NRAO eNews

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NRAO and the US Federal Government Shutdown

Tony Beasley (NRAO Director)

I am sorry to inform you that NRAO must temporarily suspend its North American operations because of the US Federal Government shutdown. All NRAO North American facilities will be closed effective 7 p.m. Eastern Daylight Time, Friday, 4 October 2013.

NRAO Site Directors have identified a skeleton staff to maintain the security, safety, and integrity of NRAO facilities, telescopes, and systems during the shutdown; but no science observing will occur at the Very Large Array, Very Long Baseline Array, or Green Bank Telescope. ALMA operations at the Joint ALMA Observatory in Chile are unaffected, but no user support will be available from the NRAO North American ALMA Science Center.

NRAO personnel, other than the skeleton staff, will be on furlough. They may not report to NRAO facilities or conduct Observatory business from home. NRAO buildings and facilities will be closed. The NRAO Archives, including the ALMA Science Archive, will not be accessible. Persons planning to visit an NRAO site in the coming weeks will need to reschedule their visits.

Up-to-date information regarding the Observatory's operations status will be available at the NRAO website home page, http://www.nrao.edu (http://www.nrao.edu) , and at the NRAO science website, http://science.nrao.edu (http://science.nrao.edu) .

Together with the National Science Foundation and Associated Universities, Inc., we will do everything possible to quickly re-start full NRAO science operations after the shutdown ends.

Upcoming Events

NRAO Community Day at GSFC (https://science.nrao.edu/facilities/alma/naasc-workshops/nrao-cd-gsfc/index)
Oct 28 - 29, 2013 | Greenbelt, MD

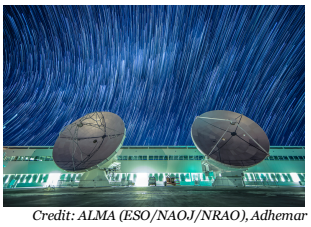
NRAO Community Day at IPAC/SSC (https://science.nrao.edu/facilities/alma/naasc-workshops/nrao-cd-ipac)
Oct 31, 2013 | Caltech/IPAC, Pasadena, CA

VLA Sky Survey Workshop (https://science.nrao.edu/science/surveys/vlass)
Jan 05, 2014 | National Harbor, MD

NRAO Town Hall (https://science.nrao.edu/science/meetings/2014/aas223/nrao-town-hall)
Jan 07, 2014 | National Harbor, MD

ALMA News

Al Wootten



Credit: ALMA (ESO/NAOJ/NRAO), Adhemar Duro

An ALMA Cycle 2 pre-announcement (https://almascience.nrao.edu/news/alma-cycle-2-pre-announcement) was published 17 September and includes a list of expected key dates. The Call for Proposals is expected on 24 October for a 5 December deadline. Cycle 2 science observing is expected to commence 1 June 2014 and last for 17 months, with science observing time intermixed with time reserved for engineering and commissioning work to realize the full suite of ALMA capabilities. The suite of ALMA capabilities for Cycle 2 will be detailed in the Call for Proposals, but an anticipated list is available in the pre-announcement.

To help ensure that the Observatory is prepared to assess the proposals submitted for Cycle 2, **PIs are strongly encouraged to submit a notice of intent by 15:00 UT on 10 October** using a web form (https://almascience.nrao.edu/noi) .

The Joint ALMA Observatory (JAO) accepted the 66th and final antenna from the contractor on 23 September. The final four nutators, which are being deployed on the total power antennas of the Atacama Compact Array (ACA), were accepted by the JAO on 24 September. Integration and Verification of ALMA components will commence with delivery of the final antenna to the Operations Support Facility (OSF) later in the week. Of the eight antennas at the OSF, four are undergoing integration and testing, one will be used for nutator commissioning, and three are scheduled for delivery to the Array Operations Site (AOS) where they will join the 57 antennas already there. Winter has delayed completion of antenna stations with baselines longer than ~500m; however construction will resume on those within the next weeks.

