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Martha P. Haynes Elected Interim President of AUI by Paul Martin

Washington, D.C. – Dr. Martha P. Haynes, a distinguished Professor of Astronomy at Cornell University, became the Interim President of Associated Universities, Inc. (AUI) on April 9th. She was elected by the Board of Trustees of this independent nonprofit organization, founded by nine northeastern universities which operates the National Radio Astronomy Observatory (NRAO) under a cooperative agreement with the National Science Foundation. Dr. Haynes, a Trustee for the past four years, will lead AUI while it seeks a successor to Dr. Lyle H. Schwartz, whose resignation became effective April 8, 1998.



In tendering his resignation, Dr. Schwartz explained, "For many months, the Board has known of my plan to move on soon after management of Brookhaven National Laboratory (BNL) passed to Brookhaven Science Associates. For the foreseeable future, AUI will be better served by a President from the astronomy community, while I can contribute more in a position where my background in materials science and engineering is more relevant."

"I shall always treasure my warm relationship with AUI and the friends I made at BNL and NRAO," he observed, "and sadly recall the strange sequence of events that made my hopes and plans for BNL moot. Scientists everywhere deeply respect the wisdom of the AUI Board and its commitment to strengthening and encouraging the best possible science under conditions in which all can take pride."

Dr. Paul Martin, Chairman of the Board of AUI and a professor and dean at Harvard University, extended the Board's gratitude to Dr. Schwartz for his remarkably effective performance during a year of

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Observatory Budget for 1998 by Paul Vanden Bout

This is a year of "good news/bad news" for the NRAO. The good news is that the Millimeter Array project will begin this year. The bad news is that the Observatory's operating budget is essentially the same as last year. And this news comes very late. Never before have we had to wait until April to receive final budget approval.

With the transfer of a number of employees from the operations budget to the MMA budget we will be able to construct a budget for NRAO operations that does not require a layoff in 1998 and will permit a modest pay raise in July. The NSF has requested an increase in NRAO's operating budget for 1999. If the economy remains strong, science remains a high priority for the federal government, and NSF receives its budget increase for 1999, next year should be better.

The Observatory is fortunate in having well developed plans for the future: the Green Bank Telescope, nearing completion; the Millimeter Array, officially beginning; and plans being completed for an upgrade of the Very Large Array. In addition to these large projects, NRAO has been funded to connect the Pie Town Very Long Baseline Array antenna by optic fiber to the VLA, doubling the angular resolution of the VLA. And we have asked for NSF funds to complete the installation of 43 GHz receivers on the VLA and to install 86 GHz receivers on the VLBA. The combination of new facilities, upgrades, and improvements will bring the Observatory into the next millennium with four world-class telescopes.

Millimeter Array Plans

by Bob Brown

The initial 3-year Design and Development (D&D) phase of the Millimeter Array at the NRAO is beginning. The goals of the D&D work are (1) to design and fabricate prototypes of the key MMA instrumentation, including a prototype antenna and receiver system; and (2) to use the experience

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Martha P. Haynes . . . (continued)

transition. "It comes as no surprise," Martin noted, "given his success as a Laboratory Director at the National Institute of Standards and Technology and at Northwestern University. We wish him every success in his next position."

"As AUI looks to NRAO and the future," continued Dr. Martin, "we thank the stars that Dr. Haynes can step in. With her experience as a researcher at many major optical and radio astronomy observing facilities worldwide; her long association with NRAO including service as Director of the NRAO facility in Green Bank, West Virginia; and her thorough understanding of the strengths of AUI management as an active member of the AUI Executive Committee, she's the ideal person to take the reins as we search for a permanent new President, restructure, and forge closer ties with universities and the astronomical community."

In accepting the responsibilities of Interim President, Dr. Haynes commented, "This is an exceptionally exciting time for NRAO, within sight of the completion of the Green Bank Telescope and the anticipated initiation of the Millimeter Array project. The radio astronomy community has long held AUI in high regard, particularly because of the prominence, breadth and personal involvement of its Board membership. My acceptance of this interim position is a direct reflection of the AUI commitment to maintaining NRAO's preeminence in radio astronomy as we enter the 21st century."



Millimeter Array Plans (continued)

gained in the prototyping work to produce a sound cost estimate for the construction of the MMA on the site in Chile.

Recruitment of the MMA D&D staff is underway. By year's end we expect approximately forty people to be assigned to the project at the NRAO. This group will be augmented by the efforts of an additional eight people who are affiliated with the university groups collaborating with the NRAO on development of the MMA. Various D&D tasks will be carried out at the CDL in Charlottesville, at the AOC in Socorro, and at the Tucson offices. The initial prototype hardware will come together and be assembled on the first prototype antenna that will be erected and tested at the VLA site early in 2001.

Efforts are being made to expand the concept of the MMA by exploring ways in which the MMA could be merged with the European Large Southern Array (LSA) to achieve a joint array with three or four times the collecting area of the MMA and baselines three times longer. The Millimeter Array Advisory

Committee (MAC) and other NRAO scientific committees see much to be gained by the enhanced capabilities of a common MMA/LSA instrument. Furthermore, there is the additional likelihood that the MMA/LSA could itself be expanded by later amalgamation with the Large Millimeter and Submillimeter Array, a project being planned by the Japanese National Astronomy Observatory. Discussions among the potential partners in a joint array will continue in parallel with the D&D work at the NRAO.

