



Upcoming Events



VLA Sky Survey Workshop (<https://science.nrao.edu/science/surveys/vlass>)

Jan 05, 2014 | National Harbor, MD



Splinter Session: Proposing for NRAO Instruments

(<https://science.nrao.edu/science/meetings/2014/223rd-aas-splinter-session/aas-splinter-session>)

Jan 07, 2014 | National Harbor, MD



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

Jan 07, 2014 | National Harbor, MD



NRAO Science Symposia at the AAAS (<https://science.nrao.edu/science/meetings/2014/aaas-2014/>)

Feb 14 & 15, 2014 | Chicago, IL



3rd China-U.S. Workshop on Radio Astronomy Science and Technology

(<https://science.nrao.edu/science/meetings/2014/3rd-china-us-workshop/>)

May 19 - 21, 2014 | Green Bank, WV

Telescope Time Allocation for Semester 2014A

Joan Wrobel

The Observatory has completed the Semester 2014A [time allocation process](https://science.nrao.edu/observing/proposal-types/peta) (<https://science.nrao.edu/observing/proposal-types/peta>) for the [Very Large Array](https://science.nrao.edu/facilities/evla) (<https://science.nrao.edu/facilities/evla>), the [Very Long Baseline Array](https://science.nrao.edu/facilities/vlba) (<https://science.nrao.edu/facilities/vlba>) / [High Sensitivity Array](https://science.nrao.edu/facilities/vlba/proposing/HSA) (<https://science.nrao.edu/facilities/vlba/proposing/HSA>) and the [Green Bank Telescope](https://science.nrao.edu/facilities/gbt) (<https://science.nrao.edu/facilities/gbt>). A record total of 450 proposals were received for the 1 August 2013 submission deadline, and a record total of 1526 unique authors submitted proposals to the Observatory, with 1146, 401 and 247 proposers competing for time on the VLA, GBT and VLBA / HSA, respectively. In aggregate the proposals covered the broad spectrum of modern research in astronomy and astrophysics.

Eight Science Review Panels (SRPs) evaluated the proposals on the basis of scientific merit. NRAO staff also reviewed the proposals for technical feasibility. Reviews were completed in September and then cross-reconciled by the Time Allocation Committee (TAC) during a telecon on 28 October 2013 and a face-to-face meeting on 4-5 November 2013 at NRAO in Charlottesville, VA. The TAC consists of the chairs of the SRPs and was charged with recommending a science program for Semester 2014A to the NRAO Director. The recommended program was [reviewed and approved](https://science.nrao.edu/observing/proposal-) (<https://science.nrao.edu/observing/proposal->

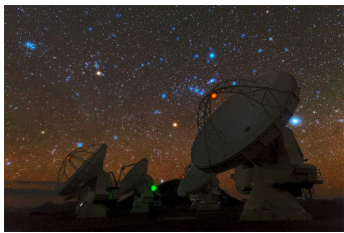
[types/directorsreview](#)) on 18 November 2013.

A disposition letter was sent to the principal investigator and co-investigators of each proposal on 25 November 2013. A [TAC report \(http://www.aoc.nrao.edu/~schedsoc/tac2014a.shtml\)](http://www.aoc.nrao.edu/~schedsoc/tac2014a.shtml) containing information for proposers and observers, including statistics and telescope pressure plots, was released the same day. The [approved science program \(https://science.nrao.edu/science/science-program\)](https://science.nrao.edu/science/science-program) will be posted soon. For each approved proposal in the science program, the [Proposal Finder Tool \(http://library.nrao.edu/proposals\)](http://library.nrao.edu/proposals) will provide access to its authors, title, abstract, and approved hours.

The Observatory welcomes community feedback on its [telescope time allocation process \(https://science.nrao.edu/observing/proposal-types/peta\)](https://science.nrao.edu/observing/proposal-types/peta). Please provide such feedback via the Proposal Review department of the [Observatory's Helpdesk \(http://help.nrao.edu/\)](http://help.nrao.edu/).

