongcai Joe Zhou, Welch Chair in Chemistry
Texas A&M University Health Science Center	Vytas A. Bankaitis, The E. L. Wehner-Welch Chair in Chemistry
Texas A&M University Health Science Center	Cheryl Lyn Walker, Welch Chair in Chemistry
Texas A&M University Health Science Center*	Welch Chair in Chemistry
Texas Christian University	Eric E. Simanek, Welch Chair in Chemistry
Texas Tech University	William L. Hase, Welch Chair in Chemistry
Texas Tech University Health Sciences Center	Vadivel Ganapathy, Welch Chair in Biochemistry
University of Houston	Olafs Daugulis, Welch Chair in Chemistry
University of Houston	Jan-Åke Gustafsson, Welch Chair in Chemistry
University of Houston	Allan J. Jacobson, Welch Chair in Science
University of North Texas	Weston Thatcher Borden, Welch Chair in Chemistry
University of North Texas Health Science Center	Laszlo Prokai, Welch Chair in Biochemistry
The University of Texas at Arlington	Daniel W. Armstrong, Welch Distinguished University Chair in Chemistry
The University of Texas at Austin	Eric V. Anslyn, Welch Regents Chair in Chemistry
The University of Texas at Austin	Allen J. Bard, The Norman Hackerman-Welch Regents Chair in Chemistry
The University of Texas at Austin	Richard M. Crooks, Welch Chair in Chemistry (Materials Chemistry)
The University of Texas at Austin	Michael J. Krische, Welch Chair in Science
The University of Texas at Austin	Dave Thirumalai, Welch Chair in Chemistry
The University of Texas at Austin	Steven Weinberg, The Jack S. Josey-Welch Chair in Science
The University of Texas at Austin*	The Marvin K. Collie-Welch Regents Chair in Chemistry
The University of Texas at Austin*	The R. P. Doherty, Jr.-Welch Regents Chair in Chemistry
The University of Texas at Austin*	The Richard J.V. Johnson-Welch Regents Chair in Chemistry
The University of Texas at Dallas	Ray H. Baughman, Welch Chair in Chemistry
The University of Texas at Dallas*	Welch Chair in Chemistry
The University of Texas at El Paso	Luis Echegoyen, Welch Chair in Chemistry
The University of Texas at San Antonio*	Welch Chair in Chemistry
The University of Texas at San Antonio*	Welch Chair in Chemistry
The University of Texas Health Science Center at Houston	Zhiqiang An, Welch Chair in Chemistry
The University of Texas Health Science Center at Houston	John L. Spudich, Welch Chair in Chemistry
The University of Texas Health Science Center at San Antonio	Bettie Sue Masters, Welch Chair in Chemistry
The University of Texas Health Science Center at San Antonio*	Welch Chair in Chemistry
The University of Texas M. D. Anderson Cancer Center	Andrew Futreal, Welch Chair in Chemistry
The University of Texas M. D. Anderson Cancer Center	John A. Tainer, Welch Chair in Chemistry
The University of Texas Medical Branch at Galveston	James C. Lee, Welch Chair in Chemistry
The University of Texas Medical Branch at Galveston	B. Montgomery Pettitt, Welch Chair in Chemistry
The University of Texas Southwestern Medical Center	J. Russell Falck, Welch Chair in Chemistry
The University of Texas Southwestern Medical Center	Eric N. Olson, Welch Chair in Science

**Chair not filled*

STATEMENTS OF FINANCIAL POSITION

AS OF AUGUST 31, 2015 AND 2014

ASSETS	2015	2014
CASH AND CASH EQUIVALENTS	$ 1,788,185	$ 1,242,412
INVESTMENTS	637,794,514	694,405,266
RECEIVABLES:		
Investment transactions	1,982,134	1,836,131
Interest and dividends	435,189	465,335
Other	280,436	389,328
Total receivables	2,697,759	2,690,794
OTHER ASSETS	909,582	1,577,670
TOTAL	$ 643,190,040	$ 699,916,142
LIABILITIES AND NET ASSETS		
LIABILITIES:		
Unpaid grants	$ 20,726,250	$ 22,562,250
Deferred federal excise tax payable	1,138,261	2,583,949
Accounts payable and other	553,426	551,114
Investment transactions payable	1,779,324	792,465
Total liabilities	24,197,261	26,489,778
NET ASSETS	618,992,779	673,426,364
TOTAL	$ 643,190,040	$ 699,916,142

STATEMENTS OF ACTIVITIES

AS OF AUGUST 31, 2015 AND 2014

	2015	2014
REVENUES:		
Interest	$ 1,400,165	$ 1,748,947
Dividends	3,669,455	4,561,036
Oil and gas royalties and other	1,964,865	3,308,839
Total revenues	7,034,485	9,618,822
EXPENSES:		
Investment advisory and custodial fees	3,689,960	3,343,513
General and administrative	2,808,631	2,694,555
Federal excise tax provision on net investment income	94,375	104,232
Property and production taxes	166,651	209,845
Advisory board fees and expenses	501,667	460,000
Total expenses	7,261,284	6,812,145
GRANTS APPROVED - Net	(28,722,825)	(34,194,525)
NET REALIZED GAINS ON SALES OF INVESTMENTS AND OTHER ASSETS	40,500,137	28,219,873
UNREALIZED (DEPRECIATION) APPRECIATION OF INVESTMENTS	(66,450,529)	66,707,458
(DECREASE) INCREASE IN PREPAID PENSION COST	(604,867)	103,807
FEDERAL EXCISE TAX ON REALIZED CAPITAL GAINS	(374,390)	(644,477)
DEFERRED FEDERAL EXCISE TAX BENEFIT (PROVISION) ON UNREALIZED CAPITAL GAINS	1,445,688	(1,172,288)
CHANGE IN NET ASSETS	(54,433,585)	61,826,525
NET ASSETS, beginning of year	673,426,364	611,599,839
NET ASSETS, end of year	$ 618,992,779	$ 673,426,364

For the Foundation's complete audited financial statements, please visit www.welch1.org.

2015 ANNUAL REPORT SUPPLEMENT

The Supplement to the 2015 Welch Foundation Annual Report is available online at www.welch1.org and includes:

- 59th Conference on Chemical Research Program
- Welch Conference on Chemical Research 1957-2015
- Welch Award Recipients 1972-2015
- Hackerman Award Recipients 2002-2015
- Principal Investigators Listed Alphabetically
- Abstracts of Current Investigations
- Publications by Principal Investigators Reported During 2014-2015

THE Welch FOUNDATION

Advancing Chemistry. Improving Life.

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