Making the MMA a reality is a big challenge, but one we have long anticipated at the NRAO, and one that we now enthusiastically welcome.



Social Engineering: Don't Be A Victim by Gene Runion

Social Engineering is a method used to penetrate a company's phone or computer system in order to commit fraud. It can even be used to gather information about a person to commit credit card fraud. One of the most popular tricks used is that a person will call and say "I am from the phone company. To complete my testing of the line I need you to dial #9000 for me." If you do what you've been asked to, the caller can then seize an outside line and make his own long distance call(s) at your expense. This method of fraud has cost many companies thousands of dollars. It is important to know that no one from the phone company will ever ask you to dial a number or transfer them to another extension in this way; they have no need to do so. Telephone companies have the equipment needed to do this themselves.

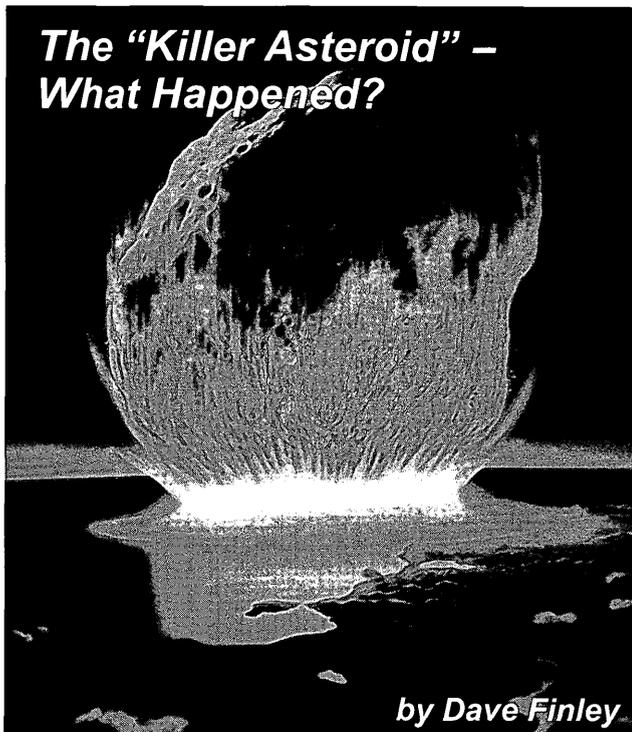
Another tactic used is that a person will call and identify themselves as being with a company that is updating their database. Then they proceed to ask you questions about yourself. Watch out! This tactic is very subtle. They may be gathering information to guess your password(s) and/or pin numbers. Unless you are familiar with the company and recognize the representative on the phone, don't answer any questions about yourself.

There are two important ways to help you and your employer avoid being telephone fraud victims:

- **Don't provide strangers with information about yourself or NRAO.**
- **Always use passwords that cannot be easily guessed.**

Look for more social engineering information in future Point Source issues.

The "Killer Asteroid" – What Happened?



by Dave Finley

On Wednesday, March 11, the dramatic news broke: an asteroid a mile wide is headed for a possible collision with Earth 30 years from now. That evening and the following morning, the newspapers and television news shows were full of death-and-destruction scenarios. In less than 24 hours, however, the story had changed: the asteroid isn't going to hit after all.

Many news reporters talked about astronomers "changing their minds" or "debating" about the asteroid's future path. Some implied that astronomers had "cried wolf." Though, as it turns out, there was a mistake involved, such large changes in a predicted orbital path are a commonplace occurrence in the branch of astronomy called celestial mechanics. When astronomers in this field get more data, their calculations become more accurate.

How does all this work? When a new asteroid or comet is discovered, it is reported to the International Astronomical Union's (IAU) Central Bureau for Astronomical Telegrams in Cambridge, MA. Astronomers at this bureau seek to calculate the new object's orbital path. In order to do this, they need precise celestial positions measured by observers. In theory, an orbit can be computed from three positions sufficiently spaced over time. In practice, a good orbital calculation requires many positions spaced over a significant percentage of the comet or asteroid's "year," the time it takes to complete a single trip around the Sun.

The asteroid at the center of the furor, called 1997 XF11, was discovered last December 6. By March 11, the astronomers at the Bureau had received measured positions covering 88 days of the asteroid's approximately 21-month "year." Based on this information, they calculated the future path of the

object, and concluded that, on October 26, 2028, it would likely pass within 30,000 miles of Earth and an actual collision was "not entirely out of the question."

Next, they did two things. The first was to issue a notice to astronomers, called an IAU Circular. As they often do in such circulars, they urged others to observe the asteroid and provide more data to allow a better orbital calculation. In addition, they suggested that images already in hand from past observations of other objects might include 1997 XF11, and that those images could help their calculations. Their next act was to issue a press release, which was distributed to journalists around the world by the American Astronomical Society (AAS).

