Advancing Chemistry.
Improving Life.

ANNUAL REPORT

2016

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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Advancing Basic Research in Chemistry, Improving Lives

Fiscal year 2016 saw the Foundation's endowment reach $637 million. From inception through the end of the year, the Foundation has provided some $837 million in actual-dollar support for basic research in chemistry. The year also saw a continuation of efforts to raise the profile of the Foundation, through social media and advertising commemorating the Welch Award and Hackerman Award recipients.

Rebecca and Norbert Dittrich, Welch president, with Janet and Ernie Cockrell, board member, at the Welch award banquet.

In February, the 2016 Norman Hackerman Award in Chemical Research was presented to Christopher J. Ellison at The University of Texas at Austin. The chemical engineer was honored for his groundbreaking work combining fundamental chemistry with engineering to tackle real-world problems.

Welch SAB Chair Peter Dervan (left), UT Austin Cockrell School of Engineering Dean Sharon Wood, and Welch Chair Charles Tate (far right) congratulate 2016 Hackerman Awardee Chris Ellison.

The annual research conference in October focused on "Frontiers in Imaging," attracted approximately 500 attendees to learn from 12 speakers discussing the latest advances in medicine and materials made possible by new technology that allows us to "see" at the molecular level. The brainchild of Scientific Advisory Board member Ahmed H. Zewail, the conference also featured a tribute to this renowned chemist and 1997 Welch Award recipient who sadly passed away in August 2016.

Also in October, the Foundation saluted co-recipients of the 2016 Robert A. Welch Award in Chemistry, Richard H. Holm of Harvard University and Stephen J. Lippard of Massachusetts Institute of Technology for their pioneering work creating the field of bioinorganic chemistry studying the roles of metals in biology. The two shared the $500,000 award.

On the governance side starting in fall 2016, the Foundation welcomed three auxiliary advisory board members to its ranks: Frederick W. Brazelton, Douglas L. Foshee and Gina A. Luna. With several board members nearing retirement, the auxiliary members will be prepared to fulfill the responsibilities of guiding the business of the Foundation.

Welch SAB Chair Peter Dervan, Chair Charles Tate and President Norbert Dittrich at the Welch research conference.

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 and Officers

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

Charles W. Tate
Chair and Director

Wilhelmina E. (Beth) Robertson
Director

Carin Marcy Barth
Vice Chair and Director

Norbert Dittrich
President

Robert C. Robbins, MD
Treasurer and Director

Douglas L. Foshee
Auxiliary Advisory Board

Ernest H. Cockrell
Secretary and Director

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

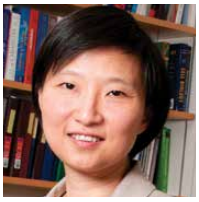
Jennifer A. Doudna
University of California, Berkeley

Peter G. Schultz
The Scripps Research Institute

Marye Anne Fox
University of California, San Diego

James L. Skinner
University of Chicago

Joseph L. Goldstein
The University of Texas Southwestern Medical Center



Xiaowei Zhuang
Harvard University

Roger D. Kornberg
Stanford University Medical School

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

Bioinorganic Pioneers Reveal Metals' Key Role in Biology

Dema Faham; Bengt Nordén and Wah Chiu, conference session leaders; and Xiaowei Zhuang, SAB member, enjoy visiting at the Welch Award banquet.

We now know metals are central to many biological functions: carrying oxygen throughout the body, facilitating information flow in the brain and converting oxygen to water, to name just a few. The 2016 co-recipients of the Robert A. Welch Award in Chemistry made that critical connection between metals and biology, pioneering the increasingly important field of bioinorganic chemistry. Richard H. Holm, Harvard University, and Stephen J. Lippard, Massachusetts Institute of Technology, were honored for their contributions at the Foundation's Oct. 24 banquet and shared the $500,000 Welch Award.

"Both Dr. Holm and Dr. Lippard represent the intrinsic mission of The Welch Foundation – to improve the lives of others through the advancement of chemical research," said Charles W. Tate, Welch chair. "In addition to their important contributions to the scientific and medical communities, they are both respected as remarkable mentors and teachers, helping to usher in future generations of scientists."

Dick Holm is a trailblazer who pioneered the synthesis of molecules in the advancement of inorganic chemistry to understand the important role metals play in biological processes. His hallmark is his scientific integrity in which rigorous analysis and thorough explorations validate his findings from multiple perspectives.

Throughout his 50-year career, Dr. Holm has created what he calls "credible representations" of a broad range of increasingly complex natural materials in order to study how they are formed and how they function. His creative approach, bolstered by elegant and careful analysis, established the basis for the field and continues to underlie the work of new generations of scientists.

"In my career, I regard my function as pure inquiry: identifying good problems and taking them to some kind of logical conclusion," Dr. Holm said. "The greatest advances are often made by people interested in pure research, and The Welch Foundation should be commended for supporting good people asking broad questions."

His body of meticulous scientific research has provided the chemical and intellectual framework that is leading to important discoveries in the diagnosis and treatment of disease. Among other accomplishments, he developed a rational approach to synthesis of biomimetic low molecular weight complexes that duplicate biological Fe-S centers.

Dr. Holm received his undergraduate degree from the University of Massachusetts-Amherst and his Ph.D. from MIT. He served on the faculties of the University of Wisconsin, MIT and Stanford University before joining Harvard in

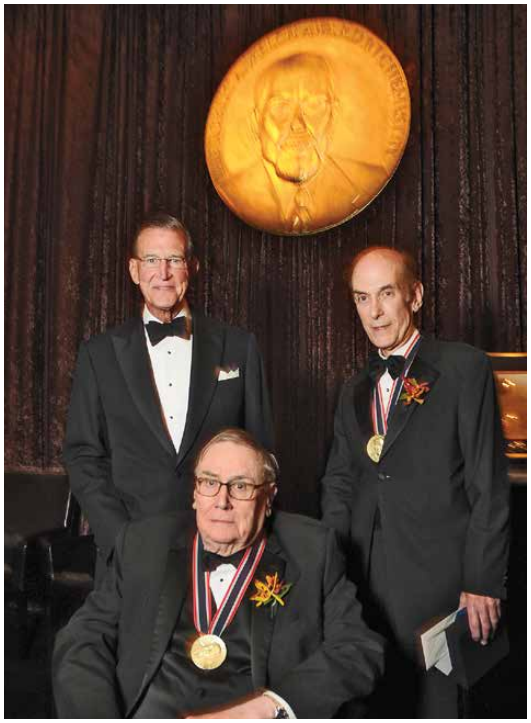
1980. Hailed for changing the way inorganic chemistry is done, the Higgins Research Professor of Chemistry has mentored a wide range of students and postdocs, and authored more than 500 papers, with 90 named lectureships and service on multiple editorial advisory boards.