ALMA Cycle 0 observations began two years ago. Nearly 30% of ALMA Cycle 0 projects have been published to date in the refereed literature. All completed or partially completed projects were delivered to PIs. Many Cycle 0 projects have reached the end of their proprietary period and are available in the ALMA Science Archive (https://almascience.nrao.edu/alma-data/archive) .

Cycle 1 observations were suspended in August owing to power issues and a workers' strike, which was settled 7 September. Recovery of full operations is progressing with some weather delays (high winds) and it is expected that PI project observing will resume shortly. A report on Cycle 1 progress will be published on the ALMA Science Portal in early October.

Cycle 1 Principal Investigators will be pleased to know that the Project Tracker is now available after logging into the ALMA Science Portal (http://almascience.org) . It has its own link under the 'Observing' menu item. The tool provides access to the current state and any observing reports for the scheduling blocks associated with a project. A user manual is available from the tool landing page. Later this season, the Project Tracker will become available also to Cycle 1 co-Investigators.

We extend congratulations to Christine Wilson of McMaster University on her election to the Royal Society of Canada (RSC). As Canada's senior National Academy, the RSC promotes Canadian research and scholarly

accomplishment. Christine has been the Canadian project scientist for ALMA since 1999 and is currently the Principal Investigator on the Herschel Very Nearby Galaxies Survey, the JCMT Nearby Galaxies Legacy Survey, and the SMA Luminous Infrared Galaxies Survey. She is currently spending six months of her sabbatical at the Joint ALMA Observatory, and will be at the NRAO North American ALMA Science Center in Charlottesville for six months beginning January 2014.

Call for White Papers for the VLA Sky Survey

Stefi Baum, Chair, VLASS Science Organizing Committee
Steve Myers, Lead, VLASS Survey Design Group
Claire Chandler, VLASS Project Director

The NRAO announces an open call for community White Papers on the upcoming VLA Sky Survey (VLASS). These white papers will form the basis for discussion at the NRAO Very Large Array Sky Survey Science Planning Workshop that will be held from 10:00 a.m. to 4:30 p.m. on Sunday 5 January 2014 at the upcoming 223rd American Astronomical Society meeting at National Harbor, MD.

The White Paper call is for submissions concerning survey science goals, techniques, development areas, and overall design. Individuals or groups interested in attending and speaking at the workshop are strongly encouraged to submit white papers by 1 December 2013, to allow ample time for inclusion in the workshop.

For instructions on how to submit white papers, including guidance on content and formats, see the VLASS website (https://science.nrao.edu/science/surveys/vlass) .

Inquiries regarding the VLASS should be directed to vlass@nrao.edu (#) .

Call for Nominations to the Science Organizing Committee for the VLA Sky Survey

Stefi Baum, Chair, VLASS Science Organizing Committee
Steve Myers, Lead, VLASS Survey Design Group
Claire Chandler, VLASS Project Director

The NRAO announces an open call for nominations of individuals to serve on the Science Organizing Committee (SOC) that will guide the initial planning for the upcoming VLA Sky Survey (VLASS) and will organize the NRAO Very Large Array Sky Survey Science Planning Workshop that will be held from 10:00 a.m. to 4:30 p.m. on Sunday, 5 January 2014 at the upcoming 223rd American Astronomical Society (AAS) meeting at National Harbor, MD.

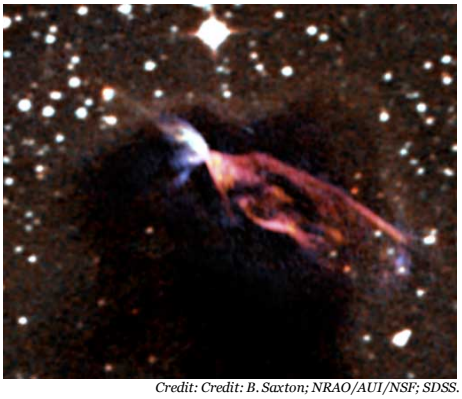
The SOC will be primarily charged with review of White Papers received from the community, with organization of the AAS Workshop, and with setting up the community-based Science Survey Group (SSG) that will carry out the definition of the survey. Colleagues who can represent the diverse interests of potential VLASS users, including those from multiple wavelength regimes, or colleagues who have expertise in sky survey planning and oversight, or those with interest in any of the science areas that would benefit from the VLASS, are all good candidates for the SOC.