The IAU Circular produced its intended effect. In a matter of hours, an image made at Palomar Observatory in 1990 was found to show 1997 XF11, and the new information greatly improved the orbital calculation. The result was that the 30,000 mile "miss distance" changed to some 600,000 miles. Such refinements are common calculations of Comet HaleBopp's orbital period (its "year") changed by more than 2,000 years from the original figure.

By the time the new orbital information came along, the press release, too, had produced its effect. Only two hours after the press release was distributed, the Associated Press sent a story out to newspapers and broadcasters around the world that "an asteroid large enough to cause widespread destruction may be heading toward a 2028 collision with the Earth." Print and broadcast reporters soon besieged scientists who use computers to simulate the effects of asteroid impacts, obtaining some dramatic and very scary quotes about what could happen if 1997 XF11 hit. Following the dreadfully bad TV movie "Asteroid" last year, and with two Hollywood films about asteroid impacts ("Armageddon" and "Deep Impact") scheduled for release this year, this news caught fire quickly. Though public understanding of science is, according to most studies, woefully poor, most people probably do know that an asteroid impact 65 million years ago is what likely killed off the dinosaurs. The announcement that a big asteroid might hit Earth in 30 years riveted the public's attention.

Though 1997 XF11 isn't going to hit us, at least anytime soon, it is certain that something else will. Impacts are probably the most common geological process in our Solar System. Just look at the surfaces of the Moon, Mercury, Mars, and moons of the outer planets they're covered with craters caused by impacts. The Earth, too, has impact craters (Meteor Crater in Arizona is perhaps the most famous). In 1908, a large object struck Siberia with the force of many nuclear weapons. Meteors, or "shooting stars," visible every night, are the fiery trails of smaller objects striking our atmosphere. In fact, many tons of interplanetary material, from dust size on up, hit the Earth every day. Major impacts, with great destructive potential, are likely, on average, every few thousand years.

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The "Killer Asteroid" – What Happened? (continued)

1997 XF11 was discovered by a project called Spacewatch, which uses a 36-inch telescope on Kitt Peak in Arizona to search for asteroids that could strike Earth. So far, they have found more than 100 "potentially hazardous asteroids." Their hope is to find any object likely to hit us long enough before the impact to allow some preventive action, such as diverting the object with rockets or nuclear bombs, to be taken.

More than a month afterward, Dr. Brian Marsden, head of the IAU's Central Bureau, issued another Circular, admitting that his own original estimate of the close approach "was incorrect." That someone who does orbital calculations practically on a daily basis could make such an error indicates the complexity of this type of work.

In the wake of the March episode, there has been some debate on how such news should be handled. Though some astronomers expressed surprise at the news media's reaction, the media firestorm was entirely predictable. Some astronomers suggested, even before Marsden admitted his mistake, that the initial announcement was premature and that, in the future, the call for additional observations should be made before making a public announcement. Others contend that holding back the news for any period of time would only fuel conspiracy theories. The next time, however, everyone will know for sure the kind of reaction to expect when such an announcement is made and probably will check their calculations one more time.

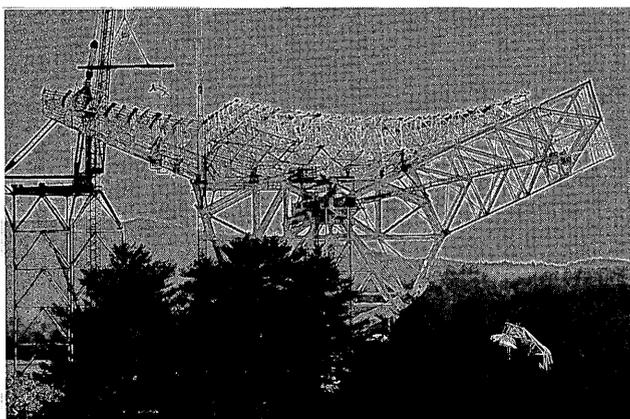


Photo taken March 1998 showing construction progress of the GBT.

Green Bank Telescope Update

The Green Bank Telescope (GBT) is entering the final stages of fabrication and assembly. The accompanying photograph of the GBT, taken in March 1998, shows that more than half of the reflector backup structure is in place atop the alidade (the structure that supports the tipping structure of the telescope). Primary elements of the servo and electrical systems have been installed on the alidade. The reflector

backup structure (BUS) consists of 7,652 different members and joints weighing approximately 2.2 million pounds.

The upper 60-foot portion of the feed arm was trial erected at the site. The feed arm servo, which controls the focus boom and subreflector equipment, has been installed and tested along with some of the NRAO monitor and control system. The 200-foot dual tower section of the vertical feed arm was trial erected at the contractor's fabrication plant in Mexia, Texas. It was disassembled and shipped to Green Bank where final assembly is now underway. All steel is now on site, and the horizontal feed arm is erected.

The 2,004 main reflector panels are now in production at the contractor's plant. Approximately 1,400 panels have been manufactured. Nine of 44 tiers of panels have been accepted by NRAO, and painting has begun. Several of the panels have been sent to the site where they were positioned on the BUS as a comprehensive fit and alignment check for the structure, actuators, panels and cabling.

Look for GBT construction progress updates in future issues of the Point Source.

