



MEETING OF THE MINDS: LEGACY OF BERND T. MATTHIAS

Symposium, Luncheon, and Open House

November 15, 2019

UNIVERSITY of **HOUSTON**

TEXAS CENTER FOR SUPERCONDUCTIVITY



**MEETING OF THE MINDS:
LEGACY OF BERND T. MATTHIAS**

NOVEMBER 15, 2019

Symposium

Elizabeth D. Rockwell Pavilion, UH Library

Luncheon

UH Hilton, Shamrock Ballroom

TcSUH Open House

University of Houston Science Center

THE TCSUH SOCIETY, est. 2019

Since our founding in 1987, TcSUH has provided research experiences for hundreds of students, postdoctoral fellows, faculty and visiting faculty, research staff, administrative staff, and student interns. **THE TCSUH SOCIETY** provides former TcSUH-affiliated personnel a formal way to connect with the Center, keep in touch with former classmates and faculty, participate in networking and mentoring opportunities, and take advantage of our extensive Calendar of Events. We are pleased to inaugurate our annual symposium series, Meeting of the Minds, and hope you enjoy learning about a giant in superconductivity, Bernd T. Matthias, from the perspective of his students.

MEETING OF THE MINDS SYMPOSIUM: LEGACY OF BERND T. MATTHIAS AT THE UNIVERSITY OF HOUSTON

BERND T. MATTHIAS (8 June 1918 – 27 October 1980)

Bernd Teo Matthias (1918-1980) was born in Frankfurt am Main, Germany, on June 8, 1918. He completed his Ph.D. in physics in 1943 at the Eidgenössische Technische Hochschule Zurich and continued his research there for four more years. He immigrated to the United States in 1947. Matthias was elected to the National Academy of Sciences in 1965 and is most noted for his discovery of nearly 1,000 superconducting materials.

Superconductivity is a phenomenon that occurs in metals at very low temperatures. When a metal is superconductive, it loses all electrical resistance. This means that electric currents can flow through a ring of superconducting material indefinitely, without losing any energy, as long as the material is kept at the very low temperature at which it becomes superconducting. Matthias's career focused on the search for materials with ever-higher transition temperatures.

In 1947, Matthias accepted an appointment at the Massachusetts Institute of Technology. The following year he began an affiliation with the Bell Laboratories in Murray Hill, New Jersey. On leave from Bell Labs in 1949-51, Matthias was an assistant professor at the University of Chicago, where he developed a career-long collaborative relationship with Willy Zachariasen, a crystallographer and the head of Chicago's Physics Department at that time. While at the University of Chicago, Matthias turned to superconductivity and ferromagnetism in collaboration with John K. Hulm. His interest in the relationship between these two phenomena continued throughout his career.

In 1951, Matthias returned to Bell Labs where he discovered many more superconducting materials and developed the concept of "electron counting." This was an empirical guide that related the transition temperature of superconducting materials with their number of valence electrons per atom, a tool he used to discover many superconducting materials.

Matthias was invited to Los Alamos National Laboratory (LANL) as a consultant in the Theoretical Division in 1956 or 1957. In 1961 he joined the physics faculty at the University of California, San Diego, and maintained a part-time presence in the labs at Murray Hill. He also maintained a presence at LANL as well, collaborating there with some of his former UCSD students, thus participating in and conducting research in three labs simultaneously.

A year after joining the Physics Department at UCSD, Matthias founded the Institute for the Study of Matter, funded first by the Air Force and later by the National Science Foundation. In 1966, the Institute merged with the Physics Department's Institute for Pure and Applied Physical Sciences under the direction of Keith Brueckner. Matthias became associate director. Matthias explored the boundaries of science and metaphysics in his courses for undergraduates titled "Frontiers of Science." He was still actively researching and teaching when he died of a heart attack on October 27, 1980.

— Courtesy of Bernd T. Matthias Prize Committee



PROGRAM: SYMPOSIUM

November 15, 2019

9:00 a.m. – Meeting of the Minds Symposium: Legacy of Bernd T. Matthias

12:00 p.m. Elizabeth D. Rockwell Pavilion, UH Library 2nd Floor

9:00 Introduction by **Paul C. W. Chu**, T. L. L. Temple Chair of Science, and Founding Director and Chief Scientist, Texas Center for Superconductivity at the University of Houston

Welcome

Zhifeng Ren, M. D. Anderson Chair Professor, Department of Physics, and Director, Texas Center for Superconductivity at the University of Houston

9:05 Introduction by Zhifeng Ren

Greetings from the University of Houston

Amr Elnashai, FEng, Vice President/Vice Chancellor for Research and Technology Transfer, University of Houston

Symposium Talks

9:10 Introduction of Symposium Moderator – Zhifeng Ren

9:12 – 9:30 **Dr. James L. Smith**, Moderator, Fellow at Los Alamos National Laboratory

Note: Each speaker will be introduced by Dr. Smith (~2 minutes at the start of each time block). Speakers will share their interactions with Dr. Matthias and how his legacy has inspired them in their own distinguished careers.

