

# Linking Girls to the Sky

By Don McCarthy

In the bid to NASA to design and build the near-infrared camera for the James Webb Space Telescope (JWST), the NIRCam (Near-Infrared Camera) Science Team proposed a broad program of Education and Public Outreach. Following a suggestion from Tim Slater, we proposed a long-term partnership with the Girl Scouts of the USA to improve the involvement of girls and young women in science, technology, engineering and mathematics (STEM). The NIRCam proposal was accepted in June 2002 and has led to an on-going international effort to support informal science education among three million girls and their adult leaders.

One of our specific goals was to leverage the UA Alumni Association's Astronomy Camps to train adult Girl Scouts of the USA (GSUSA) leaders from all US Councils. For this purpose we hold biannual workshops at the Hacienda Center of our local Sahuaro Council and also use the 61-inch Kuiper telescope on Mt. Bigelow – one of the pioneering sites of infrared astronomy. These venues provide an inspirational setting and plenty of hands-on opportunities to operate telescopes (4 to 61 inch diameter) and related electronic imagers and spectrometers. A typical camp includes not only nighttime observing with telescopes but also concentrated daytime training in STEM activities beginning with scale modeling and classification activities and extending to cosmological topics (redshift, Hubble expansion, look-back time, etc.) relating to JWST's mission.



*Three Girl Scout leaders (from CA, FL and MI) work together to understand the properties of galaxies using a "classification" activity developed by graduate students Krystal Tyler and Wayne Schlingman. These leaders attended NIR-Cam's most recent workshop (October 3-5). One of them is an engineer at Ford Motor company.*

We fund the travel and participation of Girl Scout Council leaders to a weekend Astronomy Camp twice per year. To date nine such Camps have been held involving 62 US Councils, the West Pacific Council, and 128 GSUSA leaders as well as education and public outreach leaders from JPL, the Rochester Museum of Science, Lockheed Martin, and the NIRCam science team. We are maintaining a long-term relationship with these leaders through the launch (2013) and five-year JWST science mission.

These astronomy camps are a team effort involving the Alumni Association, Steward and LPL faculty, the NIRCam team, Lockheed engineers, Steward graduate students, and a core group of ten Girl Scouts leaders from southern Arizona's Sahuaro Council who we have trained and equipped to take the dominant teaching role. A major result of this effort has been the complete revision of the "Sky Search" curriculum for Junior Girl Scouts nationwide. The earlier content had been severely flawed and promoted major miscon-

ceptions in basic ground- and space-based astronomy.

Graduate students play a major role in the camps and also support educational programs within our local Sahuaro Council. Over the past few years, these students have included Karen Knierman (funded via a NASA Space Grant Graduate Fellowship), Beth Biller, Stephanie Cortez, Jenn Donley, Kris Eriksen, Kristian Finlator, Jarod Gabor, Abby Hedden, Wayne Schlingman, Nathan Stock, and Krystal Tyler as well as postdocs Craig Kulesa, Jane Rigby, and Patrick Young. Together we have developed an annual Astronomy Patch Day event for all of southern Arizona as well as special events for Science, Math, and Related Technologies (SMART), observing nights, science evenings, and astrophotography. In the past year NIRCam has also funded scholarships for Girl Scouts to attend the summer Astronomy Camps for Teens and supported a Gold Award project. All these events serve as models for other regions of the US such as the programs being administered by NIRCam scientist Dr. Stefi

Baum and two GSUSA leaders who attended camp from the Center for Imaging Science at the Rochester Institute of Technology.

The recently recommissioned 0.5-meter Jamieson telescope on Mt. Lemmon provides an opportunity for Girl Scouts to do infrared astronomy. This telescope was a most generous gift from the estate of the late Dr. John Jamieson. It was moved from Orcas Island, WA to Mt. Lemmon through funding by Steward Observatory in 2004. Additional funding for this GSUSA program came from Dr. Laird Close's NSF CAREER grant. Astronomy Camp helped supply the telescope's infrastructure and upgraded the drive train. This work was accomplished by Steward's Operations and Engineering and Technical Support (ETS) groups under the direction of Bob Peterson and Jim Grantham. We are grateful to the Mt. Lemmon crew and to Dave Harvey, Joe Hoscheid, Jeff Rill, and Greg Safford who worked very hard to make this facility a fine educational and research tool.