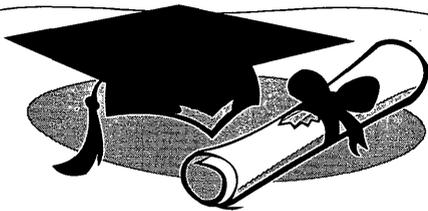


Calling All Logo Artists!

Associated Universities, Inc. needs a new logo. We're looking for a spiffy new design which incorporates the current NRAO logo into an attractive AUI corporate symbol. Major corporations have been known to pay thousands to outside design firms for a new logo. We're convinced we can find what we want right here at NRAO. And we're willing to put up a 100 bucks, plus loads of publicity for the winner. For inspiration we've shown a couple of design ideas which have already been submitted. Can you top these? Send your creation to the POINT SOURCE editor no later than June 15.



AUI Scholarship Recipients



Congratulations!



Catherine M. Chavez is a senior at Socorro High School. She has represented her school in the MESA Program, a state-wide competition in Math, Engineering and Science Achievement. She is a member of Who's Who Among American High School Students, and is a Charisma Blues Dance Team member. Catherine competes in various dance

competitions at the state and national levels; she has recently been nominated as a semi-finalist for Dancer of The Year. In addition, she has been an active participant in the Publications program, helping to produce the school's yearbook. She is a member of the San Miguel Youth Choir. Catherine will attend Eastern New Mexico University this fall where she will begin her studies in music and dance.

Catherine is the daughter of Julia and Norton Euart of Socorro. Julie is an Accounting Assistant in the Fiscal Division.



Alicia A. D'Addario is a senior at Albemarle High School in Charlottesville. She is one of the valedictorians of her graduating class. This year she has served as captain of the Color Guard, which won many inter-school competitions during the fall marching band season. She is a member of the National Honor Society, Music Honor Society,

Math Honor Society, French Honor Society and the Key Club. She served in the Albemarle County Honors Band and received the Daughters of the American Revolution History Award in her junior year. Alicia's main extracurricular interest is music. She plays the piano and the flute and is in the school's symphonic band. For the third straight year she is playing in the pit band for the school's spring musical. Alicia has been accepted at several educational institutions but has yet to decide where she will attend.

Alicia is the daughter of Larry and Candace D'Addario of Earlysville. Larry is a Senior Research Engineer in Charlottesville.



Monica A. McBride is a senior at Magdalena High School. She is a member of the National Honor Society and Business Professionals of America, where she has been both President and Treasurer. She is a member of Who's Who Among American High School Students and has received local and state art awards. She has been a Class

Officer for four years and is Girls State Alternate for the American Legion. Monica is currently working as a "Youth Risk Intern" through the Socorro County Maternal and Child Health Plan. She is one of four other seniors who has been selected as a role model to encourage and teach New Mexico's mid-school students abstinence from pre-marital sex, drugs, and alcohol. She is also very active in her church youth group. Monica plans to attend the University of New Mexico where she will study Physical Therapy.

Monica is the daughter of Theresa and Ernest McBride of Socorro. Theresa is the Personnel Assistant in Socorro.



Jennifer C. Simon will graduate from Western Albemarle High School in Charlottesville. She is spending her senior year as an exchange student in Germany. Jennifer has been involved in the Charlottesville Youth Orchestra, German Club, German Honor Society, ACE Team, and was a member of the track team. She attended Governor's School

during her sophomore and junior years where she studied German.

Jennifer is the daughter of Richard Simon of Batesville. Richard is a Scientist on the MMA Project in Charlottesville.



Emma L. van Moorsel is a senior at Socorro High School. She has been involved in Soccer, Key Club, German Club, French Club, Science Olympiad, National Honor Society and Drama Club. She has taken part in many stage productions and is currently serving as student director of *A Midsummer Night's Dream*. This past summer she attended the

New Mexico State University Regent's Program for High School Scholars, a program which gives high school students the opportunity to take college-level classes and earn college credit. She also tutors middle school students. Emma has been accepted to several institutions and is currently weighing her options.

Emma is the daughter of Gustaaf and Jacoba van Moorsel of Socorro. Gustaaf is Head of Computing in Socorro.

There are a number of projects that NRAO is involved with that are not funded by the National Science Foundation (NSF). Some of these include the NRAO Space VLBI project, the Orbiting VLBI tracking station, the U.S. Naval Observatory, and Project Phoenix under the SETI Institute, several of which are discussed here.

The NRAO Space VLBI Project

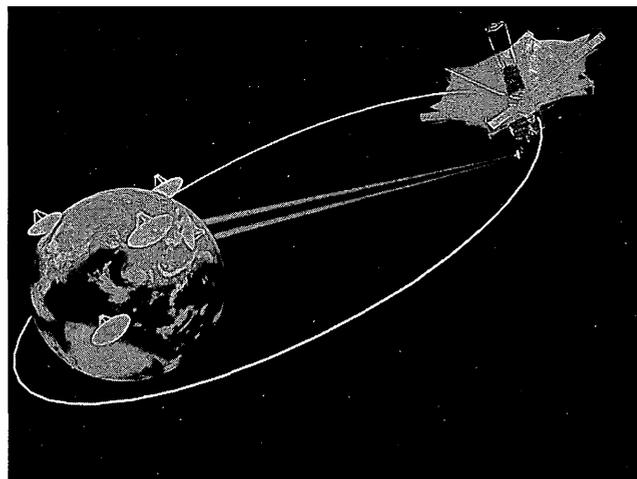
by Jon Romney

NRAO employees are generally familiar with Very Long Baseline Interferometry (VLBI), a technique developed by radio astronomers in the 1970s to achieve the highest resolving power – the most detailed images – in any branch of astronomy. Our VLBA instrument is the world's only full-time dedicated VLBI telescope. Yet even in joint observations between the VLBA and antennas in distant countries, the size of the effective "synthesized aperture" is limited by the size of the Earth. Space VLBI escapes this limit by putting an element of the interferometer in orbit.