9:30 – 9:55 **M. Brian Maple**, Distinguished Professor of Physics and Bernd T. Matthias Endowed Chair, University of California, San Diego

9:55 – 10:20 **Zachary Fisk**, Professor Emeritus of Physics and Astronomy, University of California, Irvine

10:20 – 10:45 **Paul C. W. Chu**, T. L. L. Temple Chair of Science, Professor of Physics; Founding Director and Chief Scientist, Texas Center for Superconductivity at the University of Houston

10:45 – 11:10 **Robert N. Shelton**, President, Giant Magellan Telescope Organization

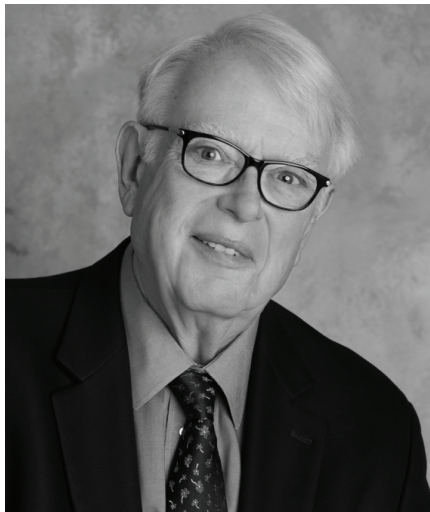
11:10 – 11:55 Moderated Q&A with Speakers

11:55 – 12:00 Concluding Remarks & Luncheon Announcement – Zhifeng Ren



PROGRAM: LUNCHEON

- 12:30 – 2:30** **The TcSUH Society Luncheon: Legacy of Bernd T. Matthias**
University of Houston Hilton Hotel, Shamrock Ballroom – 2nd Floor
- 12:30 Welcome & Introduction of Luncheon Speaker – Zhifeng Ren
- 12:35 – 12:50 Legacy: The Next Generation
Maw-Kuen Wu, *Distinguished Research Fellow, Institute of Physics, Academia Sinica, Taipei, Taiwan*
- 12:50 Lunch Served
- 1:40 – 2:10 Open Microphone: Questions for Speakers from Attendees
Informal Remembrances - Matthias Symposium (*questions from podium; passed microphone at speaker table*)
- 2:10 – 2:30 **TcSUH Progress Report & Inauguration of The TcSUH Society** –Zhifeng Ren
Concluding Remarks & TcSUH Open House Announcements
- 3:00 Depart for TcSUH, University of Houston Science Center (HSC)
Walking tour to HSC. Transportation will be available in the Hilton circle drive if needed.
- 3:30– 5:30 **TcSUH Reception & Self-Guided Lab Tours** in the Houston Science Center Building



JAMES L. SMITH MODERATOR
Fellow of Los Alamos National Laboratory

James L. Smith is an American physicist who has worked at the Los Alamos National Laboratory since 1973. He studied at Wayne State University, graduating with a B.S. in Physics in 1965. He continued his studies at Brown University, receiving his Ph.D. in Physics in 1974. Dr. Smith began working for Los Alamos National Laboratory as part of the Physical Metallurgy Group. Over his career at Los Alamos, Dr. Smith worked on low-temperature physics, superconductivity, magnetism, and actinide materials. Specifically, Dr. Smith studied the relationship between superconductivity and magnetism and helped pioneer the field of heavy fermion superconductivity.

Over the course of his career, Dr. Smith authored over 400 papers. In 1982, he became a Laboratory Fellow at Los Alamos. In 1986 he was awarded the E. O. Lawrence Award by the U.S. Department of Energy, and in 1990 he shared the American Physical Society International Prize for New Materials with three others, who included Zachary Fisk.

For more information on Dr. Smith and his connection with B. Matthias, Z. Fisk, B. Maple, and P. Chu, see the tribute to his work in Philosophical Magazine, vol. 89, August 2009, the journal for which he was Editor from 1990 through 2006.