Steve Lippard, the Arthur Amos Noyes Professor of Chemistry and a bioinorganic chemistry pioneer, has devoted his career to exploring the roles of iron, platinum, zinc and other metals in key functions related to energy and health.

One of his most notable accomplishments was detailing the mechanism and basis of cytotoxicity of a clinically very effective therapeutic drug, cisplatin. Platinum-based cancer drugs are used in approximately half of all cancer treatments and cisplatin is a leading antitumor agent especially effective against testicular cancer. In addition, Dr. Lippard has addressed critically important clinical issues, including how to deliver cisplatin more effectively, how to minimize side effects and how to design more effective platinum drugs.

"I am fascinated by the challenge of forming a motion picture of chemical reactions, especially those involving compounds containing metal ions like iron, zinc and platinum,"

Banquet attendees (from left) Peter Dervan, Jackie Barton, W. E. Moerner, Christy Landes, Beth Robertson and Steve Pearce.



Welch Chair Charles Tate congratulates 2016 Welch Award co-recipients Dick Holm (seated) and Steve Lippard.

Dr. Lippard said. "These are often at the heart of enzymes that drive many of life's most critical functions, and introducing transition metals as probes of biological processes and as pharmaceuticals have been an especially rewarding endeavor."

His studies of iron enzymes used by bacteria to oxidize methane to methanol have unveiled the secret by which biology can convert methane gas into liquid methanol. His most recent research interest is to explore the role of zinc in brain function and how it may affect neurodegenerative diseases.

Dr. Lippard graduated from Haverford College and received his Ph.D. from MIT. Following more than 16 years at Columbia University, he returned to MIT to join the faculty in 1983. He has authored more than 900 papers, holds multiple patents and co-authored a classic textbook in bioinorganic chemistry. He also has received multiple awards, including the 2004 National Medal of Science.

"Steve Lippard and Dick Holm are pioneers in the field of bioinorganic chemistry," said Peter B. Dervan, Welch Scientific Advisory Board chair. "They have revealed the crucial role of metals in biology and human medicine, as well as inspired and mentored the next generation of researchers."

'Rising Star' Combines Chemistry with Engineering

Celebrating the 2016 Hackerman Award: (from left) Welch board members Ernie Cockrell and Carin Barth; Welch President Norbert Dittrich; SAB member Marye Anne Fox; UT Austin Chancellor Bill McRaven; UT Austin President Greg Fenves; Hackerman Award recipient Chris Ellison; Welch Chair Charles Tate; Welch board members Beth Robertson and Bobby Robbins; and SAB Chair Peter Dervan.

Christopher J. Ellison looks to nature for the inspiration to solve practical problems. The associate professor of chemical engineering at The University of Texas at Austin develops fundamental new chemistry and then engineers his new knowledge into solutions that meet important, real-world needs. The 2016 Norman Hackerman Award in Chemical Research pays tribute to Dr. Ellison for his groundbreaking contributions in polymer chemistry, organic materials science and new technology.

"The core of my research – what I do every day in my laboratory with my students – is bringing chemistry to play in the development of advanced materials," Dr. Ellison said. "The chemistry aspect is central in allowing us to create materials that are at least as effective as what already exists while offering environmental, safety, performance and/or cost advantages."

To date, this rising star and his group have used this approach to create the first "green" fiber manufacturing process, increase the amount of computer memory five-fold and, most recently, produce safer flame retardants for foam and other consumer goods.

"Dr. Ellison has a reputation in the scientific community for taking on some of the most palpable issues in polymer science and finding practical solutions that positively impact all of our lives," said Charles W. Tate, Welch Foundation chair. "Although internationally recognized for his discoveries, Chris is, first and foremost, a remarkable teacher. We are proud to honor him with this year's Hackerman Award, and publicly thank him for his profound influence on the world of chemistry."

While working in a wide range of areas, Dr. Ellison unifies his research by focusing on developing more ecologically sound and safer processes that also provide more efficient and less expensive products. His research spans synthetic chemistry, chemical engineering and materials science and has generated more than 80 publications and 14 patents, most licensed by companies.

Among his most notable discoveries is a new "green" fiber manufacturing process that does not use heat energy or toxic organic solvents. The nonwoven, randomly oriented fibers he and his team created already are used in healthcare, filtration and construction applications, among others.

Welch Chair Charles Tate presents the Hackerman Award to Chris Ellison.

In other research with UT Austin chemistry professor Grant Willson, the collaboration led to a five-fold increase in computer memory through the use of self-organizing molecules that complement traditional lithography processing.

Dr. Ellison's most celebrated work to date produces safer flame retardants for use on manufactured materials such as the flexible foam in couches and mattresses. Existing retardants are potentially toxic and can accumulate in the environment over time. Ellison discovered a biologically inspired molecule, called polydopamine, which is as good as or potentially better than the artificially derived retardants currently on the market.

Chris Ellison is honored for his contributions in polymer chemistry, organic materials science and new technology.

"What distinguishes our lab from many others is that we use chemistry to engineer materials in new forms," he said. "We look for fundamental, real-world applications that can potentially improve everyday life. So when experimental research moves toward commercialization for public gain, it's really satisfying."

In addition to his research prowess, Dr. Ellison is a gifted teacher of undergraduate and graduate students and mentor for his research group. A well-respected university colleague and generous collaborator, he also is known for his work in advancing science, including working with three others to launch the popular "Excellence in Graduate Polymer Research" symposium at the American Chemical Society's annual meeting.

"As an educator and scientist, I strive to create a highly collaborative, interdisciplinary environment that inspires great discoveries in the lab," Dr. Ellison said. "Then, it is paramount that I serve as a strong communicator of that research. After all, a research team can be absolutely brilliant in their work, but if others can't understand or appreciate their achievement, it doesn't matter. Above all, winning the Hackerman Award validates my phenomenal students and postdoctoral fellows. This is for them."

Growing up in Nebraska in a farming family, he earned an undergraduate degree from Iowa State University before entering the doctoral program at Northwestern University. He joined the UT faculty after a short period working in industry and a postdoctoral stint at the University of Minnesota. Dr. Ellison has received numerous awards, including the National Science Foundation CAREER Award, Dupont Young Professor Award, the 3M Nontenured Faculty Award, the Owens Corning Early Career Award, the "Best Paper Award" from the International Conference on Photopolymer Science and Technology, and the highest teaching award offered by the McKetta Department of Chemical Engineering. He has been a Welch Foundation principal investigator since 2009.

"I've had a Welch Foundation research grant for most of my time at UT, and much of my work would never have been possible without their funding," Ellison said. "The Foundation is doing amazing things for researchers in the state of Texas and throughout the U.S. Their support has been invaluable."

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.