ALMA Project Status

Al Wootten



Credit: ESO/B. Tafreshi

ALMA received 1382 unique proposals by the close of the Cycle 2 submission process on 5 December, compared to 1131 in Cycle 1 and 919 in cycle 0; for each cycle ALMA has seen a healthy increase of 22%. The total time requested was 7314 hours for the array of 12m telescopes; 3327 hours were requested for the Atacama Compact Array. A total of 1049 individual PIs and 3408 proposers (PIs and Co-Is from the total registration pool of 5330) were involved in the submitted proposals. The fractions of proposals coming from the three Executives, Chile, and from outside the partnership has likewise remained similar at NA:30%, EU:41%, EA:20%, CL:7%, and 'Outside': 3%.

The ALMA archive encountered no problems ingesting the large number of proposals despite the rapid increase in submission rate: 11% of all proposals were submitted in the final hour, and there were nearly 600 re-submissions in the final three hours. It is anticipated that about 2000 hours of 12m Array time and a similar amount of Atacama Compact Array time will be available for Cycle 2 projects and high priority projects transferred from Cycle 1.

The Cycle 2 proposals will be sorted and sent to the referees over the course of the next weeks. The Review Panels will meet 10-14 March 2014 in London, Ontario, Canada with the final proposal ranking expected in April 2014.

ALMA Cycle 1 observations continued as planned during December. With the approach of the austral summer, periods of superb weather have been fewer. Three weeklong Early Science blocks were executed 30 October–4 December. The execution efficiency – defined as successful execution time divided by allocated time– averaged ~ 60% for the 12m array and for the Atacama Compact Array (ACA). Thus far, 80 of the 197 highest priority Cycle 1 Projects have received time; 16 Projects have been partially delivered and five have been completed. Two Director's Discretionary Time projects have been delivered. A Project is composed of one or more datasets: about as many of those are currently under reduction as have been delivered so far.

A listing of objects observed may be obtained via the [ALMA Science Archive Query Form \(https://almascience.nrao.edu/aq/\)](https://almascience.nrao.edu/aq/). PIs and Co-Is may query the status of their Project through the [Project](#)

[Tracker \(https://almascience.nrao.edu/observing/project-tracker\)](https://almascience.nrao.edu/observing/project-tracker). Early Science proceeds on alternate weeks with commissioning; Block 22 recently commenced. Beginning with Block 22, eight antennas were moved toward antenna pads for the more compact configuration C32-2 appropriate for the encroaching summer weather and providing intermediate resolution (2" at 100 GHz).

The ALMA Operations Plan envisages an on-going program of development and upgrades so that ALMA may continue to lead astronomical research through its lifetime. Construction of the first post-construction receiver bands – Band 5 (163-211 GHz) and Band 1 (35-50 GHz) – has begun, as has the ALMA Phasing Project, which aims to bring the ALMA antennas into phase so that they behave like a single enormous telescope for inclusion in very long baseline experiments. The ALMA Executives made Calls for Studies several months ago for new development options and for new development projects. An external committee has reviewed the Studies and Projects submitted in response to the North American Call. A program for ALMA Development is being constructed from the committee recommendations and will be announced soon.

Transitions

ANASAC: The ALMA North American Science Advisory Committee (ANASAC), established to provide science advice to the NRAO Director during ALMA construction, will merge into the NRAO Users Committee in 2014. NRAO expresses its appreciation to the more than fifty members of the community who have advised the Observatory via the ANASAC during ALMA construction.

Prototype ALMA Antennas: The ALMA antennas must operate in the harsh environment of the ALMA Array Operations Site at 16,500ft elevation, and they must meet demanding specifications for submillimeter interferometric performance. The antennas specified by the ALMA science requirements exceeded the performance achieved on any antenna. As a consequence, the ALMA Project contracted for prototype antennas of two different designs in early 2000.

