



Credit: Ariel Marinkovic et al., ALMA (NRAO/ESO/NAOJ)

Upcoming Events



CASPER 2013 Annual Meeting (<http://www.jb.man.ac.uk/meetings/casper2013/>)

Sep 02 - 06, 2013 | Jodrell Bank Observatory, UK



The Galactic Center: Feeding and Feedback in a Normal Galactic Nucleus

[\(<https://science.nrao.edu/science/meetings/IAU303-GC2013>\)](https://science.nrao.edu/science/meetings/IAU303-GC2013)

Sep 30 - Oct 4, 2013 | Santa Fe, NM

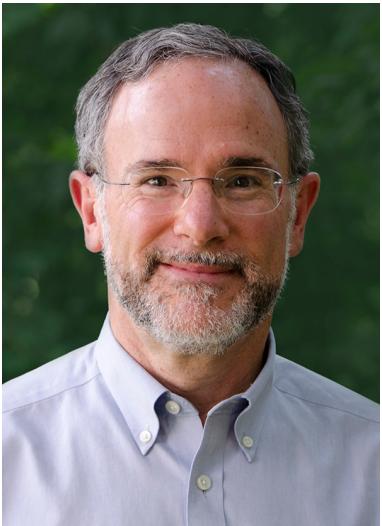


NRAO Town Hall at the AAS (<https://science.nrao.edu/science/meetings/2014/aas223/nrao-town-hall>)

Jan 07, 2014 | National Harbor, MD

2013 Jansky Lecture

Chris Carilli and Tony Beasley



The 48th annual Jansky Lecture will be given by Prof. Charles Bennett, Alumni Centennial Professor of Physics and Astronomy and a Johns Hopkins University Gilman Scholar. Prof. Bennett is being honored for his leadership in the establishment of precision cosmology through studies of the Cosmic Microwave Background radiation.

Prof. Bennett received his B.S. degree in Physics and Astronomy, cum laude with High Honors in Astronomy, from the University of Maryland, College Park in 1978. He received his Ph.D. in Physics at MIT in 1984 under Prof. Bernie Burke, working on large radio surveys with the 300-foot telescope in Green Bank, WV and follow-up “snapshot” observations at the VLA near Socorro, NM. He joined the scientific staff of the NASA Goddard Space Flight Center in 1984 and later became the Infrared Astrophysics Branch Head, and then a Senior Scientist for Experimental Cosmology and a

Goddard Senior Fellow. Dr. Bennett became a professor at the Homewood campus of the Johns Hopkins University in January 2005.

For the last two decades, Dr. Bennett has led the [Wilkinson Microwave Anisotropy Probe \(WMAP\) mission](http://map.gsfc.nasa.gov) (<http://map.gsfc.nasa.gov>). WMAP, launched June 2001, quantified the age, content, history, and other key properties of the Universe with unprecedented accuracy and precision. This was recognized by *Science* magazine as the *2003 Breakthrough of the Year*. The WMAP satellite ended its nine years of scientific

observations in August 2010.

Previous to his work on WMAP, Dr. Bennett was the Deputy PI of the Differential Microwave Radiometers (DMR) instrument and a member of the Science Team of the Cosmic Background Explorer (COBE) mission. The scientific results from this work included the first detection of variations across the sky of the temperature of the cosmic microwave background radiation.

Dr. Bennett is currently building the Cosmology Large Angular Scale Surveyor (CLASS), a microwave background instrument to search for the B-modes from inflationary gravitational waves. CLASS will be sited near ALMA in Chile. Bennett has also been active in defining the Wide-Field Infrared Survey Telescope mission, and is a member of the Euclid and the Subaru Prime Focus Spectrograph teams.

Dr. Bennett has received several awards and honors, including the 2012 Gruber Cosmology Prize, the 2010 Shaw Prize in Astronomy, the 2009 Comstock Prize in Physics, the 2006 Harvey Prize, and the 2005 Henry Draper Medal. He twice received the NASA Exceptional Scientific Achievement Medal, once for COBE and once for WMAP. He also received the NASA Outstanding Leadership Medal for WMAP. Dr. Bennett is a member of the National Academy of Sciences and the American Academy of Arts and Sciences.