Advanced Imaging Lets Scientists 'See' at Molecular Level

Welch leadership attend the conference opening session: (from left), Ernie Cockrell, Beth Robertson, Peter Dervan, Carin Barth and Norbert Dittrich.

Approximately 500 scientists gathered in Houston Oct. 24-25 to explore "Frontiers in Imaging," the 60th Welch Foundation Conference on Chemical Research. The sessions examined the new imaging technologies that are making it possible to delve ever more deeply into the molecular world with applications in chemistry, biology and biomedical science. The conference also reviewed some of the resulting advances in medicine and materials made possible by these groundbreaking techniques.

Sadly, the architect of the conference, Welch Foundation Scientific Advisory Board member and world-renowned chemist Ahmed H. Zewail, passed away before the meeting. His memory was honored as the program began with a video tribute and comments by long-time friend and California Institute of Technology colleague Peter B. Dervan. Dr. Dervan, chair of the Scientific Advisory Board, served as conference host.

At the frontiers of chemistry and biology, imaging is arguably the most fundamental method of visualization, from MRI to optical microscopy, and to electron and X-ray probing of matter. Thanks to recent revolutionary advances in imaging with light and electron microscopy, X-rays and other means, scientists can create unprecedented degrees of spatial and temporal resolutions. These permit single atom identification in solid catalysts and single molecule dynamics of processes like the 3D motion of DNA within a single living cell.

A slate of 12 leading-edge researchers and four discussion leaders highlighted the many and varied advances made possible by new imaging techniques. New research presented included using pictures of brain activity to design neural prosthetics; the role of prions in the formation and maintenance of memory; the architecture and mode of action of the ribosome, the molecular machine found in all living cells where proteins are made; and the molecular description of chromosomes, among many others.

"Attendees heard from an amazing line-up of scientists, all world authorities in their respective areas including three Nobel laureates," said Peter Dervan, conference host and chair of The Welch Foundation Scientific Advisory Board. "The quality of the conference is tribute to our friend and colleague, Ahmed Zewail, who organized the gathering before his death. Ahmed not only was honored with the Welch Award and Nobel Prize for his work in femtochemistry, but he also was instrumental in creating 4D electron

Approximately 500 attended the conference to learn how the latest imaging techniques are powering advances in science.

microscopy, advanced imaging techniques that are driving scientific advances across disciplines."

Grant J. Jensen, Caltech, led the first session with presentations on "Visualizing Through Electrons." The afternoon was spent exploring "Visualizing Through Protons" with discussions led by Bengt Nordén, Chalmers University of Technology.

Day two presentations focused on "Materials, Bio-machines and Cells," led by Wah Chiu, Baylor College of Medicine. Next, 2016 Welch Award in Chemistry co-recipients, Dick Holm of Harvard University and Steve Lippard of Massachusetts Institute of Technology, shared insights from their work in revealing the critical role of metals in biology, human health and disease.

The conference wrapped up with three presentations exploring "Prions, Amyloids and the Brain" under the guidance of Dongping Zhong, Ohio State University.

Ahmed H. Zewail: Advancing Chemistry

Ahmed Zewail was a towering intellect who combined a consuming curiosity about life with a prodigious appetite for work. He also could light up a room with his infectious smile. Dr. Zewail's legacy ranges from his many contributions to scientific discovery to his passionate championship of science on a global scale.

A long-time professor at the California Institute of Technology, he served as a member of the Welch Scientific Advisory Board since 2002, providing guidance on Foundation activities, from scientific award candidates to research grant proposals. In 1997, he received the Welch Award for his work in establishing the field of femtochemistry, for which he also received the Nobel Prize in 1999. Holder of 46 honorary degrees from institutions worldwide, his many services to science include membership on President Obama's Presidential Council of Advisors on Science and Technology, the United Nation's Scientific Advisory Board and his role as U.S. Science Envoy to the Middle East.

During the last year of his life, Dr. Zewail leveraged his famed efficiency and global network to fashion another outstanding Welch conference that showcased his most recent passion: deciphering the behavior of complex systems from materials to biological cells through the direct visualization of structures and their evolution. While his death preceded the conference itself, his spirit imbued the presentations on exciting new research using 4D imaging, with ultrafast electron diffraction, crystallography and microscopy, which holds amazing promise for new breakthroughs.

Dr. Zewail's work with the Foundation is emblematic of his drive to expand the role of science in the world. While only here for 70 years, Dr. Zewail made every moment meaningful, packing several lifetimes of achievement into a few decades. Sadly, Ahmed's time among us has run out. But his legacy in science will live on. The Welch Foundation salutes his memory.

Spurring Research, Educational Initiatives

Welch principal investigator B. V. Venkataram Prasad, Baylor College of Medicine, works with Liya Hu, an instructor in the Department of Biochemistry and Molecular Biology. Dr. Hu's graduate work was supported by Welch funding.

The Welch Foundation has supported basic research in chemistry across Texas for more than 60 years through a variety of programs. "It is so satisfying to know that what we do really makes a difference," said Norbert Dittrich, Welch president. "Interacting regularly with some of the state's leading scientists, hearing from students exploring an interest in science and supporting young chemists at the beginning of their careers – they all drive home the value of what we do. The importance of fundamental work in science can't be overstated. This basic inquiry lays the foundation for real improvements in our world that touch all our lives. I do believe our dedicated focus has contributed to the growth of a robust research environment in the state."

Research Grants

The Welch Foundation awarded $27.5 million in grants to 116 researchers at 13 Texas institutions in 2016. Support included funding 25 new proposals and renewing support for 91 projects. Overall, 327 principal investigators currently receive Welch grants and the Foundation's support for chemical research since its inception in 1954 totals approximately $837 million through August 31, 2016.

Each research grant provides a minimum of $65,000 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 2016 fiscal year, September 1, 2015, to August 31, 2016, 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 and examples of researchers' work can be found starting on page 14.

Departmental Research Grants

Small- and medium-size colleges and universities across the state play an important role in educating students in the sciences in general and chemistry in particular. However, the resources needed to provide a robust research experience can be limited at smaller campuses. So for much of its history, The Welch Foundation has provided funding to many of these schools to help build and strengthen their chemistry programs and provide opportunities for more students to take part in hands-on research.

In 2016, 39 Texas colleges and universities received Welch support. Descriptions of how two of them, Abilene Christian University and Lamar University, have put those funds to good use can

be found in the foundation grants section starting on page 14.

Departmental grants allow the schools to offer research opportunities to students, support faculty work and enhance chemistry programs. 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.

In 2016, four new chair holders were named: Charles P. France, Welch Distinguished University Chair in Chemistry at The University of Texas Health Science Center at San Antonio; Kirk S. Schanze, Welch Chair in Chemistry at The University of Texas at San Antonio (see profile on page 16); Jonathan L. Sessler, The R. P. Doherty, Jr.-Welch Regents Chair in Chemistry at The University of Texas at Austin; and Dave Thirumalai, The Marvin K. Collie-Welch Chair in Chemistry at The University of Texas at Austin (see profile on page 17).