The first of these was delivered to the Very Large Array site in May 2002. It achieved “first light” in early 2003, followed by an extensive testing campaign during which a second prototype was also delivered. As a result of the testing, contracts were signed for production antennas of an improved design in 2005. ALMA has now accepted 66 antennas in Chile that meet these specifications.

The two prototype antennas met the specifications admirably and have now been removed from the NRAO VLA site to commence new careers. The Alcatel Costamasagna EIE prototype antenna has been moved to the Arizona Radio Observatory's site on Kitt Peak in southern Arizona – the site from which NRAO operated an 11m and a 12m telescope – and is being installed there to pursue research in the millimeter spectral range. The Vertex prototype antenna will be moved to the National Science Foundation's Summit Station facility in Greenland where it will be operated by the Harvard-Smithsonian Center for Astrophysics in collaboration with the Academia Sinica Institute of Astronomy and Astrophysics in Taiwan.

Gas in the Galactic Center

F.J. Lockman

In the nucleus of many galaxies, including the Milky Way, there is a massive black hole surrounded by regions of accreting material. Through observations of the Galactic Center and Central Molecular Zone (CMZ), we can make detailed, sensitive studies of nuclear processes that are impossible to discern in more

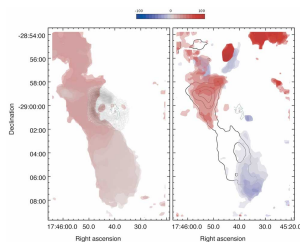


Fig. 1: Color-coded velocity channel maps of the NH_3 line from Minh et al. The 90cm continuum emission is inserted in the left panel. The boundaries of Sgr A West and Sgr A* are shown in green and magenta. Contours of the right panel are for the velocity-integrated intensity of the left panel.

distant systems.

Minh et al. used the Green Bank Telescope (GBT) to map ammonia emission over a region around the Galactic Center with the greatest sensitivity, the largest velocity range, and the highest velocity resolution to date. They discovered evidence of the interaction of the main molecular clouds with activity in the nucleus (Fig. 1, left panel), as well as new “streaming components” (Fig. 1 right panel, blue). Some of these may be feeding the circum-nuclear disk and will eventually fall into the central black hole.

In a separate study by Mills & Morris, the GBT was used to measure the physical conditions in a group of molecular clouds in the CMZ. The authors discovered widespread indications of hot molecular gas with $T \sim 400$ K throughout the region, though there is no evidence of heating by stars, and Very Large Array data show that the emission is extended. This implies that much of the CMZ molecular gas is subject to strong internal shocks and $\sim 10\%$ is within a post-shock zone at any time.

References:

Minh, Y.C. (Korea Astronomy & Space Science Inst.), Liu, H.B. (ASIAA), Ho, P.T.P. (Harvard-CfA), Hsieh, P.-Y. (ASIAA), Su, Y.-N. (ASIAA), Kim, S.S. (Kyung Hee Univ.), Wright, M. (UC Berkeley), 2013, *ApJ*, 773, 31.

Mills, E.A.C. (UCLA), Morris, M.R. (UCLA), 2013, *ApJ*, 772, 105..

VLA Sky Survey Update

Stefi Baum, SOC Chair

The recently appointed Science Organizing Committee (SOC) for the upcoming Very Large Array Sky Survey (VLASS) Workshop is hard at work. The SOC members include: Stefi Baum (RIT, *Chair*), Shami Chatterjee (Cornell), Tracy Clarke (NRL), Jim Condon (NRAO), Jackie Hodge (NRAO), Karl Menten (MPIfR), Eric Murphy (IPAC), Steve Myers (NRAO, *ex-officio*), Aneta Siemiginowska (CXC/SAO), Vernesa Smolicic (U. Zagreb), Alicia Soderberg (Harvard), Michael Strauss (Princeton), and Rick White (STScI).