Dr. Smith's Oral History on Voices of the Manhattan Project is located at the following

[URL: <https://www.manhattanprojectvoices.org/oral-histories/jim-smiths-interview>](https://www.manhattanprojectvoices.org/oral-histories/jim-smiths-interview)

In this interview, Smith recalls his more than forty-year career at LANL. He describes some of the history of the Manhattan Project and LANL's innovative work during the war through today, including work on the human genome, computing, and radiation detection. He emphasizes the importance of having multidisciplinary national laboratories to produce pioneering innovations and scientific discoveries. Smith also recalls his friendship with Edward Teller, who he was assigned to teach about superconductivity, and other Manhattan Project scientists including Nicholas Metropolis. He discusses Teller's relationship with Oppenheimer and other scientists.



M. BRIAN MAPLE

*Distinguished Professor of Physics and
Bernd Matthias Endowed Chair,
University of California, San Diego*

SYMPOSIUM SPEAKER

M. Brian Maple is Distinguished Professor of Physics and holds the Bernd T. Matthias Endowed Chair in the Physics Department at the University of California, San Diego. He served as Director of UCSD's Institute for Pure and Applied Physical Sciences (1995-2009), the Center for Interface and Materials Science (1990-2010), and Chair of the Physics Department (2004-2010). His research interests include correlated electron phenomena in novel d- and f-electron quantum materials (e.g., unconventional and high temperature superconductivity, exotic types of magnetism, valence fluctuations, heavy fermions, quantum phase transitions, quantum spin liquids, topological insulators), surface science and matter under extreme conditions. He has authored or co-authored more than 1000 scientific publications and five patents.

Professor Maple received BA (mathematics) and BS (physics) degrees in 1963 from San Diego State University (SDSU). He earned MS (1965) and PhD (1969) degrees in physics from UCSD, working under Matthias. He was appointed to the UCSD faculty in 1973 where he rose through the ranks to Professor in 1981 and Distinguished Professor in 2005. He has held the Bernd T. Matthias endowed chair since 1990. He was granted a Guggenheim Fellowship (1984) and a Humboldt Research Award (1998). In addition to his work at UCSD, he was a Bernd T. Matthias Scholar in the Center for Materials Science at Los Alamos National Laboratory (1993). He was granted an Honorary Professorship at the Trzebiatowski Institute for Low Temperature and Structure Research of the Polish Academy of Sciences (2006) and a Science Lectureship Award at Chiba University in Tokyo (2010).

He was named Distinguished Alumnus of the Year by UCSD in 1987 and by SDSU College of Science in 1988. He received the American Physical Society (APS) David Adler Lectureship Award in Materials Physics in 1996 and the APS James C. McGroddy Prize for New Materials in 2000. In 2004, he was elected to the National Academy of Sciences. Other awards include the Bernd T. Matthias Prize for Superconducting Materials and the Frank H. Spedding Award for Research on Rare Earths. He is a Fellow of the APS and the American Association for the Advancement of Science.



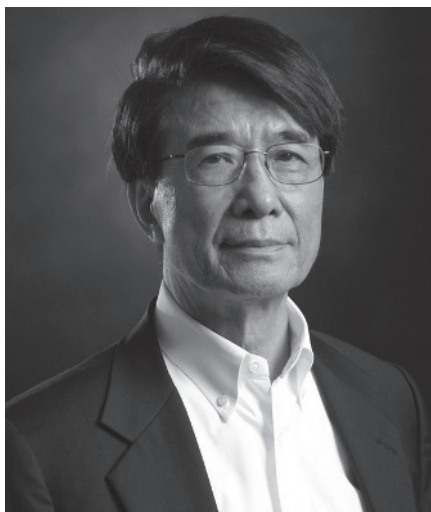
ZACHARY FISK

*Professor Emeritus of Physics and Astronomy,
University of California, Irvine*

Zachary Fisk is Professor Emeritus of Physics and Astronomy at University of California, Irvine (2006-present). He received his Ph.D. in physics from the University of California at San Diego. He has held positions at the University of Chicago, The University of California at San Diego, the Los Alamos National Laboratory, Florida State University, and the University of California at Davis.

Professor Fisk's research examines the electronic properties of magnetic and superconducting materials. In this work he has excelled at creating high-quality crystals of these superconducting materials. His work was instrumental to insight into transport and magnetic properties of a wide class of important magnetic and superconducting materials, including the heavy fermion compounds, the A15s, the rare earth borides, and the high-temperature superconducting cuprates.