Welch Summer Scholar Program

Since the Welch Summer Scholar Program (WSSP) began in 1983, some 1,700 bright high school students have had an opportunity to live on campus and conduct hands-on, university-level research in an innovative six-week program. In 2016, WSSP hosted another 42 students on five Texas campuses where they became part of faculty members' research labs.

"While I previously had Welch scholars in my lab, as the new program director, I interacted closely with the 10 students at UT Austin and met with all 42 of them in the program," said Lauren J. Webb, associate chemistry professor and the program's third state director who assumed the reins in 2015. "I was truly impressed with the caliber and focus of these students, and with the value they gained from participating. It was great to see them grow together as a group."

"Getting to work directly in a research lab with graduate students was a rewarding experience that taught me about the structure and nature of scientific research," said one student. "The Welch Summer Program was an amazing opportunity!" said another. "I learned so much about the field of photovoltaic technology, and was able to conduct actual research with my helpful and knowledgeable mentors." Students also were enthused about the new friendships made with fellow program participants and the value of the university experience.

Paired with faculty researchers, students gain direct experience in research and sample college life as the program includes room and board on campus. 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.

"With 33 years under its belt, this program already runs efficiently," Dr. Webb noted. "Our goal for the next few years is to continue expanding outreach efforts to broaden the applicant pool. While we are pleased that positive word-of-mouth sees the majority of new applicants from the schools of WSSP alumni, there are areas of the state without any representation. We want to change that with both direct outreach to these schools, counselors and chemistry teachers, and by providing tips on how to complete a competitive application."

Dr. Webb also hopes to build and strengthen the program's alumni network. "This will not only give us more information about the impact of the program on past participants, but will provide a valuable networking opportunity as we know anecdotally that many 'Welchies' go on to successful careers in academia and the sciences."

This Welch summer scholar relishes her research experience at UT Dallas.

Welch Funding Supports New Science Across Texas

Xiangyang Lei

Xiangyang Lei

Departmental Grant
Lamar University

Lamar University's chemistry department continues to grow, thanks in part to The Welch Foundation's departmental grant. Welch support for faculty research has helped attract 11 grants from other funding agencies, creating an active research program that provides students with a range on potential laboratory experiences and resulting in multiple peer-reviewed research papers and conference presentations.

Over the past year, Welch funding helped support faculty research involving 24 graduate students and 19 undergraduates, and provided direct scholarships to four of the undergrads and two in the master's program.

"Welch has been important in helping us build our program and offer research opportunities to our students," said Xiangyang Lei, interim department chair, noting that undergrads are required to take three credit hours of research. "Our goal is to teach chemistry majors to learn to think creatively, troubleshoot complex problems, perform detailed analyses and make decisions based on research. Hands-on experience is crucial to ensuring they get the most out of their scientific studies."

Of the department's six graduating seniors last year, two are in graduate programs, one in medical school and three in industry.

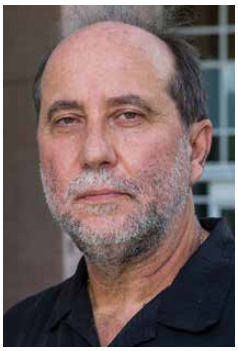
Lamar offers bachelor's degrees in chemistry, forensic chemistry, and biochemistry, and an M.S. in chemistry with 13 tenured or tenure-track faculty and one full-time instructor. The professors represent a broad range of chemical disciplines including biochemistry, physical, organic, inorganic and analytical chemistry. With all of Lamar's faculty active in research, students can choose research that fits their interests.

In the analytical area, projects included developing low-tech, low-cost methods for tackling environmental problems such as water quality, and exploring the synthesis, properties control and applications of polymer-based materials.

In biochemistry, one professor is studying the role of sterols in the development of cancer cells and another seeks to apply simplified bacterial models to the mechanistic analyses of enzymes involved in nucleic acids metabolism.

The inorganic chemistry group explored the synthesis of inorganic/organometallic complexes with interesting photochemical and catalytic properties while in organic chemistry, students studied the photochemical rearrangement of 3(2H)-furanones. Dr. Lei, herself an organic chemist, works with students on transition metal-catalyzed carbon-carbon and carbon-heteroatom cross-couplings, and synthesis and application of functionalized metal-organic frameworks.

In the physical chemistry arena, students studied the molecular behavior of macromolecules, both biological and synthetic plastics; biosorption, biodegradation, bioaccumulation and phytoremediation as they could apply to waste water treatment; the mechanism of cooperative phenomenon in novel functional materials, particularly during solid-solid phase transitions; and the application of various types of microscopy to forensic science issues.



José Onuchic

José N. Onuchic

Principal Investigator
Rice University

Biological physicist José Onuchic pioneered the study of protein folding, establishing much of what we know about how chains of amino acids fold themselves into the particular structure needed for the protein's function. In conjunction with collaborators, Dr. Onuchic discovered the underlying principles governing how information contained in a one-dimensional protein amino-acid sequence determines its resulting three-dimensional structure.

His theoretical framework shows how nature evolved an overall paradigm that guides individual interactions among the amino acids in the folding process through an efficient funnel leading to a unique, stable, native conformation. Evolution has achieved this by selecting amino-acid

sequences which are mutually supportive and cooperatively lead to a structure that minimizes the energy needed relative to competing shapes. Together, this energy landscape theory and the funnel concept provide the theoretical framework needed to further explore protein folding and function mechanisms.

Some proteins have similar functions and structure, but a different sequence of amino acids. In related work, Dr. Onuchic has shown how sequence information can provide a diagnostic tool to determine physical contacts between distant amino acids. Comparing the alignment of multiple sequences, he identifies pairs of amino acids that change together (covariance) – wherever they are on the strand – as this likely means the pair are in contact with each other once the protein is folded. These covariance signals can predict the structure and possible function of the protein.

Today, with support from Welch funding, Dr. Onuchic is looking to extend this data-driven approach into two new areas.

He is interested in developing a better understanding of the molecular "motors" that do important work inside the cell or how proteins interact with each other to perform function. Integrating the funnel concept and the covariance ideas, Dr. Onuchic now can obtain both the molecule's folding and functional landscape. In the case of molecular motors such as kinesin, the functional landscape includes not only the folding landscape of the free protein in solution, but also the binding of the protein to the microtubule – the highway on which molecular motors move. After it binds and moves, the protein then requires energy, typically supplied by ATP, to refold to its original structure and continue carrying out its original function.