Please send your nomination to vlass@nrao.edu or use the web-form at the VLASS website. Self-nominations are welcome (please include CV in submission). Acceptance of nominations will close on 11 October 2013.

For instructions on the submission of SOC nominations, see the VLASS website (https://science.nrao.edu/science/surveys/vlass) .

Inquiries regarding the VLASS should be directed to vlass@nrao.edu (#) .

ALMA Offers New View of Bipolar Ejection from a Young Star



Credit: Credit: B. Saxton; NRAO/AUI/NSF; SDSS.

Figure: The ALMA data (red and blue) show the star's outflow superimposed on an optical (Digital Sky Survey) image of the surrounding cloud.

Bipolar flows from young stars have been known for over three decades. But seldom has detail of the flow been imaged as finely as in recent ALMA observations by Hector Arce (Yale) and his collaborators (http://arxiv.org/abs/1304.0674) of the complex flow from the star powering the Herbig-Haro 46/47 nebula. One surprising feature discovered was an ultrafast component of the molecular outflow, apparently generated by a wide-angle wind emanating from the star. Clumps in the flow suggest that, in addition to the broad wind, a more collimated wind also operates that is more episodic. If these clumps form from prompt entrainment in that flow, as appears likely, the object may undergo periodic mass ejection over periods of a few hundred years. ALMA's sensitivity, resolution and spectral compass led not only to identification of the fast and clumped components but also revealed a previously unknown component to the flow. This component appears to originate from another object, perhaps a lower mass companion. Surprisingly, the secondary flow occurs at an angle perpendicular to the main flow.

A Population of Black Hole Candidates in Globular Clusters

Laura Chomiuk (Michigan State)

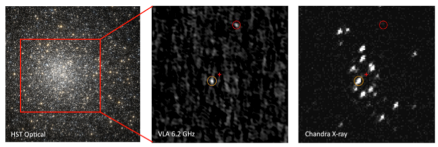


Figure: The core of the globular cluster M62 at optical (left), radio (center), and X-ray (right) wavelengths. The black hole candidate M62-VLA1 is shown as an orange circle in the radio and X-ray panels. A red cross marks the cluster photometric center; the other radio source in the central region of M62 is a known pulsar (red circle).

In a recent Astrophysical Journal paper, Laura Chomiuk and her collaborators announced the discovery of a candidate stellar-mass black hole in the Milky Way globular cluster M62. This source, dubbed M62-VLA1, was first identified as a flat-spectrum radio continuum source in deep images from the Karl G. Jansky Very Large Array (VLA). M62-VLA1 also has an X-ray counterpart in archival Chandra data and its properties agree with those of known accreting black holes.

It has been known for decades that neutron star X-ray binaries are overabundant inside globular clusters, and this enhancement is thought to be due to dynamical interactions in the dense cluster cores. However, theoretical arguments suggested that no more than one black hole should be present in a typical globular cluster, and in fact no black holes were known in Milky Way clusters.

This thinking was upended by the team's discovery of two black hole candidates in the Milky Way globular cluster M22 (3 Oct 2012 Nature), also founded on deep VLA radio continuum images. Two black holes accreting at observably high rates hint at a significant population (up to 100) of black holes in the cluster.

The discovery of a black hole candidate in M62 implies that the earlier results for M22 were not a fluke, and that black holes could be common in globular clusters. The implications would be important: globular

clusters would become important hunting grounds for additional black holes, including rare systems such as black hole-black hole binaries.

Chomiuk and the team have been awarded 140 additional hours of VLA time over the next year to enlarge the sample of clusters surveyed and to better constrain black hole populations in globular clusters.

