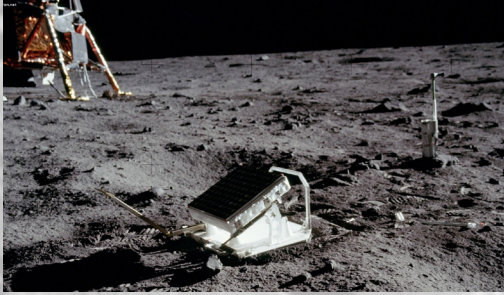


An IEEE Milestone Dedication: The Apollo 11 Lunar Laser Ranging Experiment (LURE)



Apollo 11 Lunar Laser Ranging Experiment (LURE), 1969

On 1 August 1969, Lick Observatory made the first Earth-to-Moon distance measurement with centimeter accuracy. The researchers fired a gigawatt ruby laser at a retro-reflector array placed on the Moon by Apollo 11 astronauts, and measured the time delay in detecting the reflected pulse. This was the first experiment using a hand-placed extraterrestrial instrument.

AGENDA

7:00 pm Welcome and Introductory Remarks

Brian A. Berg, IEEE Region 6 History Chair
and Milestone Coordinator

IEEE Foundation Remarks

Stan H. Retif, IEEE Foundation Chief
Development Officer

**Univ. of California Observatories
Remarks**

Michael Bolte, UC Santa Cruz

**What Was in Those Apollo 11 Moon
Rocks?**

Dennis Wingo, Skycorp, Inc.

IEEE's Milestone Program

Jim Jefferies, 2018 IEEE President and CEO

IEEE Milestones in the Bay Area

Brian A. Berg

**Prof. Hildreth "Hal" Walker, Jr. *in*
*Conversation with SETI's Seth Shostak***

8:30 pm Audience Q&A

8:45 pm Dedication of IEEE Milestone Plaque

Thanks to Videographer Ken Pyle of Viodi

PROGRAM PARTICIPANTS

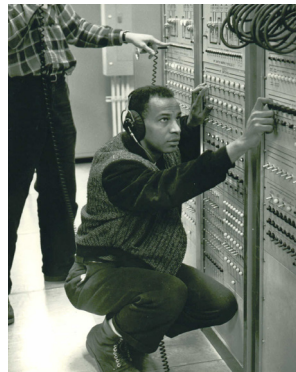
Prof. Hildreth “Hal” Walker Jr. was the field operations manager for KORAD Lasers while working on the Apollo 11 Lunar Laser Ranging Experiment (LURE). He and his team were responsible for



the manufacturing, test, and operation of KORAD’s LURE laser. Hal is the man who actually fired the 1.2 GW laser from Lick Observatory on August 1, 1969, for the first successful laser-ranging of the moon using an array of retro-reflectors placed on the lunar surface by the Apollo 11 astronauts.

Hal started his career in the 1950s serving as an electrician’s mate in the U.S. Navy aboard the jet aircraft carrier USS Rendova where he worked on high-power electronics systems. His experience in the Navy led him to be recruited by Douglas Aircraft Company to work on radar systems for the A3D Skywarrior Strategic Bomber.

In response to the Soviet launch of Sputnik, Hal was recruited by RCA to work on the Ballistic Missile Early Warning System (BMEWS) in Clear, Alaska. From RCA, Hal was hired by Ted Maiman, the inventor of the laser and founder of KORAD Lasers located in Santa Monica. KORAD was subsequently selected as one of the competing teams for the Apollo 11 LURE project, and Hal was selected by KORAD to be their field operations manager. Hal ultimately retired from Hughes Electro-Optical Data Systems.

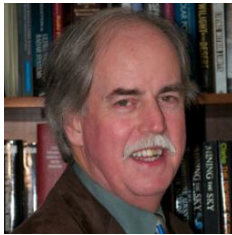


In the 1990s, Professor Hal Walker and his wife Dr. Bettye Walker were invited by President Nelson Mandela to bring their U.S.-based STEM education programs to South Africa where they still operate programs, and they recently launched the Cape Town Space Society. Hal continues to serve as a NASA Solar System Ambassador for science and engineering education.



Brian A. Berg

Brian A. Berg has been a data storage technologist for over 30 years through his Berg Software Design consultancy, where his current specialty is flash memory. He works extensively with patents and intellectual property, and is Technical Chair of the annual Flash Memory Summit. As IEEE Region 6 History Chair and Milestone Coordinator, Brian has secured Milestones for the EEPROM/Flash Memory, the Apple Macintosh, SHAKEY the Robot, CDMA, and the DIALOG Search System. He has assisted with Milestones for CP/M, Moore's Law, the Apple I and II, and Doug Engelbart's Demo. Brian has a Bachelors in Mathematics, and was a Computer Engineering graduate student at Stanford University.



Dennis Wingo

Dennis Wingo is CEO and Founder of Skycorp, Inc. and Greentrail Energy, Inc., and Co-Founder and CTO of Orbital Recovery, Inc. His key areas of expertise are solar electric propulsion, satellite and spacecraft design, advanced mission planning, and lunar surface operational scenario development. Dennis led the development, construction and testing of microgravity payloads for sounding rockets and the Space Shuttle at the Univ. of Alabama in Huntsville. He also led the design and development of the world's first commercial satellite servicing system at Orbital Recovery, as well as the Lunar Orbiter Image Recovery Project (LOIRP) that restored and digitized the images of NASA's Lunar Orbiter Program.

Dennis's international team was the first to rescue and operate a spacecraft (ISEE-3) in interplanetary space. He is author of the book *Moonrush: Improving Life on Earth with the Moon's Resources*, as well as dozens of scientific articles and entries on his blog. He has also been featured on many documentaries, programs, and news articles on advanced space activities.