Professor Fisk has received many awards and honor in recognition of his work in condensed matter physics, including the American Physical Society's International Prize for New Materials in 1990 and the E. O. Lawrence Award in 1992. He was elected a Fellow of the American Academy of Arts and Sciences in 1994, and in 1996 he was elected to the National Academy of Sciences for his work linking crystal chemistry with condensed matter physics, which improved scientific insight into the transport and magnetic properties of a variety of magnetic and superconducting materials. Professor Fisk is a fellow of the American Physical Society and the Los Alamos National Laboratory.



PAUL C. W. CHU

*T. L. L. Temple Chair of Science, Professor of Physics,
and Founding Director and Chief Scientist,
Texas Center for Superconductivity at the
University of Houston*

SYMPOSIUM SPEAKER

Paul C. W. Chu currently serves as Professor of Physics, T. L. L. Temple Chair of Science, and Founding Director and Chief Scientist of the Texas Center for Superconductivity at the University of Houston; and as Honorary Chancellor of the Taiwan Comprehensive University System. He is President Emeritus and University Professor Emeritus of Hong Kong University of Science and Technology. He was born in Hunan, China, and received the B.S. degree from Cheng-Kung University in Taiwan. After service with the Nationalist Chinese Air Force, he earned the M.S. degree from Fordham University, Bronx NY, and completed the Ph.D. degree at the University of California at San Diego (1968), all three degrees being in Physics.

After doing industrial research with Bell Laboratories at Murray Hill, New Jersey, Dr. Chu held an academic appointment at Cleveland State University. He assumed his appointment at the University of Houston in 1979. He was Director of the Texas Center for Superconductivity at the University of Houston between 1987 and 2001. He had served as a consultant and visiting staff member at Bell Labs, Los Alamos National Lab, the Marshall Space Flight Center, Argonne National Lab, and DuPont at various times.

Professor Chu has been working on superconductivity since his student days with Bernd T. Matthias at the University of California at San Diego in 1965-1968. In January 1987, his team and former student M. K. Wu achieved superconductivity at 93 K (180 °C), above the boiling point of liquid nitrogen (-196 °C), making its commercialization more practical, and they continue to hold the current record high transition temperature of 164 K (109 °C) in another cuprate compound when compressed. Presently, he is actively engaged in the basic and applied research of high temperature superconductivity. His research activities extend beyond superconductivity to magnetism and dielectrics. His work has resulted in the publication of more than 690 papers in refereed journals.

Professor Chu has been elected as a member of several prestigious national academies of science of the U.S. (1988) and other countries. He has received numerous awards, including the U.S. National Medal of Science (1988), and has served on many different national and international professional committees.



ROBERT N. SHELTON

President, Giant Magellan Telescope Organization

Robert Shelton was educated at Stanford University (B.S., 1970) and the University of California at San Diego (M.S., 1973; Ph.D., 1975) and began his academic career at UC-San Diego as an assistant research physicist in 1975. Moving to Iowa State University in 1978, Shelton was promoted to associate professor in 1981 and professor in 1984. He returned to California as chair of the Department of Physics at UC-Davis in 1987 and served in that capacity until 1990, when he was named vice chancellor for research.

In 1996, Dr. Shelton joined the President's Office at the University of California as vice provost for research. In 2001 he assumed the position of executive vice chancellor and provost at the University of North Carolina at Chapel Hill. On July 1, 2006, Shelton began his appointment as the 19th president of The University of Arizona. He retired from this position effective July 31, 2011 to assume the leadership of the Arizona Sports Foundation on August 1, 2011. From March 2014 to February 2017, Shelton served as president of Research Corporation for Science Advancement. In February 2017, he began his presidency at the Giant Magellan Telescope Organization.

Dr. Shelton was a guest scientist at both the Kernforschungsanlage in Jülich, Germany, and of the Japanese government at the Institute of Metals in Tokyo, Japan; and a visiting professor in the Département de Physique de la Matière Condensée, at the Université de Genève, Geneva, Switzerland. He has been an active and productive scientist whose work has focused on collective electron effects in novel materials. He is a fellow of the American Physical Society, and member of Sigma Xi, and Phi Beta Kappa.