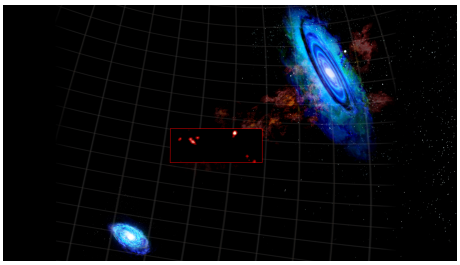
References

Laura Chomiuk (Michigan State/NRAO), Jay Strader (Michigan State), Thomas Maccarone (Texas Tech), James Miller-Jones (ICRAR/Curtin), Craig Heinke (Alberta), Eva Noyola (UNAM), Anil Seth (Utah), & Scott Ransom (NRAO), 2013, ApJ, in press (http://arxiv.org/abs/1306.6624) .

Jay Strader, Laura Chomiuk, Thomas Maccarone, James Miller-Jones, & Anil Seth, 2012, Nature, 490, 71 (http://arxiv.org/abs/1210.0901) .

Discrete Hydrogen Clouds in the Local Group

F.J. Lockman



The spectral stability of the Green Bank Telescope and its high sensitivity to low surface-brightness emission has made it possible for Wolfe et al. to detect very faint HI 21cm emission between the Local Group galaxies M31 and M33 and resolve the emission into discrete clouds the size of dwarf galaxies.

The newly discovered clouds lie ~100 kpc from either galaxy, and have kinematics more associated with the galaxy's systematic velocity than with the system of high-velocity clouds that surrounds each galaxy. Although M31 and M33 have several dozen known stellar satellites, the HI clouds do not appear to be associated with any of them. The clouds have HI masses that range from 4 to 40 x 10^4 $M_\odot$, similar to the baryonic mass of some dwarf galaxies. But with the clouds' size of ~2 to 6 kpc, and their relatively broad 21cm HI lines, the implied virial mass of each cloud is several orders of magnitude greater than its HI mass.

These clouds have neutral column densities log N(HI) = 17.5, and likely contain an extensive ionized component. They may represent a new population of very low neutral column objects condensing out of an intergalactic filament.

Reference

Wolfe, S.A. (WVU), Pisano, D.J. (WVU), Lockman, F.J. (NRAO); McGaugh, S.S. (Case Western); Shaya, E.J. (Maryland) 2013, Nature, 497, 224.

A Wide-Field GBT Focal Plane Array Beamformer

Karl Warnick (Brigham Young), D.J. Pisano (WVU), and Bill Shillue (NRAO)

Brigham Young University (BYU), West Virginia University and NRAO have recently been awarded a major NSF Advanced Technologies and Instrumentation (ATI) grant to develop a digital signal processing system for a new wide-field L-Band receiver for the Green Bank Telescope (GBT).

The grant will support the development of a type of array feed that increases the size of the sky region that

Figure: Focal L-Band Array for the Green Bank Telescope (FLAG), with 19 dual-polarized elements.

can be surveyed in a single snapshot image. The image size, or field of view, is directly related to the observing power of a telescope. At optical wavelengths, the advent of multi-pixel detectors revolutionized astronomical science. Radio telescopes have lagged behind in pixel-count for technical reasons, but dedicated efforts have been underway for more than a decade to close some of this ground.

Several telescopes worldwide currently use clusters of horn-type feeds to create multiple image pixels, but at radio frequencies the resulting pixels are widely separated on the sky and the field of view is discontinuous. A more sophisticated approach to increasing the field of view is to build a type of focal plane array known as a "phased array." This is an array of antenna elements in the focal plane of the telescope, in which the relative phases and amplitudes of the respective signals feeding the elements are weighted and combined in such a way that the effective radiation pattern of the array is reinforced in a desired direction and suppressed in undesired directions. With a modern digital backend it is possible to perform this process in a parallel fashion so that multiple beams can be formed on the sky. Development of phased array feeds is proceeding at a number of radio observatories worldwide, and in particular a pioneering program at NRAO has grown out of early work by Rick Fisher in the mid-1990s.