The VLASS Workshop will be held in the Annapolis-1 room at the Gaylord National Resort and Convention Center from 10:00 am to 4:00 pm on Sunday, 5 January 2014, as part of the up-coming American Astronomical Society (AAS) meeting at National Harbor, Maryland. No registration is required to attend the Workshop. All interested community members are welcome to attend; bring collaborators, students, and colleagues from across the multi-wavelength spectrum! A dozen white papers and abstracts have already been received covering diverse topics ranging from transients to lensing to polarization, covering our Galaxy to the far reaches of the Universe and everything in between.

The VLASS Workshop will be an exciting opportunity to learn about the power of large surveys with the Jansky Very Large Array, to consider how they fit into the broader multi-wavelength astronomical survey framework, and to help shape (and name) the future Karl G. Jansky Very Large Array Sky Survey. Please visit the [VLASS website \(https://science.nrao.edu/science/surveys/vlass\)](https://science.nrao.edu/science/surveys/vlass) for additional information about the Workshop.

At the AAS meeting at National Harbor, Steve Myers will also give a talk (236.01) on the Karl G. Jansky Very Large Array Sky Survey in the Surveys and Large Programs II Session on Tuesday, 7 January at 2:00 p.m., in Maryland Ballroom D.

2014 NRAO Summer Student Research Assistantships Program

Jeff Mangum



NRAO 2013 Summer Students at Socorro, Charlottesville and Green Bank.

NRAO is now accepting applications for the 2014 NRAO Summer Student Research Assistantships program. Each summer student conducts research under the supervision of an NRAO staff member at one of

the NRAO sites, on a project in the supervisor's area of expertise. The project may involve any aspect of astronomy, including original research, instrumentation, telescope design, or astronomical software development. Examples of past summer student research projects can be found on-line at the [Summer Student website \(http://science.nrao.edu/opportunities/summerstudents.shtml\)](http://science.nrao.edu/opportunities/summerstudents.shtml).

Supervisors choose their own student candidates from the received applications, and the site to which a summer student is assigned depends on the location of the NRAO supervisor who chose them. Students are encouraged to review the NRAO staff web pages to learn more about the types of research being conducted at the NRAO. On their application, students may request to work with a specific staff member, to work on a specific scientific topic, or to work at a specific site.

The program runs 10-12 weeks each summer, from early June through early August. At the end of the summer, participants present their research results at a student seminar and submit a written report. These projects often result in publications in scientific journals. Financial support is available for students to present their summer research at an American Astronomical Society meeting, generally at the winter meeting following their appointment. In addition to their research, students take part in other activities, including social events and excursions, and an extensive lecture series that covers many aspects of radio astronomy and astronomical research. Students also collaborate on their own observational projects using the Very Large Array, Very Long Baseline Array, and/or Green Bank Telescope.

There are three types of Summer Student programs available at the NRAO. The *NRAO Research Experiences for Undergraduates (REU)* program is for undergraduates who are citizens or permanent residents of the United States or its possessions, and is funded by the National Science Foundation (NSF) Research Experiences for Undergraduates (REU) program.

The *NRAO Undergraduate Summer Student Research Assistantship* program is for undergraduate students or graduating college seniors who are U.S. citizens, are from an accredited U.S. Undergraduate Program, or are otherwise eligible to work in the U.S. This program primarily supports students or research projects that do not meet the REU guidelines, such as graduating college seniors, some foreign undergraduate students, or projects involving pure engineering or computer programming.

The *NRAO Graduate Summer Student Research Assistantship* program is for graduate students who are citizens or permanent residents of the United States or its possessions, enrolled in an accredited U.S. Graduate Program, or otherwise eligible to work in the U.S.

The stipends for the 2013 Summer Student Program will be \$657 per week for undergraduates and graduating seniors, and \$703 per week for graduate students. These stipends include an allowance for housing, since housing is not provided.

