David T. Young

Dr. Young's primary scientific interests and contributions center on investigating and understanding the chemical composition of solar system plasmas and the effects of composition on the dynamics of planetary magnetospheres. In pursuit of those interests Dr. Young has led or contributed to the design and development of several cutting-edge spectrometers widely used to investigate space plasmas. Experiments based on his instruments have contributed to a better understanding of terrestrial, planetary, and cometary magnetospheres.

In the 1970s Dr. Young showed that the composition of Earth's magnetosphere is strongly correlated with solar cycle UV emissions. In the 1980s his work concentrated on studies of heavy-ion (He^+ and O^+) acceleration by self-generating ion cyclotron waves discovered in the equatorial magnetosphere. In the 1990s his work focused primarily on developing measurement techniques for the instruments he was developing. By the 2000s and 2010s Dr. Young's attention turned to the composition-dependent complexities of Saturn's magnetosphere. He contributed to the discovery that "water ions" shed by icy satellites dominate Saturn's magnetosphere. He also worked to understand Titan's complex atmosphere and ionosphere that are comprised primarily of positively- and negatively-charged heavy carbon molecules. It is these molecules that form the aerosol particles covering Titan's surface.

Dr. Young's laboratory research pushed techniques for cutting edge ion mass spectrometry, opening up new experimental possibilities. He was the first to extend, by orders of magnitude, the energy range and sensitivity of mass spectrometers, such as the Thermal Ion Dynamics Experiment on the Polar mission. His work led to miniaturization and increased performance of energy spectrometers, such as the Ion Electron Sensor on the Rosetta mission, as well as mass spectrometers, such as the Plasma Experiment for Planetary Exploration on Deep Space One. In 2002 he invented and led the early development of the ultra-high resolution MASPEX mass spectrometer (capable of out-performing most laboratory instruments) for the Europa Clipper mission.

In 1988 Dr. Young conceived of the Cassini Plasma Spectrometer (CAPS), an integrated three-instrument suite, for the Cassini mission to Saturn. Because of his decade-long experience in Europe while at the University of Bern, he was able to assemble and manage a team that eventually included 170 scientists and engineers from the U.S. and five European nations. In 1990 NASA selected CAPS with Dr. Young as Principal Investigator, in part because the European teams' contributions saved NASA $15 million (in 2022 dollars) over the course of the mission. In 2019 he was informed by Cassini project management that data from CAPS had contributed to over 500 publications and 26 doctoral dissertations.

During the course of his career Dr. Young has contributed to the experimental space science community by designing and building highly accurate calibration systems at four institutions: Rice, Bern, Los Alamos, and two at SwRI. These systems have been used for programs as varied as the Apollo Lunar Surface Experiments Package, ESA's Rosetta mission to 67P/Churyumov-Gerasimenko, and Cassini.

As well as his work in experimental space science, Dr. Young's interests have included educating the next generation(s). To that end he has taught courses on magnetospheric physics and gamma ray spectrometry (University of Bern), and space instrumentation and spacecraft design (University of

Michigan and Rice University). He has also served as thesis director for four successful PhD students (two from Rice) and two MS students (one from Rice).

Dr. Young has authored or co-authored 228 publications in the scientific and engineering literature. Fifty-five of those papers describe space science instruments eventually flown on multiple successful missions. He also holds two patents on terrestrial spinoffs of his space instruments.

Post Retirement Public Service

Since retiring in 2012, Dr. Young has drawn on his educational background and scientific interests to serve the San Antonio community by giving lectures and courses on Climate Change, Planetary Stewardship, Cosmology, and Science and Religion. His "students" have included members of Rotary and similar community groups, adult extended education courses, and classes at several local universities. During the COVID pandemic he taught two courses that, via Zoom, attracted students from both the US and Europe. He has also contributed to San Antonio's "Climate Action and Adaption Plan" and, at the request of a city council member, has lectured to high school students on Climate Change.

Education

B.S. in Physics (*Summa Cum Laude*), 1964, University of Louisiana at Lafayette
M.S. in Space Science, 1967, Rice University
Ph.D. in Space Science, 1970, Rice University
Venia Docendi in Space Physics, 1980, Institute of Physics, University of Bern, Switzerland.
Note: The *Venia Docendi* is a post-doctoral thesis submitted as part of the *Habilitation*, the "highest university degree" awarded in most European countries. The recipient holds the position of *Privat Docent*, equivalent to a tenured associate professorship in the U.S.