Research and development of phased arrays at NRAO in recent years has focused on multiple-element wideband dipole front-end receivers. A strong collaboration between NRAO and BYU led to progress on the design of the dipole elements, electronics and signal transport, and beam forming algorithms. Recent work at NRAO has implemented robust fiber optic transmission capability between the GBT and the control building for high element-count phased array receivers. Current work is focused on improving the Focal L-Band Array for the GBT (FLAG) and performing initial tests on the GBT.

The NSF-ATI grant will support development of a digital back end and post processing system for the FLAG receiver. All results to date from FLAG have been produced using narrow instantaneous bandwidth data acquisition systems, with beam forming done in post-processing. A complete science grade instrument requires a real-time broadband signal processing system for array calibration, beam forming, correlation, and pulsar and transient searching. The project will be a collaboration between Brigham Young University (signal processing, calibration, beam forming, RFI mitigation algorithm development, analog-digital subsystems interface) and West Virginia University (science goals, algorithm and back end programming work, commissioning). NRAO staff will provide support to ensure seamless integration into the GBT electronics and control systems. The project is expected to span three years.

FLAG will increase telescope survey speed relative to existing single-pixel instruments by a factor of 3-5. This receiver will push the GBT survey capability to a new state-of-the-art and will enable significant new science, including adding more millisecond pulsars to the array used to correlate changes in their pulse times of arrival due to gravitational waves, searching for pulsar-black hole binary systems to test gravitational physics and probe the space-time around black holes, measuring precise neutron star masses to probe the equation-of-state at high densities, and undertaking a diffuse HI census around galaxies to answer questions about galaxy formation, gas accretion, and star formation. FLAG's high sensitivity and wide field of view will also open up a new parameter space for studies of the transient radio sky, particularly for bright but rare transients such as the newly recognized and likely extragalactic population of fast radio bursts.

VEGAS Update

Richard Prestage, Anish Roshi, Ray Creager (NRAO) and Glenn Jones (NRAO/Columbia) on behalf of the VEGAS team.

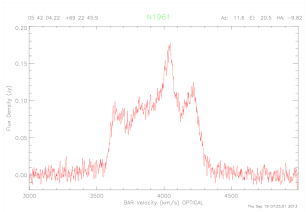


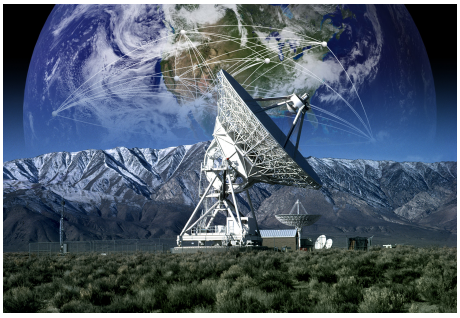
Figure: A 12-minute observation of N1961 (average of two polarizations).

After first-light spectral line observations in December 2011, and the commissioning of the low resolution "mode 1" in July 2013, we are now starting to commission some of the higher resolution modes of the Versatile GBT Astronomical Spectrometer (VEGAS).

Figure 1 shows a 12-minute observation of N1961, a galaxy chosen from Rick Fisher's GBT HI Galaxy Survey. This spectrum was obtained using one bank of the Spectrometer and the production GBT Device Manager, and was processed using SDFITS and GBTIDL. VEGAS has a rich and powerful set of observing modes (http://www.gb.nrao.edu/vegas/modes/). Commissioning work continues on Modes 5 through 29, and we expect to start shared risk observing soon. Potential observers will be contacted by their GBT friend as appropriate modes become available.