Kim Scott

In preparation for the upcoming proposal cycles for NRAO facilities – including the Atacama Large Millimeter/submillimeter Array (ALMA), the Jansky Very Large Array (VLA), the Green Bank Telescope (GBT), and the Very Long Baseline Array (VLBA) – we invite the astronomical community to host NRAO Community Days (CDs) starting in mid-September and continuing through mid-December 2013. The main goal of these CDs is to inform the community of the capabilities of these NRAO telescopes, and thus enable users to carry out cutting edge scientific research using NRAO facilities. We are particularly interested in reaching new users without expertise in radio astronomy.

NRAO CDs are one to two day events designed in cooperation with host institutions across North America. NRAO staff members will travel to the host institutions, with the goal of providing sufficient information to allow the participants to propose for time on NRAO facilities and/or to analyze data taken from these telescopes. In addition to describing telescope capabilities and the broad science they enable, the CDs may also include demonstrations and hands-on workshops on proposal preparation, observation planning, and data reduction.

The agenda for each CD will be largely driven by the goals of the host institution and the expected participants. As noted above, the NRAO is interested in supporting CDs for scientists who do not actively work on studies at radio wavelengths, aiming to inform the local community about how radio astronomy is relevant to their science. CDs of this type may include presentations by NRAO staff on the capabilities of NRAO telescopes, talks on how observations at radio wavelengths are used in astronomical studies (with emphasis on the fields of most interest to the attendees), and tutorials on proposal preparation for NRAO telescopes. This type of CD would be for one day, and the host institution should aim for at least 30

participants.

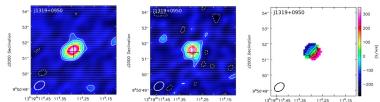
The NRAO will also support CDs for astronomical communities with more experience in radio astronomy that are already familiar with NRAO facilities. CDs for advanced users may include tutorials on using the proposal preparation tools (the Proposal Submission Tool for VLA, GBT, VLBA, and the Observing Tool for ALMA) and data reduction software (CASA for VLA and ALMA, GBTIDL for GBT, and AIPS for VLBA). These events are expected to have at least 15 participants, and may span one or two days depending on the number of facilities and tutorials to be covered.

Persons interested in organizing and hosting a CD at their institution can [apply online](https://science.nrao.edu/php/nrao-cd-app/app.php) (<https://science.nrao.edu/php/nrao-cd-app/app.php>). The application should include a description of the primary goals of the CD (e.g. learning about NRAO telescopes/science, CASA tutorial), the number of people expected to attend (including both astronomers at the host institution and from neighboring communities), the requested length of the CD (one or two days), and which NRAO facilities are of interest to the expected participants. The host institutions are expected to handle the local workshop logistics (meeting room, high-speed Internet, projector, etc.) and work together with the NRAO to broadly advertise the CDs. Applications may be submitted as early as 15 August and will be accepted on a rolling basis.

Note that the expected proposal deadline for ALMA Cycle 2 is early December 2013. The next proposal submission deadline for the VLA, GBT, and VLBA is 3 February 2014.

Star Formation and Gas Kinematics of $z \sim 6$ QSO Host Galaxies

Aaron Evans



In the [August Astrophysical Journal](http://adsabs.harvard.edu/abs/2013ApJ...773...44W) (<http://adsabs.harvard.edu/abs/2013ApJ...773...44W>), Ran Wang and her collaborators present ALMA continuum and [C II] observations of a sample of five $z \sim 6$ QSO host galaxies. A preliminary version of these results from a

Wang et al. conference paper was discussed in the [2012 October eNews](https://science.nrao.edu/enews/5.10/index.shtml#naascnews) (<https://science.nrao.edu/enews/5.10/index.shtml#naascnews>).

The [C II] 158 micron fine structure line is a major coolant in the neutral ISM and has been shown to account for as much as 1% of the far-infrared luminosity of normal star-forming galaxies in the local Universe. An example of the ALMA dust continuum (left), [C II] line emission (middle) and [C II] velocity map (right) from one of the 5 QSO hosts is shown in the Figure.