Students who are interested in Astronomy and have a background in Astronomy, Physics, Engineering, Computer Science, and/or Math are preferred. The same [online application form and process](http://science.nrao.edu/opportunities/summerstudents.shtml) (<http://science.nrao.edu/opportunities/summerstudents.shtml>) is used for all three programs. Required application materials include an on-line application form (including a statement of interest), transcripts, and three letters of recommendation. The deadline for receipt of all application materials is Saturday, 1 Feb 2014.

Summer Student Presentations at 2014 Winter AAS Meeting

Jeff Mangum

Monday, 6 January 2014	
Novae, Cataclysmic Variables, Evolved Stars	154. 11. Evidence for non-thermal radio emission from a classical nova - V1723 Aql Y. Zheng; J.L. Sokoloski; M.P. Rupen; J. Weston; L. Chomiuk; A.J. Mioduszewski; K. Mukai; M.I. Krauss; N. Roy; T. Nelson
Pulsars & Neutron Stars	153. 18. Rotation Measures of Globular Cluster Pulsars as a Unique Probe of the Galactic Magnetic Field A. Ho; S.M. Ransom; P. Demorest
Tuesday, 7 January 2014	
AGN, QSO, Blazars Poster	250. 21. Large Radio Sources Hosted by Spiral Galaxies (aka: The Wrong Type of Host!) R. Duffin; M. Mao; F.N. Owen
Computation, Data Handling, & Image Analysis	255. 07. Quantifying Deep-Imaging Limits of the VLA J. Mayeshiba; J. Mayeshiba; U. Rau; F.N. Owen
Evolution of Galaxies	246. 02. Probing Star Formation in Polar Ring Galaxy NGC 2685 L. Ackman; J. Donovan Meyer; J. Muñoz-Mateos
	246. 27. The Influence of Bars in Triggering Star Formation Since $z = 1$ D. Powell
Star Formation	244. 03. New Star Formation in NGC 3690 A. Abdullah
	244. 04. Stacking Spectra of High Critical Density Tracers in ALMA Cycle o Observations of the Antennae Galaxies J. Kadowaki; A.K. Leroy; L. Barcos; C. Lee; B.C. Whitmore; C.L. Brogan; J.E. Hibbard; K.E. Johnson; R. Chandar; G.C. Privon; A.S. Evans; A.J. Remijan; K. Sheth
	244. 13. Infall as a Function of Position and Molecular Tracer in L1544 and L694 J.A. Keown; S. Schnee; T.L. Bourke; R. Friesen
Starburst Galaxies	252. 02. Imaging the Spatial Density Within Starburst Galaxies M82 and Arp220 N.S. Kern; J.G. Mangum; J.K. Darling; C. Henkel; K. Menten
The Solar System	247. 17. Interpreting the Thermal Lightcurve of Iapetus at 1.3mm N. Hagen; A. Moullet; M.A. Gurwell
HAD VI: History of	209. 05. Radio Frequency Interference and the National Radio

Astronomy	Astronomy Observatory S. Smith
Wednesday, 8 January 2014	
Dwarf & Irregular Galaxies	355. 17. Magnetic Fields in the Irregular Galaxy NGC1156 S. Schmitz; A.A. Kepley; R. Beck; C.C. Lang; E.M. Wilcots
Young Stellar Objects	347. 09. Study of the Outflow and Disk surrounding a Post-Outburst FU-Orionis Star S.N. Mellon; L.M. Perez
Thursday, 9 January 2014	
Molecular Clouds, HII Regions, Interstellar Medium	454. 06. Evolution of the ISM at $z < 1$ Z. Mohamed
	454. 07. Examining the Initial Conditions of Star Formation Through Dense Gas Kinematics A.T. Mead; J.J. Tobin; R. Smith
	454. 11. Investigation of Interstellar Formation Routes Using Molecular Abundance Ratios of C₃H₂O Isomers R.A. Loomis; C.H. Johnson; A.J. Remijan
	454. 32. Power law structure of the interstellar medium: Fractal dimension of the HI, CO and mid-IR in nearby galaxies L. Bowman; J. Ott; D. Westpfahl
	454. 38. NH₂D in Orion KL: Results from ALMA, EVLA, and IRAM A.B. Lucy; A. Wootten; N. Marcelino