Rapid Response with the VLBA

Walter Max-Moerbeck



In recent years, several space and ground-based observatories with wide-field imaging capabilities have been routinely surveying the dynamic sky. Satellites such as Swift and Fermi, and precursors to the Large Synoptic Survey Telescope and the Square Kilometre Array such as Pan-STARRS, the Palomar Transient Factory, and the Low Frequency Radio Array can detect transient astronomical events in real or near-real time and generate alerts to trigger sensitive, narrow-field instruments such as the Very Long Baseline Array (VLBA). Follow-up capabilities will be ever more critical to the science goals of characterizing and localizing these fast events.

With these goals in mind, a new VLBA capability has been added that enables trigger observations on time scales as short as 10 minutes. This new capability has been available since NRAO Semester 2013A as part of the Resident Shared Risk Program. The long baselines of the VLBA can provide milli-arcsecond imaging, precise localizations, and robustness to radio frequency interference that are not possible with any other instrument.

One current VLBA program (P.I. Keith Bannister) is using this capability to confirm detection and conclusively associate short-duration radio pulses from Gamma-Ray Bursts (GRBs) occurring within 15 minutes of a Swift trigger. These short-pulses were first detected using the Parkes 12m telescope as single dispersed pulses for two GRBs, with flux densities of 7 Jy and dispersion measures in excess of Galactic values (Bannister et al. 2012). If such detections are confirmed they can provide an important tool to study GRBs and the intergalactic medium.

The VLBA rapid response capability as currently implemented supports follow-up observations in times as short as 5 minutes after a trigger at times when there are no observations running on the array. Notices from the Gamma-ray Coordinates Network containing preliminary locations and basic information for the events are automatically received at the Array Operations Center in Socorro, NM. Events matching the

given science case are used to generate VLBA schedules and an email notification to the array operators, who make the decision to observe based on the available array time. The astronomer is responsible for the event selection and schedule generation, for which the observatory can provide support during the development process.

Various science programs could benefit from this new VLBA rapid response capability. Examples include imaging changes in SgrA* in response to strong IR flares, fast-evolving X-ray binaries, short-lived flare stars, and much more. We encourage the community to apply for time for the next observing cycle (NRAO Semester 2014A: 1 February 2014 proposal submission deadline).

Reference

Bannister et al. 2012, ApJ, 757, 38.

Jansky Lab Emergency Generator Upgrade

Butch Wirt and Richard Prestage

While many NRAO–Green Bank staff remember the 2012 derecho for squashed vehicles and numerous downed trees, it also served as a reminder of the significant need for improvements to our emergency power capabilities. Coordination is underway to replace the Jansky Lab emergency generator with a new Caterpillar 125kW generator set. While GBT will not be observing during an outage, this new generator will permit continued cooling for the GBT control room electronics and spectrometer, and allow Management & Information Systems, Fiscal, and network operations to continue for the other NRAO sites when Green Bank loses commercial power.

The existing Lab generator enables the Dormitory to remain in operation for school groups, or to provide disaster relief to the community. The Cafeteria and Residence Hall complex will also receive a new Caterpillar 125kW generator set. This unit will replace the ailing 45+ year-old Detroit Diesel generator that can be heard throughout the community when running and that allows us to serve our guests and observers during these events and, if needed, provide disaster relief to the community. And our scientists may appreciate uninterrupted food services for those hungry hours of data reduction! We are currently in a carefully planned process to get the new generators on line, anticipating a fall completion with minimal disruption to NRAO operations, with site electrician Rusty Taylor busily gearing up for the big day.

The planned date for the switchover is 13 November, with backup dates of 7 or 14 November, with weather being the final determinant. During this time, the Jansky Lab will undergo a planned power shutdown. The complete power and computing equipment outage is expected to last up to twelve hours. While power is off, GBT computing facilities will not be available to observers. Thus, they will not be able to use these facilities to prepare observing scripts, run GBTIDL, and so on.

In recent years, the electronic equipment installed in the Jansky Lab has increased in sophistication. This now includes CASPER Roach-2 digital electronics systems, Lustre data archive servers, and high-speed network switches. These all have increased radio frequency (RF) emissions, in many cases extending well into the 10s of GHz range. We will use the opportunity of the controlled power shutdown to perform RF scans of the Jansky Lab, with and without various pieces of equipment powered on. This will allow us to determine whether any of these items exceed the effectiveness of the lab-shielded rooms, and hence may require additional local shielding.