The dust continuum and [C II] are constrained to have spatial extents of $\sim 1.7\text{-}3.5$ kpc and $\sim 1.2\text{-}2.3$ kpc, respectively. If the gradient observed in the velocity maps is due to rotation, the dynamical masses in the central few kpc are $\sim 10^{10\text{-}11}$ solar masses. The authors make use of prior rest-frame 1450 Angstrom luminosity measurements and the assumption of Eddington accretion to estimate nuclear black hole masses, and thus nuclear black hole-to-dynamical mass ratios of $\sim 0.012\text{-}0.030$. These ratios are found to be an order of magnitude higher than those measured for local spheroidal galaxies and support the idea that the build-up in stellar bulge mass of early Universe QSO hosts lags behind the build-up in nuclear black hole mass.

Finally, their estimated [C II]-to-far infrared luminosity ratios are $\sim 10^{-4}$, i.e., considerably less than in local,

normal star-forming galaxies and consistent with the values of local luminous and ultra-luminous infrared starburst galaxies.

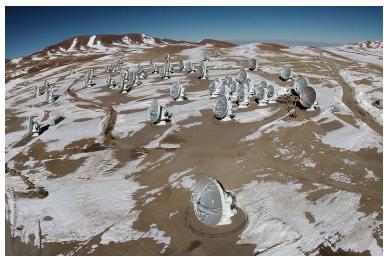
Did You Know: The ALMA and NRAO Knowledgebase

Aaron Evans

Both the [ALMA Helpdesk](https://help.alma-science.org) (<https://help.alma-science.org>) and the [NRAO Helpdesk](https://science.nrao.edu/observing/helpdesk) (<https://science.nrao.edu/observing/helpdesk>) include a library of “Knowledgebase” articles that address a number of common issues and questions. As such, these articles may save users time during critical periods of proposal writing and data reduction. The number of ALMA knowledgebase articles has increased substantially since its inception, and the number contained within the NRAO knowledgebase is also growing. Users are encouraged to make use of this resource and to submit helpdesk tickets when the answers to their inquiries are not found through the knowledgebase.

ALMA Project Status

Al Wootten



Credit: Ariel Marinkovic et al., ALMA (NRAO/ESO/NAOJ)

The ALMA Cycle 1 software was accepted 22 July for operations of the 12m Array; software tests with the Atacama Compact Array (ACA) and Total Power 12m antennas continue with acceptance expected soon. Several Cycle 1 projects were executed in the course of software acceptance and are now in the reduction process and may soon be delivered to Principal Investigators.

One of the datasets cleared for delivery was observed using Director's Discretionary Time (DDT). Opportunities for applying for DDT were announced in the ALMA Science Portal in March. Nine DDT proposals have been submitted to date; two are under review and one has been accepted and executed on ALMA.

The array image above was one of many [images recently acquired from a hexacopter flying above the Array Operations Site](http://www.almaobservatory.org/en/press-room/announcements-events/624-first-aerial-pictures-from-alma-in-operations) (<http://www.almaobservatory.org/en/press-room/announcements-events/624-first-aerial-pictures-from-alma-in-operations>). At ALMA's 16,500-foot altitude near the Tropic of Capricorn, winter can pose operational problems. Little Cycle 1 data could be taken in July, which featured sustained hurricane force winds gusting to 95 mph propelling horizontal snow. With the acceptance of the software, however, it is expected that the pace of observing Cycle 1 projects will accelerate.

Potential ALMA users are reminded to watch the [Science Portal](https://almascience.nrao.edu) (<https://almascience.nrao.edu>) for news pertaining to progress with Cycle 1 observations, and for announcements regarding Cycle 2. Internal testing of the Observing Tool for Cycle 2 has begun, and final drafts of Cycle 2 documents are being prepared. A pre-announcement of Cycle 2 is expected in early September, followed by Call for Proposals in October with a December submission deadline. Cycle 2 science observing is expected to commence 1 June 2014.

About five-dozen ALMA Cycle 0 datasets are now publicly available through the Science Archive. Sixty-one papers have been published to date that use ALMA Cycle 0 data. Several press releases featured ALMA science in the last month, and a striking visualization of the ALMA data acquired by Alberto Bolatto (University of Maryland) et al. on the nearby starburst galaxy NGC 253 adorns the cover of the 25 July 2013 issue of *Nature*. By one count, ~ 20% of ALMA Cycle 0 observations have been published.