Inspired by ideas from protein folding, Dr. Onuchic and his collaborators are developing co-polymer models for chromatin, a much more complex and challenging system. Ultimately this will help us unravel the mystery of how the two-meter long DNA molecule folds itself to fit into a 10-micrometer nucleus, or one million times smaller space – without knotting – critical for successful gene expression.

Greg Powell

Gregory Powell

Departmental Grant
Abilene Christian University

"A scientific education really isn't complete without direct research experience," said Professor Greg Powell. "At ACU, we try to get as many students as possible involved in the lab. There is no doubt that Welch support has made it possible to establish and maintain a first-rate undergraduate research program."

The school has a Summer Research Institute in which up to five faculty and 12 undergraduates conduct full-time research for eight weeks. Students receive a stipend and are required to write a report of the work in the form of a journal article and give an oral presentation. Many of the students continue research during the school year with a record-setting 20 undergraduates participating in research projects in spring 2017.

"This time of concentrated effort is quite valuable to our students," Dr. Powell said. "In addition to contributing to their education, it often gives them a sense of accomplishment, an increased confidence in their abilities, an appreciation for working with others and a desire to continue being involved in research."

With eight full-time faculty, ACU research spans diverse areas of scientific inquiry, including understanding DNA damage repair, preparing new organic chemicals with medicinal properties, discovering new types of polymers and synthesizing metal cluster complexes with potential anticancer activity.

With older faculty retiring, ACU recently hired young Ph.D. scientists to replace them. "The Welch Departmental Grant has played a role in our ability to recruit talented staff as these new assistant professors are attracted by the opportunity to be part of a robust research program that produces publishable results with undergraduate assistants," Dr. Powell said.

Over the past 15 years, ACU faculty and students have published 20 journal articles with Welch-stipend students listed 69 times as coauthors. At the 2016 Meeting-in-Miniature sponsored by the American Chemical Society's DFW section, ACU students swept the awards. Since ACU began receiving Welch funds, 106 graduates have gone on to earn a Ph.D. degree and 164 have earned doctoral degrees in the health professions. Another 25 alumni are currently attending graduate school.

"The vast majority of these alumni participated in research while they were undergraduates, and we believe that experience makes them better scientists and physicians," Dr. Powell added.

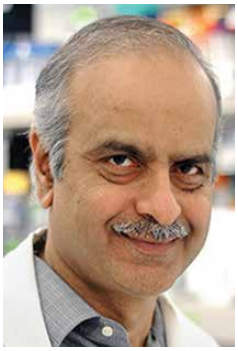
About 10 years ago, Welch funds made it possible for ACU to purchase a microwave reac-

tor, enabling research that led to 10 publications.

"Success often breeds more success," Dr. Powell said. "Our results with the microwave reactor garnered the attention of several generous alumni whose large contribution allowed us to purchase a research-grade X-ray diffractometer. Our future looks as bright as ever!"

B. V. Venkataram Prasad

Principal Investigator
Baylor College of Medicine



B. V. Venkataram Prasad

Dr. Prasad explores the structure-function correlation of various viruses that attack the digestive system. He believes a better understanding of these relationships will help design and develop more effective antiviral drugs.

A fellow in the American Association of Microbiology, the professor of biochemistry and biology joined the Baylor College of Medicine in 1988 and received his first Welch research grant in 1990.

"Welch support has been absolutely critical to my research," he said. "Not only has it been instrumental in supporting my doctoral students and post-docs – many of whom have gone on to make their own important contributions to science – but it has made possible grants from other sources."

This additional funding includes grants from the National Institutes of Health and two consecutive Methods to Extend Research in Time, or MERIT, awards from the National Institute of Allergy and Infectious Diseases, given to investigators who have shown superior competence and outstanding productivity in their work.

Much of Dr. Prasad's research focuses on the rotavirus responsible for gastroenteritis that kills some 250,000 children each year; the norovirus, best known as the scourge of cruise ships; and influenza.

Dr. Prasad and his group use cryo-electron microscopy and X-ray crystallography as well as biochemical and cell biology techniques to explore the structures and then correlate this architecture with the viral functions. His goal is to determine how these viruses gain entry into host cells, how they interact with receptors, how they evade the immune system, how they disassemble and how they replicate.

"We want to understand, at the molecular level, these very fundamental processes. A detailed blueprint of how these viruses attack cells will allow the development of more effective drugs to prevent and treat the diseases the viruses cause," Dr. Prasad said.

Dr. Prasad also is fascinated by the viruses' ability to counteract the antiviral response mounted by the host cells. His lab is researching the non-structural NS1 and NSP1 proteins found in influenza and rotavirus, respectively. Encoded by the virus genome, the proteins primarily function to counter the body's immune response, targeting critical cellular pathways by interacting with various cellular proteins. This allows the virus to survive and reproduce.

"There is something very satisfying in helping to unravel the workings of viruses that have caused so much human misery over the centuries," Dr. Prasad said.

Kirk S. Schanze

Robert A. Welch Distinguished University Chair in Chemistry
The University of Texas at San Antonio

After 30 years at the University of Florida, Kirk Schanze brought his photochemistry research to Texas and UTSA last year, thanks in part to the lure of an endowed Welch Foundation chair. At UTSA he is continuing to expand his research into how light interacts with molecular systems and materials. The field, also known as "organic electronics," has potential applications in solar power, light emitting diodes, transistors and diodes.

"I like the challenge of a new place and new colleagues to reinvigorate and redirect our work," Dr. Schanze said. "My wife and I love San Antonio, and it's exciting to be part of a young and growing program here at UTSA. Since I was a young scientist, I have been a bit envious of what you have in Texas. I'm proud to hold a Welch chair and benefit from that forward-thinking commitment to research."

His work is primarily focused on understanding the photochemical and photophysical processes that are stimulated when molecular systems absorb light. His team studies conjugated polymers, a class of functional, light-emitting and -absorbing materials with potentially useful properties, to explore the phenomenon of luminescence, or light emission. His group uses spectroscopic methods to understand the mechanisms of absorption and emission.

Dr. Schanze's team leverages this fundamental work to develop polymer LEDs, or novel light-emitting devices, and fluorescent sensors,

some of which are in use by aerodynamic engineers in wind-tunnel testing, and by chemists and biochemists for sensing analytes of interest.

The group also is studying solar fuels generated in processes that use energy from the sun to create stored chemical energy. For example, he is interested in splitting water to produce hydrogen and oxygen, or potentially combining water and carbon dioxide to create methane, the primary component in natural gas. Both of these processes use sunlight to create chemical fuels that can be used later to do work.

"With these 'uphill' reactions – so-called because they move in the opposite direction of typical chemical reactions – we hope to take low-cost commodities and convert them into high-value fuels while at the same time addressing the carbon dioxide emissions contributing to climate change," he said. The research is funded through the Center for Solar Fuels, a Department of Energy-funded project based at the University of North Carolina.