Dr. Shelton and his wife of 50 years, Adrian A. Shelton, M.S., were undergraduates at Stanford. They have three adult children: Christian Shelton, Ph.D., a Professor of Computer Science at UC Riverside; Cameron Shelton, Ph.D., an Associate Professor of Economics at Claremont-McKenna College; and Stephanie Shelton Crossen, M.D., M.P.H., an Assistant Professor of Pediatric Endocrinology at the University of California, Davis.



MAW-KUEN WU

*Distinguished Research Fellow, Institute of Physics,
Academia Sinica, Taipei, Taiwan*

SYMPOSIUM SPEAKER

Professor Maw-Kuen Wu is currently a distinguished research fellow at the Institute of Physics, Academia Sinica in Taiwan. Prof. Wu has received many major scientific awards including the U.S. National Academy Comstock Prize, the Bernd T. Matthias Prize, the Humboldt Research Award from Germany, the Nikkei Asia Prize of Japan, the Ettore Majorana-Erice-Science Prize of Italy, and the Presidential Science Prize of Taiwan. He is a member of the Academia Sinica, Taiwan, a Foreign Associate of the U.S. National Academy of Sciences as a Foreign Associate, and a member of the Academy of the Developing Countries. In addition, he served as a member of the cabinet in charge of science and technology in Taiwan, from 2000 to 2002 as Deputy Minister, and from 2004 to 2006 as the Minister of the National Science Council (Now the Ministry of Science and Technology). He was the Director of the Institute of Physics in Academia Sinica from 2006-2011, and in 2012-2016 was the President of the National Dong Hwa University located at his hometown on the east coast of Taiwan. He also served briefly as the Minister of Education of Taiwan in 2018.

SELF-GUIDED LABORATORY TOURS IN HOUSTON SCIENCE CENTER AT THE UNIVERSITY OF HOUSTON



1st Floor

Room 107	Education & Outreach: City of the Future , Mr. Trevor Bontke
Room 115	Ion Beam Laboratory , Prof. Wei-Kan Chu, Dr. Di Chen, Mr. Jayahansa Napagoda
Room 136A	Optical Microscopy Lab , Mr. Ian Bishop and Mr. Ron Presswood, Elemental Recycling. Poster on Liquid-Aluminum-Mediated-Pyrolysis (with J. Meen group)
Room 140E	CreaTec LT-STM-AFM-MBE Laboratory , Dr. Yanfeng Lv, Mrs. Samira Daneshmandi, Prof. Paul C. W. Chu
Room 141	Electron Microprobe Lab , Prof. James Meen (YBCO solid solution limits)
Room 143B	Transmission Electron Microscope Laboratory (2000FX) , Dr. Eduard Galstyan
Room 143C	Field-Emission Transmission Electron Microscope Laboratory (2010F) , Dr. Dezhi Wang, Mr. Brian McElhenny
Room 144	Scanning Electron Microscopy Laboratory , Monica Martinez (moon rock and LPSC poster)