A Call for ALMA Development Project proposals was released 3 June. Submissions must be received at NRAO by the close of business 16 August 2013. A website and documents related to the Call for Project proposals is available [online \(<https://science.nrao.edu/facilities/alma/alma-development-2014/call-for-proposals>\)](https://science.nrao.edu/facilities/alma/alma-development-2014/call-for-proposals).

Nine ALMA Development Study proposals have been received from 8 Principal Investigators with teams totaling 41 investigators from 17 institutions located within the United States, Canada, and Taiwan. An external review committee is reviewing the proposals, and the highest ranked proposals will receive funding.

Reports from the previous round of ALMA Development Studies have been received. One of these, a proposal for construction of receivers for ALMA Band 1 (7mm wavelength), has become a Development Project led by East Asia in partnership with institutions in Taiwan, the United States, Canada, Chile, and Japan. The Preliminary Design Review was held 29-30 July in Taipei. Other ALMA Development Projects continue: the ALMA Phasing Project held its Critical Design Review in May; the NRAO-ESO collaboration to equip ALMA with Band 5 (1.5mm) receivers is proceeding; and the construction to enable ALMA's incorporation into the Chilean data network proceeds on course.

The VLA Pressure Histogram

Joan Wrobel and David Harland

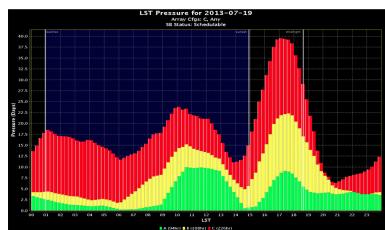


Fig. 1: Pressure histogram for SBs in the VLA dynamic queue on Friday, 19 July 2013, aggregated by the scheduling priority A, B, or C assigned by the NRAO TAC. The total hours per prioritiy are also displayed. LSTs between sunrise and sunset have a blue shading. The LST at local midnight is also shown.

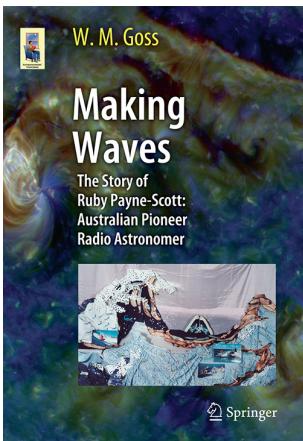
The Very Large Array (VLA) is dynamically scheduled ([Perley et al. 2011, ApJ, 739, L1](https://iopscience.iop.org/2041-8205/739/1/L1/)). (<http://iopscience.iop.org/2041-8205/739/1/L1/>) Information from [approved proposals](https://science.nrao.edu/science/science-program) (<https://science.nrao.edu/science/science-program>) flows to the Observation Preparation Tool (OPT). Astronomers use the OPT to specify sources to be observed, instrumental setups, timing information and weather constraints, all packaged as a Scheduling Block (SB). SBs carry the scheduling priority of A (almost certain), B (best effort), or C (filler) assigned to them by the NRAO Time Allocation Committee (TAC). After vetting by NRAO staff, SBs are entered into the dynamic queue.

NRAO staff use the Observation Scheduling Tool (OST) to examine the current weather conditions and the SBs in the queue. The OST then applies heuristics to select the optimal SB from the queue and send it off for observation. Clearly, dynamic scheduling enhances science data quality and the array's ability to discharge time-sensitive science. But it can leave astronomers puzzled about the chances that their SBs will be selected for observation.

For this reason, every Friday we now post a “pressure histogram” for the dynamic queue (see Figure 1). The OST heuristics include SB attributes under astronomer control, specifically its duration, weather constraints, observing bands, and range of starting Local Sidereal Times (LSTs). Guided by the weekly histogram, some astronomers might wish to use the OPT to adjust the attributes of their SBs. Most weekdays between about 8am and 5pm the array is unavailable for science because of maintenance and development activities. An [update of this histogram](http://www.aoc.nrao.edu/~schedsoc/FridaysPressureHistogramVLA.png) (<http://www.aoc.nrao.edu/~schedsoc/FridaysPressureHistogramVLA.png>) is posted every Friday.