STEM Role Models: The Power of Partnerships

Tim Spuck and Kathryn Williamson



The power of positive science, technology, engineering and mathematics (STEM) role models cannot be overstated. Many of us can point to individuals that either inspired us to consider a STEM career, or to continue our pursuit during challenging times. For role models to be effective, the learner must be able to relate to them. Younger scientists, and undergraduate or graduate students, who are often closer in age and more reflective of K-12 student demographics, can be highly effective as STEM role models for younger students.

How can your science research group inspire the next generation of STEM professionals while addressing Broader Impacts requirements?

NRAO in Green Bank is partnering with the West Virginia (WV) Space Grant Consortium and the NASA Independent Verification and Validation center to pilot a statewide program called the WV Space Public Outreach Team (SPOT). SPOT trains undergraduate presenters from across the state to learn and present interactive programs that highlight West Virginia's on-going and world-class space science research. You can learn more about the WV SPOT program [on-line \(https://sites.google.com/site/wvaspot/\)](https://sites.google.com/site/wvaspot/).

WV SPOT can serve as a model for other scientists interested in partnering with institutions in their state and reaching out to K-12 audiences on a broad scale. In addition, NRAO scientists may wish to piggyback onto the WV SPOT program, working with the program coordinator to develop new presentations for students.

The [Graduate STEM Fellows in K-12 Education \(http://www.gk12.org\)](http://www.gk12.org) (GK-12) program is another great model that has demonstrated its effectiveness at inspiring young students to consider STEM careers, as well as improving communication and teaching skills of graduate students. The GK-12 model provides a

fellowship award to a graduate student in STEM, and in return the graduate student partners with a teacher to bring their research, and science practice skills into the K-12 classroom. Since its inception, the model has morphed into a variety of approaches, including science communication certificate programs and graduate courses, and other scientists have implemented variations of the model to fulfill the Broader Impacts requirement in their research grants.

The GK-12 program recently published “*The Power of Partnerships: A Guide from the NSF GK-12 Program*,” a handbook on how to successfully implement these types of projects. This publication provides strong evidence of the benefits to graduate students, teachers, and K-12 students, as well as research advisors and is [available via free download \(http://www.gk12.org/2013/06/10/the-power-of-partnerships-a-guide-from-the-nsf-gk-12-program/\)](http://www.gk12.org/2013/06/10/the-power-of-partnerships-a-guide-from-the-nsf-gk-12-program/).

If you have questions or would like more information about SPOT, please contact [Kathryn Williamson \(mailto:kwilliam@nrao.edu\)](mailto:kwilliam@nrao.edu) (Green Bank Public Education Specialist). For questions or more information regarding GK-12, please contact [Tim Spuck \(mailto:tspuck@au.edu\)](mailto:tspuck@au.edu) (AUI STEM Education Development Officer).

Recent Press Releases & Announcements



[Seeing Double: New System Makes the VLA "Two Telescopes in One"](https://public.nrao.edu/news/pressreleases/vlite-makes-vla-two-telescopes) (<https://public.nrao.edu/news/pressreleases/vlite-makes-vla-two-telescopes>)

10 Dec 2013

The [Very Large Array \(VLA\)](https://public.nrao.edu/telescopes/vla) (<https://public.nrao.edu/telescopes/vla>) will get a new system allowing it to continuously monitor the sky to study the Earth's ionosphere and detect short bursts of radio emission from astronomical objects. [Read More ...](https://public.nrao.edu/news/pressreleases/vlite-makes-vla-two-telescopes)
(<https://public.nrao.edu/news/pressreleases/vlite-makes-vla-two-telescopes>)