2nd Floor

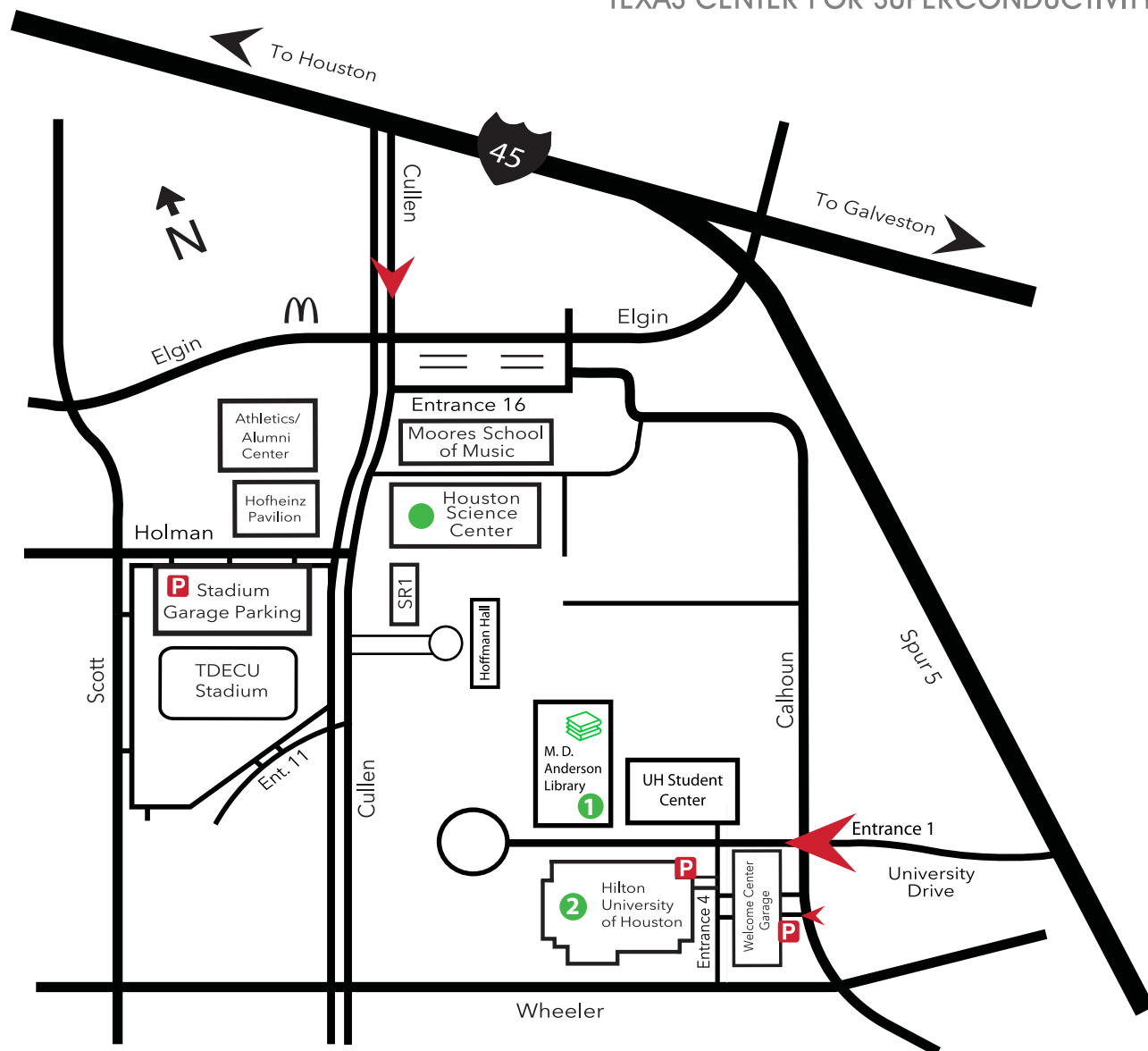
Room 207	Raman & IR Laboratory , Dr. Viktor Hadjiev
Room 215	Nanomedicine Physics Laboratory , Dr. Audrius Brazdeikis
Room 221	Diamond Anvil Cell Laboratory , Dr. Liangzi Deng, Prof. Paul C. W. Chu
Room 256	Magnetic Measurement Laboratory , Mr. Rabin Dahal, Prof. Paul C. W. Chu
Room 259A/B	High Pressure Low Temperature Laboratory , Dr. Melissa Gooch, Prof. Paul C. W. Chu

3rd Floor

Room 331	High Frequency Bioengineering Laboratory , Prof. Jarek Wosik
Room 336	Energy Conversion and Storage Laboratory , Mr. Benjamin Emley, Prof. Yan Yao

4th Floor

Room 456	1). Water Electrolysis for Hydrogen , Dr. Luo Yu, Prof. Zhifeng Ren 2). Enhanced Oil Recovery , Dr. Dan Luo, Prof. Zhifeng Ren
Room 461	High Thermal Conductivity , Dr. Fei Tian, Prof. Zhifeng Ren
Room 465	Thermoelectric Materials and Characterizations , Dr. Jun Mao, Prof. Zhifeng Ren



NOVEMBER 15, 2019 EVENTS

- 9:00 a.m. **1 Meeting of the Minds-Legacy of Bernd T. Matthias Symposium** 
M. D. Anderson Library, Elizabeth D. Rockwell Pavilion
2nd Floor - 114 University Drive, Houston, TX 77004
- 12:30 p.m. **2 Symposium Luncheon**
The TcSUH Society, host
Hilton University of Houston, Shamrock Ballroom
2nd Floor - 4450 University Drive, Houston, TX 77024
- 3:00 p.m. **3 TcSUH Open House/Homecoming**
Houston Science Center - Bldg. 593
3369 Cullen Boulevard, Houston, TX 77204

P Parking Garages

UH Stadium Garage

3874 Holman, Houston, TX 77204

Hilton Hotel Underground Parking

Entrance 4

UH Welcome Center Garage

4926 Calhoun Rd., Houston, TX 77004

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www.uh.edu/maps/

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