Making Waves: Ruby Payne-Scott, Australian Pioneer Radio Astronomer

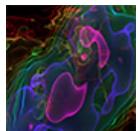
Ellen N. Bouton



A new book by Miller Goss – [Making Waves: The Story of Ruby Payne-Scott: Australian Pioneer Radio Astronomer](#) (<http://www.springer.com/astronomy/book/978-3-642-35751-0>) – just published by Springer (list price \$39.95), is an abbreviated, partly re-written version of *Under the Radar – The First Woman in Radio Astronomy: Ruby Payne-Scott* (Goss & McGee, Springer, 2010). It addresses a general readership interested in historical and sociological aspects of astronomy and presents the biography of Ruby Payne-Scott (1912-1981). As the first female radio astronomer, and one of the first people in the world to consider radio astronomy, she made classic contributions to solar radio physics. She also played a major role in the design of the Australian government's Council for Scientific and Industrial Research radars, which were in turn of vital importance in the Southwest Pacific Theatre in World War II. These

radars were used by military personnel from Australia, the United States and New Zealand. From a sociological perspective, her career offers many examples of the perils of being a female academic in the first half of the 20th century. Complemented by many historical photographs, the book offers fascinating insights into the beginnings of radio astronomy and the role of a pioneering woman in astronomy.

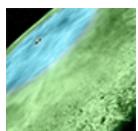
Recent Press & Image Releases



[Starburst to Star Bust](http://www.nrao.edu/pr/2013/starburst-bust/)

24 July 2013

A new study published in the journal *Nature* shows how vigorous star formation can turn the tables on a starburst galaxy by forcing hydrogen and other gases high into the surrounding galactic halo, leaving little fuel for the next generation of stars. [Read more...](http://www.nrao.edu/pr/2013/starburst-bust/) (<http://www.nrao.edu/pr/2013/starburst-bust/>)



[Snow Falling around Infant Solar System](http://www.nrao.edu/pr/2013/snowline/)

18 June 2013

Astronomers using the new Atacama Large Millimeter/submillimeter Array (ALMA) telescope have taken the first-ever image of a snow line in an infant solar system. This frosty landmark is thought to play an essential role in the formation and chemical make-up of planets around a young star. [Read more...](http://www.nrao.edu/pr/2013/snowline/) (<http://www.nrao.edu/pr/2013/snowline/>)



[Photo release: VLA Provides Water to Community in Need](http://www.nrao.edu/pr/2013/magwater/)

[\(<http://www.nrao.edu/pr/2013/magwater/>\)](http://www.nrao.edu/pr/2013/magwater/)

13 June 2013

National Radio Astronomy Observatory (NRAO) employees Shane Baca and Matt Metevier direct drinking water from the Very Large Array (VLA) water system into a tanker for delivery to the village of Magdalena. The village's main well went dry on June 5. [Read more...](http://www.nrao.edu/pr/2013/magwater/) (<http://www.nrao.edu/pr/2013/magwater/>)



[NRAO Media Tip Sheet: Science, engineering, and technology milestones](http://www.nrao.edu/pr/2013/tipsheetjune/)

[\(http://www.nrao.edu/pr/2013/tipsheetjune/\)](http://www.nrao.edu/pr/2013/tipsheetjune/)

13 June 2013

- ALMA Takes Close-up of Matter Spiraling toward a Black Hole
- VLBA Makes Most Accurate Pulsar Distance Measurement
- NRAO Engineer Earns Patent for New 'Reflectionless' Filter

[Read more... \(http://www.nrao.edu/pr/2013/tipsheetjune/\)](http://www.nrao.edu/pr/2013/tipsheetjune/)

Career Opportunities

New Postings

[Cryo Technician](https://careers.nrao.edu/applicants/Central?quickFind=50942) (<https://careers.nrao.edu/applicants/Central?quickFind=50942>) : The NRAO in Socorro, NM is seeking a Cryo Technician to assist with fabrication, installation and maintenance of cryogenic (very low temperature) refrigeration equipment, vacuum systems and to support the FE receiver group. The technician will assist with the day to day operation of the EVLA and VLBA maintenance programs.

[Project Manager](https://careers.nrao.edu/applicants/Central?quickFind=50932) (<https://careers.nrao.edu/applicants/Central?quickFind=50932>) : The NRAO in Socorro, NM is recruiting for a Project Manager. He/she will manage, plan, and coordinate activities of projects to ensure that goals or objectives are accomplished within prescribed time frame and funding parameters. This is a one year term appointment.