A successful Space VLBI demonstration was carried out in the mid-1980s by NASA, using a satellite of the Tracking and Data Relay (TDRSS) system, in geostationary orbit above the Pacific Ocean. One of the participating ground telescopes was located in Japan, and this project led the Japanese space agency ISAS to develop their own dedicated Space VLBI mission, the VLBI Space Observatory Programme (VSOP). VSOP brings a true imaging capability to Space VLBI for the first time. Its spacecraft, launched in February 1997 and renamed "Halca" after launch, follows an elliptical low earth orbit, spending much of its time at an apogee altitude of about 21000 km, but zooming in to only 800 km at perigee, and back out to apogee in a period of about six hours. For radio sources in directions roughly perpendicular to the plane of this orbit, Halca increases the resolving power by two to three times over what can be done on the Earth alone.

The VSOP mission is a large international collaboration, in which NRAO is a major participant, through two separate NASA-funded internal projects: the Green Bank OVLBI Earth Station and the NRAO Space VLBI Project. The latter, based at the AOC, includes the operation of the VLBA in conjunction with Halca in a large fraction of VSOP observations, either alone or as part of a larger, global ground array. Correlation of all these observations is done at the VLBA correlator. A number of specialized capabilities were also added to AIPS for analysis of Space VLBI observations.

We began preparing for the VSOP mission as soon as the VLBA began operating routinely for ground-based observations. Most of the preparation involved enhancements to the VLBA correlator, among others, to compute the position of a space antenna in its orbit instead of one fixed on the surface of the Earth, and to allow the correlator to track the rapid motions that occur in parts of the orbit. A series of NRAO Newsletter articles during 1997 described the completion and extensive testing of these features, and the challenge of finding the VLBA correlator's first VSOP fringes and making the first Space VLBI image.



Artist conception of VSOP

Since then, the Project's efforts have concentrated on developing a smooth interaction between the VSOP Science Operations Group in Japan and the VLBA Operations Division. This process has nearly been completed, and we expect to turn over all aspects of VSOP observing to Operations in the near future. The National Science Foundation's (NSF) agreement with NASA for NRAO participation in the VSOP mission calls for operational funding to continue through the year 2000.

A large number of NRAO people have been involved in this project. The VLBA correlator enhancements were developed by Chuck Broadwell and Joe Greenberg on the hardware side, and by John Benson and Steve Blachman in software. Chris Flatters and Ketan Desai have done the main work on the AIPS enhancements. Support for Space VLBI operations is provided by data analysts Craig Lewis and Andy Hale, and tape librarian Brenda Broadwell. Two members of the scientific staff, Mark Claussen and Jim Ulvestad, are specially designated to assist visiting astronomers in analyzing their VSOP observations; Amy Mioduszewski has a similar position funded by the Joint Institute for VLBI in Europe. Although nominally assigned to ongoing operations and user support, this last group made invaluable contributions to the early days of the VSOP mission, and to the success of the NRAO Space VLBI Project.

Watching the World Turn

by Frank Ghigo

As you drive past the gate at NRAO Green Bank, the first telescope on the right hand side is a new 20-meter antenna, completed in 1994. The 20-meter, run by NRAO for the U.S. Naval Observatory (USNO) under an interagency agreement with the NSF, is part of a global VLBI network for measuring the Earth's rotation and motions of the pole. These measurements provide

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Watching the World Turn (continued)

data that are used to keep navigation systems and navigational tables updated. Every week the USNO publishes a bulletin (the IERS, or International Earth Rotation Service bulletin) that lists current Earth rotation and polar motion results with predictions for three months in the future; these data are derived from several observing programs including the VLBI measurements with the Green Bank 20-meter. This information is used not only by navigators but also by astronomers doing high-precision measurements. For example, the VLBA array needs the time corrections and polar motion supplied by the USNO to accurately measure positions of radio sources. Other telescopes in this VLBI array are in Kauai (Hawaii), Fairbanks (Alaska), Wettzell (Germany), Fortaleza (Brazil), and sometimes Ny Alesund (Spitsbergen) and Hartebeesthoek (South Africa).

The 20-meter telescope also participates in a series of Earth measurement experiments that include the VLBA antennas, a collaboration between USNO, NASA, and NRAO. These have been the largest VLBI experiments ever done, with seventeen antennas participating. In all these observations, we repeatedly observe a set of quasars whose positions are well known. The quasars are used as reference points in the sky. The Earth's orientation is measured with respect to the coordinate system defined by these distant reference points. Quasars make a good set of reference points because they are the most distant known objects and are point-like, having little or no measurable size.