[Hidden Details Revealed in Nearby Starburst Galaxy: Green Bank Telescope's new vision debuts](https://public.nrao.edu/news/pressreleases/gbt-finds-hidden-details-in-starburst-galaxy) (<https://public.nrao.edu/news/pressreleases/gbt-finds-hidden-details-in-starburst-galaxy>)

9 Dec 2013

Using the new, high-frequency capabilities of the National Science Foundation's [Green Bank Telescope \(GBT\)](https://public.nrao.edu/telescopes/gbt) (<https://public.nrao.edu/telescopes/gbt>), astronomers have captured never-before-seen details of the nearby starburst galaxy M82. These new data highlight streamers of material fleeing the disk of the galaxy as well as concentrations of dense molecular gas surrounding pockets of intense star formation. [Read More ...](https://public.nrao.edu/news/pressreleases/gbt-finds-hidden-details-in-starburst-galaxy)
(<https://public.nrao.edu/news/pressreleases/gbt-finds-hidden-details-in-starburst-galaxy>)



[NRAO Media Tip Sheet: Science, engineering, and technology milestones](https://public.nrao.edu/news/tip-sheets/science-engineering-technology-milestones) (<https://public.nrao.edu/news/tip-sheets/science-engineering-technology-milestones>)

26 Nov 2013

- [Long-distance 'Fringes' Achieved between West Virginia and Shanghai](https://public.nrao.edu/news/tip-sheets/science-engineering-technology-milestones#fringes)
(<https://public.nrao.edu/news/tip-sheets/science-engineering-technology-milestones#fringes>)
- [Modern and Historic Technology Merge at Newly Unveiled VLA Sundial](https://public.nrao.edu/news/tip-sheets/science-engineering-technology-milestones#sundial)
(<https://public.nrao.edu/news/tip-sheets/science-engineering-technology-milestones#sundial>)

- **[NRAO Astronomer Elected Fellow of AAAS](https://public.nrao.edu/news/tip-sheets/science-engineering-technology-milestones#lockman)** (<https://public.nrao.edu/news/tip-sheets/science-engineering-technology-milestones#lockman>)

[Read More ...](https://public.nrao.edu/news/tip-sheets/science-engineering-technology-milestones) (<https://public.nrao.edu/news/tip-sheets/science-engineering-technology-milestones>)



[Infant Galaxies Merging Near ‘Cosmic Dawn’](https://public.nrao.edu/news/pressreleases/infant-galaxies-merge-near-cosmic-dawn)

<https://public.nrao.edu/news/pressreleases/infant-galaxies-merge-near-cosmic-dawn>

21 Nov 2013

Astronomers using the combined power of the [ALMA telescope](https://public.nrao.edu/telescope/alma) (<https://public.nrao.edu/telescope/alma>) and NASA’s Hubble Space Telescope have discovered a far-flung trio of primitive galaxies nestled inside an enormous blob of primordial gas nearly 13 billion light-years from Earth. [Read More ...](https://public.nrao.edu/news/pressreleases/alma-observes-two-black-holes) (<https://public.nrao.edu/news/pressreleases/alma-observes-two-black-holes>)

Career Opportunities

[CO-OP Student, Technical](https://careers.nrao.edu/applicants/Central?quickFind=50970) (<https://careers.nrao.edu/applicants/Central?quickFind=50970>): The NRAO in Green Bank, West Virginia is seeking a CO-OP Student to work on FPGA-based data acquisition systems for experiments at the Green Bank site. The student will gain experience in designing, implementing, and testing FPGA designs, and in developing and deploying software for the control of the data acquisition instruments. This is a temporary full-time position for a period of three months.

[Mechanical Engineer II](https://careers.nrao.edu/applicants/Central?quickFind=50962) (<https://careers.nrao.edu/applicants/Central?quickFind=50962>): The NRAO in Socorro, NM is accepting applications for a Mechanical Engineer II responsible for the carrying out and assisting in engineering analysis, design, and general execution of a project or whole system. Responsibilities include recommendations, coordination and assisting in decisions on such aspects as design, procurement, manufacture, erection, test and some degree of initial operation.