Kirk Schanze

"Our goal is to let the molecules do the work, leveraging molecular-based processes as a catalyst for water oxidation and CO_2 reduction," Dr. Schanze added. "This is an example of how I like to think about how our fundamental research can relate to the real world and contribute to finding long-term solutions to important needs."

Dave Thirumalai

The Marvin K. Collie-Welch Regents Chair in Chemistry
The University of Texas at Austin

In early 2016, Dave Thirumalai moved from the University of Maryland to head the UT Austin chemistry department.

Dave Thirumalai

"I am excited about working with our faculty to redirect and build on the already-outstanding chemistry department here," the Collie-Welch chair holder said. "The move also gave me an opportunity to change the direction of my own research. I am taking full advantage of the stimulus and insights I gain from interacting with the excellent researchers here on campus."

A theoretical/computational chemist, Dr. Thirumalai is interested in developing and applying concepts in chemistry and physics to biological problems and dynamical transitions in super cooled liquids and glasses. He has begun work to understand how cancer cells grow and invade neighboring tissues.

"A typical biopsy only samples a portion of a cancer tumor," he noted, "and this poses a problem for oncologists in determining the best treatment protocol. All too often, treatment based on biopsy results is initially successful, but then the tumor starts growing again because of tumor heterogeneity." Cancer heterogeneity shares aspects of a similar phenomenon in glasses, which may provide quantitative insights into tumor growth.

In other research, he is continuing a decade of work on molecular motors, the engines that power cargo transport in the cell. His team has developed theoretical and computational tools to describe the peculiarities of motors' motility on actin and microtubule. He studies three types of cellular "motors" – dynein, kinesin and myosin – all powered by "burning" ATP, allowing conversion of chemical to mechanical work.

"Just like a motor powers equipment, including your car, cellular nanomotors are fundamental to biological processes," Dr. Thirumalai said, "and they are incredibly more efficient than our mechanical versions. A better knowledge of how they work could perhaps shed new light on how to design synthetic materials with motor activity. In particular, can we redesign natural motors to perform unnatural functions?"

Protein folding is another area that has long intrigued him and he is applying concepts from polymer chemistry to the more difficult problems of how genomes fold.

"If you stretched out all the DNA in a human, it would reach to the moon and back multiple times," he said. "We want to understand how DNA can package itself into only 10 microns – less than 1/7 of the width of a typical human hair. If you try that with a long thread, it would quickly ball up and become knotted. We are just starting to crack some aspects of this remarkable feat."

While new to Texas, Dr. Thirumalai says he is very grateful for Welch support.

"Welch support makes such a difference, not only in my own research, but across the department and related areas of the university," he added. "My colleagues across the country are envious of our access to Welch support for new ideas and fundamental explorations."

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
John M. Abrams	The University of Texas Southwestern Medical Center	Apoptosome Caspase Control by Tango7
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
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	Giant Sensitivity and Broadband Circular Dichroism in Plasmonic Metamaterials
Meigan Aronson	Texas A&M University	Accelerating the Search for New Topological Materials Using *in-situ* X-ray Diffraction Measurements and Electronic Structure Calculations
Vaibhav Bahadur	The University of Texas at Austin	Role of Surface Chemistry and Interfacial Charge on Methane Hydrate Nucleation
Carlos R. Baiz	The University of Texas at Austin	Studies in Biophysical Chemistry: Applications of Ultrafast Infrared Spectroscopy
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
Laura Banaszynski	The University of Texas Southwestern Medical Center	Role of Chromatin Remodeling in ALT-Positive Cancers
Jiming Bao	University of Houston	Distinguishing Photocatalytic Activity of Different Cobalt Oxides Through Controlled Material Synthesis and Systematic Photoelectrochemical Investigation
David P. Barondeau	Texas A&M University	Evolving Metallocofactor Chemistry Through Second Shell Interactions
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
Matthew R. Bennett	Rice University	The Role of Protein/DNA Interactions in the Kinetics of Biochemical Networks
David E. Bergbreiter	Texas A&M University	Thermally Responsive Multiphase Catalyst Systems
Ricardo A. Bernal	The University of Texas at El Paso	Deciphering the Structural and Functional Basis for Ring Separation in Chaperonins
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
Jennifer S. Brodbelt	The University of Texas at Austin	Impact of Charges on Protein Fragmentation
Maurice Brookhart	University of Houston	New Pd(II) and Ni(II) Catalysts for Olefin Polymerizations and Copolymerizations
Richard K. Bruick	The University of Texas Southwestern Medical Center	Isoform-Selective Regulation of HIF-Alpha by Isoprenoids
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 Intermediary Metabolism 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 Mechanism of a Clock-Enhancing Natural Product
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	Surface Functionalization of Zirconium Phosphate and Phosphonate for Drug Delivery, Lubrication and Catalysis
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	Asymmetric Carbon-Carbon Bond Formation from Functionalized Azoalkenes
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
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	Compartmentation of a Redox-Balancing Metabolic Activity in the Cancer Cell Peroxisome
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 Highly Fluorinated Ligands
Loi H. Do	University of Houston	Site-Differentiated Platforms for Olefin Polymerization Catalysis
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 Optical Probes of 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
Livia Schiavinato Eberlin	The University of Texas at Austin	Development of Ambient Ionization Ion Mobility Mass Spectroscopy Imaging for Spatial and Chemical Lipid Analysis in Biological Samples
Ron Elber	The University of Texas at Austin	Bridging Temporal and Spatial Scales in Membrane Modeling
Andrew D. Ellington	The University of Texas at Austin	Kinetic and Structural Characterization of the First Error-Correcting Reverse Transcriptase
Christopher J. Ellison	The University of Texas at Austin	Chemistry and Properties of Self-Assembly Directed Nanomaterials
Jan P. Erzberger	The University of Texas Southwestern Medical Center	Structural and Biochemical Characterization of DEAD-Box ATPase Function and Regulation During Ribosome Biogenesis
Donglei L. Fan	The University of Texas at Austin	Innovative Mechanism for the Synthesis of 3-D Nano-Superstructures by Designed Catalysts
Lei Fang	Texas A&M University	π-Conjugated Macrocyclic Molecular Belts
Walter L. Fast	The University of Texas at Austin	Chemical Probes of Biological Catalysts
Michael Findlater	Texas Tech University	Base-Metal Catalyzed Transformations
Ilya J. Finkelstein	The University of Texas at Austin	Mapping the Proofreading Mechanisms of Cas9 Nuclease on a Hacked DNA Sequencer
Paul F. Fitzpatrick	The University of Texas Health Science Center at San Antonio	Mechanisms of Oxidative Enzymes
Matthew S. Foster	Rice University	Quantum Coherence in Driven, Disordered and Topological Many-Body Systems
Doug E. Frantz	The University of Texas at San Antonio	Exploiting Catalytic Tandem Decarboxylation/β-Hydride Eliminations to Chiral Allenes
François P. Gabbaï	Texas A&M University	Coordination Non-Innocence of Antimony and Tellurium Ligands
Elyssia S. Gallagher	Baylor University	Can We Apply Hydrogen/Deuterium Exchange – Mass Spectrometry to Elucidate Glycan Binding Interactions?
Venkat Ganesan	The University of Texas at Austin	Fundamental Studies of Self-Assembly in Mixtures of Organic and Inorganic Molecules
Isaac Garcia-Bosch	Southern Methodist University	Efficient, Sustainable and Selective Catalytic Systems for the Direct C-N Functionalization of C-H and C=C Bonds Based on Iron-Nitrenoid/Imido Species
John A. Gladysz	Texas A&M University	Werner Complexes as “Organocatalysts”
Vishal M. Gohil	Texas A&M University	Phospholipid Requirements for Mitochondrial Structure and Function
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	Emergence of Biological Complexity
Nick V. Grishin	The University of Texas Southwestern Medical Center	Discovering New Chemistries with Whole Genome Sequencing