The rotation rate of the Earth is somewhat irregular: the length of the day, 24 hours on average, varies by a few milliseconds one way or the other over a few months. Surprisingly, these small changes in the length of the day correlate with large scale wind patterns. For example, the "El Nino" weather pattern, a change in the direction of prevailing winds in the Pacific, causes the Earth to turn a little more slowly. This slowing is clearly seen in the VLBI results. Due to El Nino the days are 1-2 milliseconds longer than average.

The 20-meter has the distinction of being the speediest antenna in all of NRAO: it turns at 120 degrees per minute in both axes, even outpacing the VLBA antennas, who run at a more modest 90 degrees per minute.

VLBI measurements are also used to study continental drift, ocean currents, and the shape of the Earth's core. We can all rest a little easier knowing that the behavior of the Earth is being continually watched.



Project Phoenix/SETI Institute

by Jay Lockman

For the past year and a half, the SETI Institute, under an agreement with the NSF, has been using the 140 Foot Telescope for their Project Phoenix, a targeted search for radio emissions from nearby stars that could signal the presence of an intelligent species. Project Phoenix has its own receiver which covers 1.2 to 3.0 GHz in two bands. The data are analyzed in real time on an extremely sophisticated digital processing system located in a trailer anchored outside of the 140 Foot. The detection system uses a series of elaborate tests to distinguish potentially interesting signals from the background of terrestrial interference. Additionally, a second antenna, located at Woodbury, Georgia, goes into operation to confirm the reality of suspected signals. Regular observations of the U.S. satellite Pioneer 10 test the ability of their observing procedure to detect a signal of known strength and drift rate relative to the Earth.

So far, several hundreds of stars have been observed at Green Bank for the project. None has shown any evidence of intelligent radio emission. In late spring 1998, the Project Phoenix equipment will be moved to Arecibo for a few months of observations using the more sensitive antenna located there. There is the possibility that the SETI Institute will return to Green Bank to become the sole user of the 140 Foot Telescope after it is closed to general use later this year. Further information about the Project Phoenix work at Green Bank can be found on the SETI Institute web page: <http://www.setiinst.edu>.

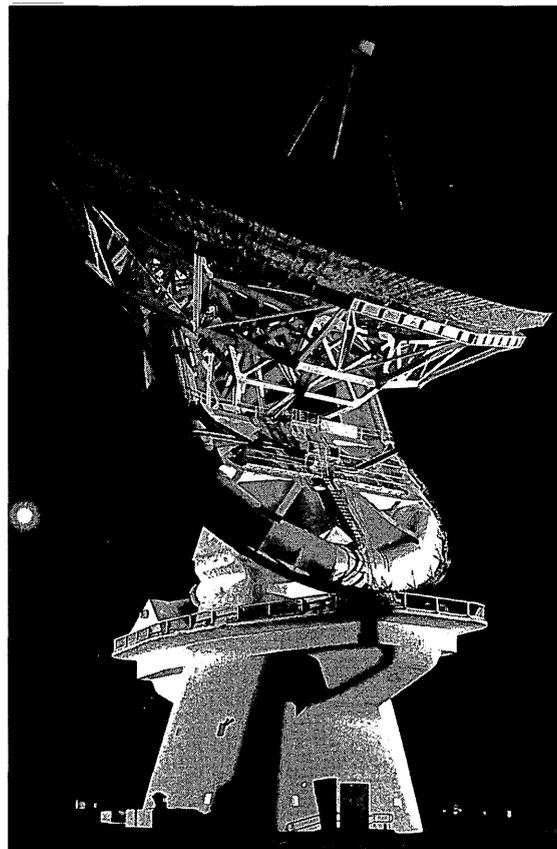


Photo taken at night of the 140 Foot Telescope.

WHO'S WHO?

Can you identify any or all of the pictures below? Employees were asked to send in a picture of themselves between the ages of 3 and 10 for this contest. Below are some of those pictures chosen at random with the appropriate site indicated in the upper left corner as a clue.

An NRAO t-shirt will be awarded to the employee who correctly identifies the most employees first. So write, fax or email the Personnel Office as soon as you think you've got them figured out!

We'll give you one other clue - there are two "stumpers" in the group that you won't be able to identify - so look out and have fun! The winner will be announced at a later date. Good luck!



“Do-It-Yourself” Project Expands VLA’s Capabilities by Dave Finley

Persistence, elbow grease and a \$20,000 gift have made a long-held wish come true for a group of astronomers who completed a "spectacularly successful" observing session with new equipment at the VLA this Spring. The new equipment allowed them to use all 27 of the VLA's dish antennas to study the sky at a frequency of 74 MHz, far lower than the frequencies for which the VLA was originally designed.

In 200 hours of observing with the new equipment, astronomers from four continents studied objects including the Sun, galaxies, and remnants of exploded stars. The observations "were a spectacular success and we're very pleased by that", said Rick Perley, the NRAO scientist in charge of the project. "We proved that you can make good images with the VLA at this frequency and that radio interference is not, as some feared, a showstopper."