[Head of the ALMA Department of Engineering \(ADE\)](https://careers.nrao.edu/applicants/Central?quickFind=50965) (<https://careers.nrao.edu/applicants/Central?quickFind=50965>): The Joint ALMA Observatory (JAO) in Santiago, Chile is recruiting for a Head of the ALMA Department of Engineering. The incumbent will be responsible for the management and leadership of the department, for the engineering and technical staff within the JAO and for the work outcomes from those staff including Systems Integration efforts, the ongoing engineering operations of the array and overall maintenance issues. The term of appointment is three years.

[Operations Specialist](https://careers.nrao.edu/applicants/Central?quickFind=50964) (<https://careers.nrao.edu/applicants/Central?quickFind=50964>): The NRAO in Green Bank, West Virginia is accepting applications for an Operations Specialist. This is one of three progressively more complex Operations Specialist positions. With frequent direct supervision of the supervisor, or instructions from more senior operators, the incumbent safely and efficiently monitors and operates one or more telescopes. Monitors the performance of telescope systems and assists engineers and technicians in diagnosing telescope equipment failures.

[Technical Specialist II:](https://careers.nrao.edu/applicants/Central?quickFind=50943) (<https://careers.nrao.edu/applicants/Central?quickFind=50943>) The NRAO in Socorro, NM is accepting applications for a Technical Specialist II. Under general supervision from scientists and engineers, the Technical Specialist assembles, calibrates, tests, analyzes, troubleshoots and/or repairs the

Digital Transmission System and Receiver modules.

NRAO Postdoc (<https://careers.nrao.edu/applicants/Central?quickFind=50956>): The NRAO in Green Bank, WV is seeking a NRAO Postdoc join their scientific staff. The successful applicant will have 50% of his/her time available for independent research, while 50% of his/her time will be devoted to support of the Robert C. Byrd Telescope (GBT) and GBT observers. This is a two-year appointment.

Systems Administrator I (<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.

From the Archives

Ellen Bouton



About this month's photo: Take a Hike! In fall 1994 a wellness program in Green Bank and Charlottesville encouraged employees to begin a regular walking program with a challenge between the two sites. Which site's walkers could "travel" to the most VLBA antennas? Green Bank walkers won the challenge by traveling a total of 3151 miles, "visiting" Hancock, North Liberty, Los Alamos, and Pie Town. Charlottesville participants walked 2564 miles. In this photo, Green Bank walkers celebrate their success. **[Left to right]** Sue Ann

Heatherly, Bob Payne, Bob Simon, Mark Clark, Rick Fisher, Sue Shears, Becky Warner, Zula Taylor, Rich Lacasse, Carol Ziegler, David Williams, George Behrens, David Burgess, Mark McKinnon, Rich Hall, Henrietta Reigel, Shirley Curry, Ray Hanshew, Greg Morgan, Bill Shank. Thanks to Sue Shears for help with names.

Additional information about the [October 1994 Cerro Chajnantor photograph](https://science.nrao.edu/enews/6.13/index.shtml#archives) (<https://science.nrao.edu/enews/6.13/index.shtml#archives>), which appeared in the November 2013 eNews: Several people asked about the location of the photograph relative to the current ALMA site. Thanks to Angel Otarola, who tells us, "The rock where we established our very first camp ever, is located on the west side of Cerro Chajnantor and towards its north end. The site is a few meters to the east edge of the dirt road that we used to drive to gain access to the site. Here I am talking about that road that goes by Cerro Toco. Should be no problem to find the place. Just follow the road on the west side of Cerro Chajnantor from the telescope site towards the north (in the direction of Cerro Toco). When doing this keep looking to the right (the passenger side) until you see this big boulder. If the rock is not there, then I will assume is because the landscape was changed during the deployment of the Atacama gas pipeline."

From the Archives is an ongoing series illustrating NRAO and U.S. 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, ebouton@nrao.edu (#).

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



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