Recent Press Releases & Announcements

Final Antenna Delivered to ALMA: All 66 ALMA antennas now handed over to the observatory (https://public.nrao.edu/news/announcements/final-alma-antenna-delivered)

1 Oct 2013

After more than a decade of planning and construction, the 66th and final antenna for the Atacama Large Millimeter/submillimeter Array (ALMA) telescope has been delivered to and accepted by the ALMA Observatory. Read more... (https://public.nrao.edu/news/announcements/final-alma-antenna-delivered)

Astrophysicist Charles Bennett Receives 2013 Jansky Lectureship Award (https://public.nrao.edu/news/announcements/bennett-2013-jansky-lecture)

26 Sep 2013

AUI, and the NRAO have awarded the 2013 Karl G. Jansky Lectureship to Charles Bennett, Ph.D., the Alumni Centennial Professor of Physics and Astronomy at Johns Hopkins University in Baltimore, Md. Read more... (https://public.nrao.edu/news/announcements/bennett-2013-jansky-lecture)

'Jekyll and Hyde' Star Morphs from Radio to X-ray Pulsar and Back Again (https://public.nrao.edu/news/pressreleases/xray-pulsar-binary)

25 Sep 2013

Astronomers have uncovered the strange case of a neutron star with the peculiar ability to transform from a radio pulsar into an X-ray pulsar and back again. This star's capricious behavior appears to be fueled by a nearby companion star and may give new insights into the birth of millisecond pulsars. Read more... (https://public.nrao.edu/news/pressreleases/xray-pulsar-binary)

Voyager 1 Spotted from Earth with NRAO's VLBA and GBT Telescopes (https://public.nrao.edu/news/pressreleases/vlba-spots-voyager-1)

12 Sep 2013

Astronomers using the National Science Foundation's Very Long Baseline Array and Green Bank Telescope spotted the faint radio glow from NASA's famed Voyager 1 spacecraft -- the most distant man-made object. Read more... (https://public.nrao.edu/news/pressreleases/vlba-spots-voyager-1)

Career Opportunities

NRAO Postdoc (https://careers.nrao.edu/applicants/Central?quickFind=50956) **:** The NRAO in Green Bank, WV is seeking a NRAO Postdoc to 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 Green Bank Telescope (GBT) and GBT observers. This is a two-year appointment.

Jansky Fellow (https://careers.nrao.edu/applicants/Central?quickFind=50951) **:** The NRAO invites applications for the position of Jansky Fellow. The purpose of the Jansky Fellowship Program is to provide an opportunity for early career scientists to establish themselves as independent researchers so that they may more effectively compete for permanent positions. This is a two-year appointment.

NAASC Postdoctoral Fellow (https://careers.nrao.edu/applicants/Central?quickFind=50949) **:** The NRAO in Charlottesville, VA is seeking a NAASC Postdoctoral Fellow. Applicants for this position should expect to spend 50% of their time on independent research, with the remaining time spent on developing ALMA expertise and assisting the NAASC scientific staff in the support of ALMA users. This is a two-year appointment.

Technical Specialist II: (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.

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 and high performance computing systems.

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: Paul Rhodes and Bill Gust stand at the entrance to the new NRAO Tucson offices on Forbes Blvd. in October 1974. Prior to moving into the Forbes Interstate Industrial Park, where the interior space was specially designed for NRAO (and included NRAO's first shower room – many Tucson employees rode bicycles to work), NRAO had occupied space in the basement of Kitt Peak National Observatory's Tucson offices. Equipment complexity and increasing staff numbers meant the limited available KPNO space no longer met NRAO's needs, so the search for new quarters began in 1973. Nineteen NRAO employees moved into the Forbes Blvd. offices in 1974.

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, ebouton@nrao.edu (#) .

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