Professional Positions

Research Scientist, Rice University, Houston, TX (1969 – 1970)
Senior Research Scientist, Royal Institute of Technology, Stockholm, Sweden (1971)
Senior Research Scientist, Institute of Physics, University of Bern, Switzerland (1971-1980)
Associate Professor of Physics (*Privat Docent*), Institute of Physics, University of Bern, Switzerland (1980 – 1981)
Member of the Scientific Staff, Los Alamos National Laboratory (1981 – 1987)
Institute Scientist, Southwest Research Institute (1988 – 1999)
Professor of Space Science, Department of Atmospheric, Oceanic and Space Sciences, University of Michigan, Ann Arbor (1999 – 2002)
Institute Scientist, Southwest Research Institute (2002-2009)
Adjunct Professor of Space Science and Astronomy, Rice University (1996 – 1999, 2003 – 2009)
Director for Research and Development, Division of Space Science and Engineering, Southwest Research Institute (2009 to retirement in 2012)

Honors and Awards

The 2002 Heinrich Greinacher Prize (currently valued at $25,000) awarded by the International Space Science Institute for career achievements in experimental space physics.
Medal of the City of Marseille, France (2004) awarded for leadership of the Cassini Plasma Spectrometer Team.
Fellow of the American Geophysical Union "in recognition of eminence in geophysics" (2008).
Professional Achievement Award, The Association for Women in Communications (2012) for contributions to research in space science.

NASA Achievement Awards for instrument design, development, operations and scientific analysis on the following space missions:

- Dynamics Explorer Mission, Energetic Ion Composition Spectrometer (1983)
- Global Geospace Science Mission, Polar Thermal Ion Dynamics Investigations Team (1998)
- Cassini Program, Design of Cassini Plasma Spectrometer (1998)
- Cassini Program, Science Operations Element (1998)
- Deep Space One Project, Plasma Experiment for Planetary Exploration (PEPE) (1999)
- Deep Space One Project, Science Team (1999)
- IMAGE Mission, Medium-Energy Neutral Atom Imager, (2001)
- Deep Space One Comet Team, successful Borrelly Encounter (2002)
- Cluster Science Team, Contributions to Success of Mission (2004)
- Rosetta 67P/Churyumov-Gerasimenko, Rosetta Ion and Electron Instrument Team (2005)
- Cassini Mission, Cassini Plasma Spectrometer Team for Scientific Success of Mission (2009)
- Magnetospheric Multi-Scale Instrument Suite Team, Exceptional Achievement Award (2016)

European Space Agency (ESA) Achievement Awards for instrument design, development, operations and scientific analysis on the following space missions:

- Ion Mass Spectrometer, GEOS Geostationary Scientific Satellite 1 (1977) and GEOS 2 (1978)
- Ion Mass Spectrometer, Giotto mission to Halley's Comet (1987)
- Science Team, Huygens Probe mission to Titan (1997)
- Ion Mass Spectrometer, ESA Rosetta Mission (2005)

Jet Propulsion Laboratory Achievement Awards for instrument design, development, operations and scientific analysis on the following space missions:

- Deep Space One First Flight, Plasma Experiment for Planetary Exploration, (2000)
- New Millennium Program, Deep Space One Technology Validation Mission (2001)

Responsibilities on NASA Space Science Missions:

- Principal Investigator, Cassini Plasma Spectrometer, Cassini Mission to Saturn
- Principal Investigator, HPCA experiment, Magnetosphere Multiscale Mission

- Principal Investigator, Plasma Experiment for Planetary Exploration, Deep Space 1
- Principal Investigator, Low-Energy Magnetospheric Ion Composition Spectrometer, CRRES
- Principal Investigator, four NASA Plasma Instrument Definition and Development Programs leading to experiments for Cassini, Deep Space One, MMS, and Europa Clipper
- Principal Investigator, design and development (2002-2012) of the Mass Spectrometer for Planetary Exploration (MASPEX) for the Europa Clipper mission (J. Burch is now PI)
- Co-investigator, ESA GEOS 1 and 2 Ion Composition Experiments
- Co-investigator, Thermal Ion Dynamics Experiment, Polar GGS
- Co-investigator, Toroidal Ion Mass Spectrometer, Polar GGS
- Co-investigator, Plasma Electron and Current Experiment, ESA/Cluster 2 Mission
- Co-investigator, Medium-Energy Neutral Atom Imager, IMAGE Mission
- Co-investigator, Ion and Electron Spectrometer, ESA Rosetta Mission
- Co-investigator, ROSINA Ion Mass Spectrometer, ESA Rosetta Mission
- Co-Investigator, Ion Mass Spectrometer, ESA Giotto Mission
- Co-investigator, Rosetta Orbiter Spectrometer for Ion and Neutral Analysis, Rosetta Mission

Patents:

Patents No. 5,360,976 issued in 1994, and No. 5,463,220 issued in 1995, for applications of Time-of-Flight Mass Spectrometry to laboratory applications in medicine and similar fields.

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