TODAY'S PRESENTATION

Program: What Will We Discover? The Next Decade of Space Exploration
Speaker: Greg McCauley, Executive Director/CEO, Link Observatory Space Science Institute
Attendance: 103
Guests: Carol Mutter, Jim Mutter, Jim Stohler, Bob Kruse, Tom Hall, and one more not recorded
Introduced by: Jeff Rasley ***Scribe:*** Hank Wolfla
Editor: Carl Warner

Today's talk was given by Greg McCauley, Exec. Dir. and CEO, of the Link Observatory Space Science Institute. The Mission of this organization is to "Advance scholastic literacy of future generations with informal STEM education focused on NASA missions, astronomy, and space exploration; and to foster scientific curiosity and advance science literacy to cultivate and nurture the next generation of leaders.

Greg gave a review of 4 new major telescopes due to be completed in the next 10 years:

GMT – Giant Magellan Telescope to be built on Las Campanas Peak, Chile. This scope has a collecting area of 368 sq. meters, a total cost of $1.1B, and projected commissioning of a partial telescope (4-mirror version) in 2023. Its purpose is to detect extra-solar planets, explore the furthest reaches of the universe and explore dark energy.

TMT – Thirty Meter Telescope, hopefully to be located on HI's Mauna Kea Summit, has a collecting area of 655 Sq. meters and a cost of $1.4 billion. The anticipated completion in 2022 has been delayed by a permit problem. If not in HI, then it will be built in the Canary Islands. This telescope has many of the same purposes as the GMT telescope.

E-ELT – European Extremely Large Telescope that will be built on Cerro Armazones, Chile. This is a very large telescope with an extremely large collecting area of 978 sq. meters, a completion date of 2024, and a cost of $1.5B. The ELT uses a very advanced five mirror design. This telescope will utilize a giant leap in technology called Adaptive Optics.

Lastly, the James Webb Space Telescope has a proposed launch date of 2018. This telescope will be deployed 1 million miles from earth at Lagrange point L-2. It will have a 6.5meter primary beryllium/gold 18 segment mirror with an estimated cost of $8.8B. This is an infrared telescope and can detect the heat of a honey bee on the moon. It will generate 235 gigabits of data every day. The JWST objectives are to determine the assembly of galaxies, origins of the universe, birth of stars and protoplanetary systems, and to explore exoplanets and even the origins of life.

The need for adaptive optics is based upon the fact that as light passes though the atmosphere of the earth, each photon of light energy reaches the earth at a different time. This is what causes stars to twinkle at night as you look at them. Before adaptive optics, the stars viewed by a telescope, much less planets around them, were blurry and shifting images.

In the ELT, the light is captured by its large lens, it is sent to a “deformable mirror” then to a beam splitter. The output of the beam splitter is sent to the science camera and a wavefront sensor. The deformable mirror is about 10 ft. in diameter and has hundreds of small mirrors that can be pushed from behind to change the length of time the light from that location on the wavefront sensor hits the science camera. A computer controlled feedback system is used to vary the movement of the segment mirror in the range of 5 microns. This feedback system has been the biggest change in telescope technology and now allows us to see planets around stars in the distant universe. The ELF telescope will be the first telescope to create surface maps of nearby exoplanets.

How do we detect life on exoplanets? The signs of life on another planet will be found with a spectrograph. By observing the light coming from the distant star and its planet, we can measure the radiation transmitted through the planet’s atmosphere. First, we look for water vapor, oxygen and other gases. If we see the same pollutants that the earth has in its atmosphere, we have a good idea that intelligent life may have produced these. Closing statement from the Goddard Symposium for leadership for space: <u>There will be more major discoveries made in the next decade than in all human history</u>. These new telescopes will make this happen.

Link Observatory Space Science Institute’s Greg McCauley (today’s speaker) and Kurt Williams, left and right respectively, flanking Scientech’s Jeff Rasley during the Scientech Club Foundation’s check presentation to the Institute at today’s meeting.