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
Arnold M. Guloy	University of Houston	Chemical Bonding and Properties of Polar Intermetallics Along the Border Between Metals and Nonmetals
Jason H. Hafner	Rice University	Surface Enhanced Spectroscopy for Membrane Structural Biology
Naomi J. Halas	Rice University	Chemical and Photophysical Properties of Electron-Delocalized Nanoparticles
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	A Radical Proposal for How Transmembrane Transit of H+-Ions Can Generate an Oscillating Electric Field for Driving Rotation of the Flagellar Motor
P. John Hart	The University of Texas Health Science Center at San Antonio	In silico Screening for Inhibitors of CARDS Toxin from M. pneumoniae
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 Principles of Inhibitory Neurotransmitter Receptor Modulation
Christian B. Hilty	Texas A&M University	Characterization of Olefin Metathesis Using Dissolution Dynamic Nuclear Polarization
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	Design and Synthesis of New Metalloligands for the Construction of Phosphine Coordination Materials with Advanced Solid-State Properties
Gyeong S. Hwang	The University of Texas at Austin	First-Principles Investigation of the Structure, Chemistry and Function of Graphene-Like Nanomaterials

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
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
Khuloud Jaqaman	The University of Texas Southwestern Medical Center	*In situ* Measurement of Inter-Receptor Interaction Kinetics on the Cell Surface
Makkuni Jayaram	The University of Texas at Austin	Complex Active Sites for Phosphoryl Transfer: Continued Chemical, Biochemical, Biophysical and Structural Analyses
Jean X. Jiang	The University of Texas Health Science Center at San Antonio	Modulating Hemichannel Activities Using Targeting Antibodies
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
Youxing Jiang	The University of Texas Southwestern Medical Center	Structural and Functional Studies of Ligand-Gated Cation Channels
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	Texas State University	Chemistry of *N*-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
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 Spectroscopy of Low-Dimensional Materials
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

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
László Kürti	Rice University	Novel Methods and Reagents for C-C and C-N Bond Formation
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	Noninvasive Electrical Mapping of Chemical Processes in 2D 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	Chemical, Biochemical and Structural Studies of Inflammation-Induced DNA Lesions
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
Wen-hong Li	The University of Texas Southwestern Medical Center	Fluorescent Probes for Cellular Imaging
Xiaoqin (Elaine) Li	The University of Texas at Austin	Bio-Compatible Quantum Sensors
Roger L. Lichti	Texas Tech University	Muonium Defect Chemistry in Functional Oxides
Paul A. Lindahl	Texas A&M University	Characterization of Low-Molecular-Mass Metal Complexes in Mitochondria and Blood
Stephan Link	Rice University	Observing Chemistry via 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

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
Yi Liu	The University of Texas Southwestern Medical Center	Biochemical Analysis of an RNA Interface Pathway
Steve W. Lockless	Texas A&M University	Membrane Protein Regulation Through the Lipid Bilayer
Jun Lou	Rice University	Development of Nanomaterials for Low Cost Solar Energy Harvesting
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	Functional Interrogation of Extracellular Protein Lipidation
Lloyd L. Lumata	The University of Texas at Dallas	Tracking Amino Acid Metabolism in Cancer in Real-Time Using Hyperpolarized ^{13}C Magnetic Resonance
Weibo Luo	The University of Texas Southwestern Medical Center	Regulation of Hypoxia-Inducible Factor 1 Transcriptional Activity by the Histone Modifier
Jodie L. Lutkenhaus	Texas A&M University	Discovering the Rich Electrochemistry of Nitroxide Radical-Modified Conjugated Polymers
Nathaniel A. Lynd	The University of Texas at Austin	Synthesis and Self-Assembly of Cooperatively Crystalline Block Copolymers
Jianpeng Ma	Baylor College of Medicine	Exploring the Chemical Forces Stabilizing Human Polycomb Repressive Complex 2
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
Corina Maeder	Trinity University	Mechanism of a Small Protein at the Heart of Spliceosome Activation
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 Reference Map of Core Eukaryotic Protein Complexes
Paul Marshall	University of North Texas	Kinetic and Product Studies of Gas-Phase Reactions Over Wide Ranges of Temperature
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

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
Seiichi P.T. Matsuda	Rice University	Terpene Biosynthesis
Jeremy A. May	University of Houston	The Total Synthesis of Bioactive Natural Products via Novel Methods and 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
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
Saikat Mukhopadhyay	The University of Texas Southwestern Medical Center	Biochemical Characterization of Factors Regulating Subcellular Trafficking and Function of Membrane Adenylyl/Guanylyl Cyclases
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	Multipolar Spin Orders in Correlated Electron Materials
Kyriacos C. Nicolaou	Rice University	Total Synthesis of Bioactive Natural and Designed 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 Nanostructures
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

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
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
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 Nanorods and Nanoplates
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
David C. Powers	Texas A&M University	PCET-Triggered Metal-Ligand Cooperation for Aerobic Oxidation Catalysis
B. V. Venkataram Prasad	Baylor College of Medicine	X-ray Crystallographic Studies on Viruses and Viral Proteins
Han Pu	Rice University	Synthetic P-Wave Interaction in 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	Multiple Ubiquitin Ligases Regulate Centromere Function and Genome Stability
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 Ultracold Atomic Mixtures and Dissociated Molecules
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
Luke M. Rice	The University of Texas Southwestern Medical Center	Structure and Biochemistry of a Microtubule Regulatory Protein
Michael G. Richmond	University of North Texas	Synthesis and Reactivity Studies of Polynuclear Clusters