Stan H. Retif, IEEE Foundation Chief Development Officer

Stan H. Retif has held senior level positions at major human services organizations in the Philadelphia area, including VP for Development & Communications at Woods Services. He has also held senior level positions in education, religion and human services, and was recently elected Board Chairman of the Greater Philadelphia Chapter of the Association of Fundraising Professionals.

Stan currently serves as Chief Development Officer at the IEEE Foundation, whose Realize the Full Potential of IEEE Campaign has achieved 2/3 of its \$30 million goal. He received his BA in Political Science from Tulane University, was a Fellow in Loyola University of New Orleans' Institute of Politics, and is a Certified Fundraising Executive (CFRE).



Michael Bolte, PhD

Michael Bolte is a Distinguished Professor of Astronomy and Astrophysics at the University of California Santa Cruz. He received his PhD from the University of Washington in 1987, received a Plaskett Prize Postdoctoral Fellowship at the National Resource Council of Canada, then became one of the first of the NASA Hubble Prize Postdoctoral Fellows. He joined the faculty at UC Santa Cruz in 1993. From 2005 through 2012 he was the Director of the University of California Observatories, a multicampus research unit that manages the Lick Observatory, the W.M. Keck Observatory and the Astronomical Instrumentation Laboratories at UC Santa Cruz and UCLA.

He was a Director on the CARA Board that oversees the W.M. Keck Observatory from 2005 - 2012 and has been a Director on the Thirty-Meter Telescope International Observatory since 2005. His research areas are the determination of the ages of the oldest stars in the Galaxy, the evolution of the chemical makeup of the Universe and the early epoch of the formation of the Galaxy.



Seth Shostak, PhD

Seth Shostak is Senior Astronomer and Fellow at the SETI Institute in Mountain View. He has conducted radio astronomy research on galaxies for much of his career, and he has written over 500 articles and web stories on topics in astronomy, technology, film and television. Dr. Shostak has written, edited and contributed to a half dozen books, the most recent of which is *Confessions of an Alien Hunter: A Scientist's Search for Extraterrestrial Intelligence* (National Geographic). He is also co-author of a college textbook on astrobiology, and he has published over 60 professional journal papers.

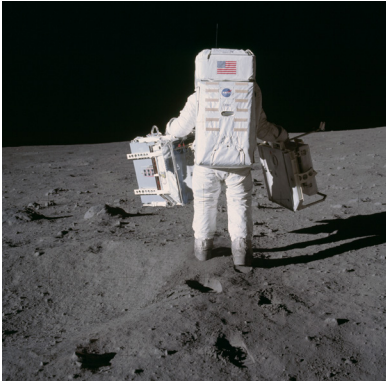
Seth chaired the International Academy of Astronautics' SETI Permanent Committee for a decade, and he hosts SETI's weekly hourlong science radio show titled "Big Picture Science." His Bachelors in Physics is from Princeton University, and his PhD in Astronomy is from Cal Tech.



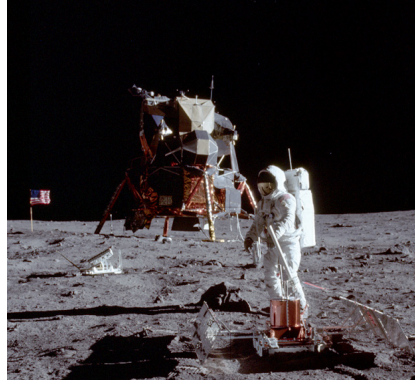
Jim Jefferies

Jim Jefferies was the 2018 IEEE President and CEO. He is a retired AT&T and Lucent Technologies executive who in 33 years rose from manufacturing engineer to Vice President. He worked directly with the Bell Labs teams that developed fiber optic cables, and also served as logistics Vice President responsible for worldwide supply chains, quality assurance, and export planning. More recently Jim teamed with fellow Stanford Business School graduates in an entrepreneurial venture in San Francisco for which he served as COO.

While he was 2015 IEEE-USA President, Jim supported expanded focus on public visibility, young professionals and humanitarian outreach. He earned his BSEE from the University of Nebraska, an MSES from Clarkson University, and is a licensed PE (Emeritus). Jim attended the Stanford University Business School as a Sloan Fellow, earning an MS in Management.



Apollo 11: Buzz Aldrin with Seismometer (left) and Retro-reflector (right).



Apollo 11: Retro-reflector and Seismometer deployed.

Apollo 11 astronauts, (left to right) Buzz Aldrin, Michael Collins and Neil Armstrong show a two-pound Moon rock to Frank Taylor, director of the Smithsonian Institute in Washington D.C. on Sept. 15, 1969. (NASA)



1997: President Nelson Mandela, Dr. Bettye Walker and Prof. Hal Walker met to discuss STEM Education Programs in South Africa. This resulted in the Walkers returning every year since then to develop STEM

programs across South Africa, including the Feb. 2019 launch of the Cape Town Space Society.

Thank you to our event sponsors



IEEE Foundation

The IEEE Foundation is the IEEE's philanthropic arm, and its donors enable programs that improve access to technology, enhance technological literacy, and support technical education and the IEEE professional community. As a 501(c)(3) organization, it supports grants to grassroots projects of strategic importance, strives to be a leader in transforming lives through the power of technology and education, and improves awareness of technology history.



Thanks also to



Special thanks to Lick Staff Astronomer Dr. Elinor Gates for all of her assistance.

Program design by Shadow Cliffs Engineering