Not bad for a "do-it-yourself project," as Perley describes it.

Though the VLA was designed to receive cosmic radio emissions at frequencies of roughly 1 GHz and higher, some astronomers, notably Bill Erickson, an emeritus University of Maryland professor and Perley's Ph.D. advisor, wanted to use lower frequencies. In the 1980s, 327 MHz receivers were added to the VLA, and, a few years ago, eight antennas got 74 MHz systems. Getting 74 MHz systems for the rest of the VLA's antennas proved much more difficult.

"We knew we could use off-the-shelf components and equip antennas for about a thousand dollars each," said Perley, "but we just couldn't seem to squeeze the loose change out of anyone."

Enter another of Erickson's former Ph.D. students, Namir Kassim, an astronomer at the Naval Research Laboratory (NRL) in Washington, D.C. Kassim got the NRL to transfer \$20,000 to NRAO for the 74 MHz systems with no strings attached. That's when the "hands-on" part of the project began.

Wanting to get the most performance for the money, Erickson, now retired and living in Tasmania (but still doing research part-time at the University of Tasmania), produced a new design for the 74 MHz receivers. Then, over last summer, Erickson constructed them at NRL, with help from Kassim. To capture the signals at this frequency, small wire dipole antennas were to be placed below the subreflector of each VLA dish antenna. However, these wire antennas degrade the performance of the VLA dish at higher frequencies, so they would have to be removed when 74 MHz observing was not scheduled. Erickson, an avid sailor, designed a system using ropes, eyebolts and cleats that allows deploying and removing the 74 Mhz dipoles. NRAO engineer Gerry Petencin helped Erickson in this design effort.

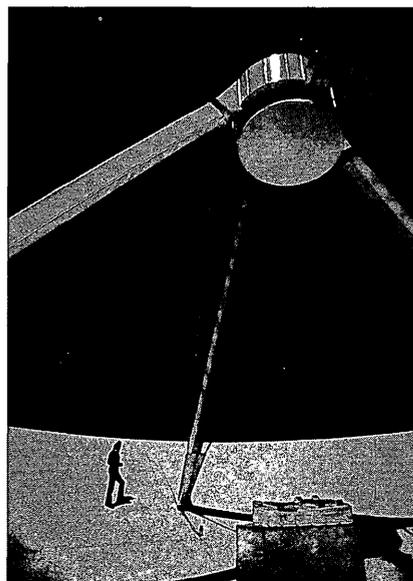
Antenna mechanics Pat Baca, Ramon Gutierrez, Chester Moeller, Ben Otero, Jimmy Sanchez and John Wall worked to install this system on the VLA antennas.

To get all these systems in place, Perley put out a call for Socorro astronomers to help with the manual labor in January. Unfortunately, the day the work party was scheduled saw freezing temperatures and a snowstorm. It was unsafe to climb around in the ice-encrusted VLA dishes, so the work had to wait. In the next few days, Paul Lillie, Galen Watts, Everett Callan, Bill Morris and Bob Smith, from Socorro's Front-End Group, got the systems deployed, and observing could begin.

"We had put out a call for observing proposals and got about 30 requests to use the new system," Perley said. "Some 200 hours of 74 MHz observing were approved by the scheduling committee." The timing was good – both the Sun and the Earth's ionosphere, which could hamper observations at this frequency, were relatively quiet and well-behaved. "We learned a lot" from the first session, said Perley. "It was great seeing this work out." Still, he adds, "this is a hard frequency to work at." Some aspects of calibrating and reducing data at the new frequency "would make a great Ph.D project," Perley said. The 74 MHz dipoles were removed in March, to await their next scheduled observing session.

In the future, it may not be necessary to install and remove the 74 MHz dipoles by hand. Clint Janes, Jim Ruff and Wayne Koski are working with two engineering students at New Mexico Tech to design a system that would deploy and stow them by remote control. Alternatively, they may be installed permanently in a location that would not cause the performance loss at other frequencies.

Erickson, Perley and Kassim are enthusiastic about using the new systems to expand the radio "vision" of the VLA. "We certainly are grateful to NRL for that \$20,000," Perley said.



Scoping the Sites . . .

AOC

Driver training courses, called Decision Driving, have been ongoing at the AOC and VLA sites since October. The one day course, developed by NRAO's vehicle insurance carrier, Liberty Mutual, is designed to increase driver awareness and improve the principles of defensive driving, including decision making. The course has received very positive feedback from participants and it is hoped that the class will be made available to all NRAO employees in the future. Stay tuned for more details about the course contents in the next Point Source issue.

By Jon Spargo

Charlottesville

The Charlottesville site sponsored the semi-annual golfing tournament for Green Bank and Charlottesville golfers, which took place on April 16 at the Lexington Golf Club. Four teams competed, made up of 12 players from Green Bank and 4 from Charlottesville. The winning players were Jim Gibb, Russell Poling, Jr., Ted Riffe and Dave Williams. They each won a \$20 gift certificate to Wal-mart.