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
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
Grigory Rogachev	Texas A&M University	The Origin of Chemical Elements in the Universe
Daniel Romo	Baylor University	Novel Strategies for β-Lactone Synthesis and Annulation to Impact Basic Cell Biology
Michael J. Rose	The University of Texas at Austin	Earth Abundant Metal Catalysts for Energy-Related Chemical Transformations
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	Magnetic, Electronic and Dynamical Behavior of New Semiconducting 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	Dissecting Dynamin Isoform-Specific Regulation of Clathrin Mediated Endocytosis
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
Jonathan T. Sczepanski	Texas A&M University	Development of Cross-Chiral Nucleic Acid Biosensors for Detection of RNA Structure
Joachim Seemann	The University of Texas Southwestern Medical Center	Biochemical and Structural Analysis of Golgi-Based Spindle Assembly Activities
Laura Segatori	Rice University	Synthesis and Characterization of Bio-Inspired Nanoparticles with Autophagy-Modulating Properties
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	Tailoring Electronic and Excitonic Structures of 2D Materials
Qimiao Si	Rice University	Theoretical Studies of Electronic Dynamics in Carbon-Based and Related Low Dimensional Structures

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
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	Biochemical Studies of Pathways and Compounds that Modulate Telomere Length
John F. Stanton	The University of Texas at Austin	Studies in Quantum Chemistry
Mihaela C. Stefan	The University of Texas at Dallas	Semiconducting Block Copolymers Capable of Actuated Changes of Opto-Electronic Properties
Keith J. Stevenson	The University of Texas at Austin	Synthesis of Mesoporous Carbon and Metal Oxide Architectures
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
Vincent S. Tagliabracci	The University of Texas Southwestern Medical Center	Novel Bacterial Spore Coat Protein Kinases
Uttam K. Tambar	The University of Texas Southwestern Medical Center	Stereoselective Transformations of Dienes
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	Managing Photons and Charge Carriers 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	Multivalent Cucurbit[n]urils for High-Affinity Reversible Binding
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 Medical Branch	Cryo-EM Analysis of the Integrator Complex

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
Yihong Wan	The University of Texas Southwestern Medical Center	Biochemical Characterization of How Maternal Milk Impacts Offspring Epigenome and Metabolism
Meng Carla Wang	Baylor College of Medicine	Chemical Imaging of Glutathione Spatiotemporal Dynamics During Aging
Qinghua Wang	Baylor College of Medicine	Chemical Mechanisms of Muscle Contraction and Regulation
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	Regulation of Necroptosis by Casein Kinase 1δε
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
R. Bruce Weisman	Rice University	Photostudies of Carbon Nanostructures
Kenneth D. Westover	The University of Texas Southwestern Medical Center	Development of Covalent TAK1 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
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 and Grain Boundaries
Nan Yan	The University of Texas Southwestern Medical Center	A Monogenic Immune Disorder Associated with Oligosaccharyltransferase Dysregulation
Ding-Shyue Yang	University of Houston	Ultrafast Structural Dynamics of Molecular Assemblies at Interfaces
Jin Ye	The University of Texas Southwestern Medical Center	Biochemical Characterization of the Fatty Acid-UAS Domain Interaction
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

PRINCIPAL INVESTIGATOR	INSTITUTION	TITLE OF RESEARCH
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
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	Identification of Potential Therapeutic Compounds for Hematopoietic Regeneration
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
Yubin Zhou	Texas A&M University Health Science Center	Optical Rewiring of Epigenetic Landscapes to Reprogram Cell Fate

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*	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	Jonathan L. Sessler, The R. P. Doherty, Jr.-Welch Regents Chair in Chemistry
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 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	Kirk S. Schanze, 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	Charles P. France, Welch Distinguished University Chair in Chemistry
The University of Texas Health Science Center at San Antonio*	Welch Distinguished University 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, 2016 AND 2015

	2016	2015
ASSETS		
CASH AND CASH EQUIVALENTS	$ 3,148,546	$ 1,788,185
INVESTMENTS	632,101,147	637,794,514
RECEIVABLES:		
Investment transactions	462,295	1,982,134
Interest and dividends	399,964	435,189
Other	380,176	280,436
Total receivables	1,242,435	2,697,759
OTHER ASSETS	765,459	909,582
TOTAL	$ 637,257,587	$ 643,190,040
LIABILITIES AND NET ASSETS		
LIABILITIES:		
Unpaid grants	$ 20,477,500	$ 20,726,250
Deferred federal excise tax payable	1,077,887	1,138,261
Accounts payable and other	970,608	553,426
Investment transactions payable	133,002	1,779,324
Total liabilities	22,658,997	24,197,261
NET ASSETS	614,598,590	618,992,779
TOTAL	$ 637,257,587	$ 643,190,040

STATEMENTS OF ACTIVITIES

AS OF AUGUST 31, 2016 AND 2015

	2016	2015
REVENUES:		
Interest	$ 1,350,877	$ 1,400,165
Dividends	3,696,628	3,669,455
Oil and gas royalties and other	1,128,888	1,964,865
Total revenues	6,176,393	7,034,485
EXPENSES:		
Investment advisory and custodial fees	3,481,161	3,689,960
General and administrative	3,300,682	2,808,631
Federal excise tax provision on net investment income	82,672	94,375
Property and production taxes	105,471	166,651
Advisory board fees and expenses	555,833	501,667
Total expenses	7,525,819	7,261,284
GRANTS APPROVED - Net	(30,385,590)	(28,722,825)
NET REALIZED GAINS ON SALES OF INVESTMENTS AND OTHER ASSETS	38,402,766	40,500,137
UNREALIZED DEPRECIATION OF INVESTMENTS	(10,310,449)	(66,450,529)
CHANGE IN PENSION	(503,771)	(604,867)
FEDERAL EXCISE TAX ON REALIZED CAPITAL GAINS	(308,093)	(374,390)
DEFERRED FEDERAL EXCISE TAX BENEFIT ON UNREALIZED CAPITAL GAINS	60,374	1,445,688
CHANGE IN NET ASSETS	(4,394,189)	(54,433,585)
NET ASSETS, beginning of year	618,992,779	673,426,364
NET ASSETS, end of year	$ 614,598,590	$ 618,992,779

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

2016 ANNUAL REPORT SUPPLEMENT

The Supplement to the 2016 Welch Foundation Annual Report is available online at www.welch1.org and includes:

- 60th Conference on Chemical Research Program
- Welch Conference on Chemical Research 1957-2016
- Welch Award Recipients 1972-2016
- Hackerman Award Recipients 2002-2016
- Principal Investigators Listed Alphabetically
- Abstracts of Current Investigations
- Publications by Principal Investigators Reported During 2015-2016

THE Welch FOUNDATION

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5555 San Felipe
Suite 1900
Houston, Texas 77056-2730
713.961.9884
www.welch1.org