[Systems Administrator I](https://careers.nrao.edu/applicants/Central?quickFind=50937) (<https://careers.nrao.edu/applicants/Central?quickFind=50937>) : The NRAO in Green Bank, West Virginia is seeking a Systems Administrator to support local technical and scientific staff Redhat Linux systems and assist in the development and maintenance of the GBT data archive, high performance computing systems.

[Web Software Developer](https://careers.nrao.edu/applicants/Central?quickFind=50934) (<https://careers.nrao.edu/applicants/Central?quickFind=50934>) : The NRAO in Charlottesville, VA is accepting applications for a Web Software Developer. The successful candidate will be responsible for providing operational and development support for Web based applications, under general supervision, supporting in particular developments that are relevant for the ALMA user community. This is a two year term appointment.

[Software Engineer II](https://careers.nrao.edu/applicants/Central?quickFind=50867) (<https://careers.nrao.edu/applicants/Central?quickFind=50867>) : The NRAO in Socorro, NM is recruiting for a Software Engineer II. He/she will be working as software developer in the Control and Correlator subsystems, developing new features and completing and extending the current functionalities. The ideal candidate will be a skilled developer that can assume an end-to-end perspective, and develop an understanding of the system all the way from high level user interfaces to low level hardware details.

[Test Developer](https://careers.nrao.edu/applicants/Central?quickFind=50926) (<https://careers.nrao.edu/applicants/Central?quickFind=50926>) : The NRAO in Socorro, NM invites applications for a Test Developer to maintain test infrastructure, working with other software engineers to ensure adequate testing at the unit test level and develop system-level integration tests, testing aspects of the system that are not usually tested when developing new features, such as the general system scalability, and performance.

[Science Support and Archive \(SSA\) Software Group Lead](https://careers.nrao.edu/applicants/Central?quickFind=50878) (<https://careers.nrao.edu/applicants/Central?quickFind=50878>) : The NRAO in Socorro, NM is seeking a Science Support and Archive (SSA) Software

Group Lead to manage the Science Support and Archive (SSA) software group. The SSA group is responsible for most NRAO software with which astronomers directly interact.

Software Engineer II, Control/ObOps (<https://careers.nrao.edu/applicants/Central?quickFind=50908>): The NRAO in Socorro, NM invites applications for a Software Engineer II. The successful candidate will participate in the development of user interfaces, working half of the time on the Observatory Operations Support Software (ObOps) group, based in Garching, Germany; and the other half of this time on the Control Software group, in Socorro, New Mexico. As this position is based in Socorro, the candidate will interact directly with the Control team, but will coordinate development activities remotely with the ObOps team. The candidate is expected to participate in all aspects of the software development effort.

From the Archives

Ellen Bouton



About this month's photo: The Very Long Baseline Array (VLBA) was dedicated twenty years ago, on 20 August 1993. In this photo, U.S. Representative Joe Skeen (left), NRAO Director Paul Vanden Bout (right), and NRAO Associate Director Bob Brown (background) watch as Senator Pete Domenici scans the bar code below the word "Start" to initiate observations of W3OH. As the antennas began to point, lights on the displayed map lit up for each station, sequencing from east to west. There also was a monitor that showed right ascension/declination and azimuth/elevation for each antenna, and those numbers started changing as the antennas slewed toward their target. Bob Greschke, VLBA chief operator at the time, wrote the software for the bar-code trick that triggered the map-light sequence and then put a message on his operator's screen so he could manually start the actual pointing sequence.

Greschke, VLBA chief operator at the time, wrote the software for the bar-code trick that triggered the map-light sequence and then put a message on his operator's screen so he could manually start the actual pointing sequence.

Thanks to Dave Finley and Bob Greschke for caption information, to Peggy Perley, Jon Romney, and Craig Walker for suggestions on finding out about the observing target, and to Jim Ogle, who searched through the (still readable!) 20 year old Exabyte backup tape to find the source observed for the occasion.

From the Archives is an ongoing series illustrating NRAO and US radio astronomy history via images selected from our collections of individuals' and institutional papers. If readers have images they believe would be of interest to the Archives, please contact Ellen Bouton, [#](mailto:ebouton@nrao.edu).

Contact the Editor (<mailto:mtadams@nrao.edu?subject=NRAO eNews Editor>)



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