By Tessy Schlemmer

Green Bank

Pocahontas County High School hosted the Snowshoe Classic Girl's Basketball Tournament the weekend of December 30, 1997. That was a weekend of particularly heavy snowfall and several teams became stranded in Pocahontas County. The Huntington Vinson High School team attempted to return home when one of their vans broke down in Dunmore. They called John Snyder, Pocahontas County girl's basketball coach, for assistance. He soon found out that all the local motels were full due to the weather and the number of skiers in the area. John arranged with Richard Fleming and Becky Warner to house the team, consisting of 12 players and 3 coaches/managers, in the NRAO Residence Hall. By late the

following day, repairs were made to the van and the team headed back to Huntington, WV. The team and coaches were very excited about their stay at the Observatory and really enjoyed learning more about radio astronomy and the Green Bank telescopes.

By Becky Warner

The Green Bank Employee's Recreation Association sponsored a ski trip to Timberline Resort in Canaan Valley, WV on Sunday, February 22. Twenty two people joined together for a beautiful day of skiing that started at 8 a.m. and ended at 9 p.m. Conditions and temperatures were excellent with lows in the mid 20's, highs in the mid 30's and no wind. Everyone who attended enjoyed themselves.

By Chuck Beverage

Tucson

The Tucson office has undergone some major reconstruction. The storage area, VAX computer room and part of the office supply area have been eliminated. The eliminations resulted in three new offices and an additional 500 square feet for the MMA Cryogenics and Receiver Lab.

VLA

A new telephone system was installed at the VLA site on April 24, 1998. It replaced the current system that had been in use since the early 1980s. It is designed to work together with the telephone system used by the AOC, which is part of the New Mexico Tech system. VLA employees will soon have the same telephone capabilities as AOC employees, including voice mail. The most significant change will be new telephone numbers for all VLA employees, which will start with (505) 835-7XXX. AOC based staff telephone numbers will be

unchanged. The main number for the AOC and VLA will be (505) 835-7000. The new numbers have been distributed to all sites and appear on the NRAO Web site. An Observatory wide telephone directory revision will be distributed.

By Skip Lagoyda

The VLA site will begin the summer work schedule on April 13, with hours changing to 6:30 a.m. to 4:30 p.m.

Rudy Latasa was elected as Mayor of Magdalena in March, winning the seat over three other candidates, including the incumbent mayor.

The second Tuesday of every month finds almost all site employees, and any visitors who might be there, gathered again in the cafeteria for the recently established tradition of the "No Host Lunch." Ellen Ary cooks some type of soup, stew, or casserole and her famous home made rolls, followed by the PRA sponsored birthday cake and ice cream celebrations for employees with birthdays during that month. It is a special event because, in addition to the great food, everyone has a chance to visit with people we don't often see and helps us get acquainted with new employees.

By Patty Lindsey

VLBA

The Big Island of Hawaii has recorded only 10 inches of rain the past four months. The site usually averages about 10 inches a month. The hardest hit areas are Puna and Ka'u. Brush fires have been burning out of control in Ka'u where over 300 acres have burned. It was the sixth major fire in the Ka'u district this year. Homes in the Puna district have been destroyed by fire there. In all, about 125 brush fires have struck the tinderdry Big Island this year. Could El Nino be the culprit?

Meanwhile, our Kitt Peak VLBA station has been experiencing the
(continued on back page)

Employees Honored for Service to the Observatory

Service award celebrations have been held in the coming weeks to honor employees for their years of service to the Observatory. Formal dinners have been held as shown.

The following employees received service awards this year:

Charlottesville

NancyJane Bailey	10 years
Walter A. Brown	20 years
Francoise G. Johnson	10 years
Lee J. King	30 years
Donald G. Stone	30 years
Barry E. Turner	30 years

Dinner/Ceremony held at the Boar's Head Sports Club on April 24.

Green Bank

William R. Campbell	30 years
Harley W. Carpenter	10 years
George C. Liptak, Jr.	30 years
Dharl B. McLaughlin	30 years
Sue Shears	10 years
Sherry L. Sizemore	10 years
Jerry A. Turner	30 years
David L. Vandevender	10 years
Sylva J. Warner	10 years
Steven Douglas White	10 years

Dinner/Ceremony held at the Cheat Mountain Lodge on May 4.

Tucson

John T. Fitzner	10 years
Thomas W. Folkers	10 years
William R. Hale	10 years
John M. Payne	30 years

Dinner/Ceremony held at Janos Restaurant on April 17.

Socorro

Tim Bastian	10 years
Eugene Cole	10 years
Lothar Dahlmeyer	10 years
Philip Diamond	10 years
Ramon Gutierrez	20 years
Paul M. Harden	20 years
Patty Lindsey	10 years
Millie Lopez	20 years
David G. Medcalf	10 years
Manuel D. Montoya	20 years
Godin R. Otero	10 years
George N. Peck	10 years
Richard A. Perley	20 years
Gerry Petencin	10 years
Magdalene A. Romero	10 years
Jonathan C. Spargo	30 years
Esther F. Vigil	10 years
Ronald B. Weimer	30 years
Brent E. Willoughby	10 years
Joan M. Wrobel	10 years
Michael J. Zamora	10 years

Pie Town, NM VLBA Site

C. Eric Carlowe	10 years
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Dinner/Ceremony for Socorro and Pie Town held at Val Verde Steakhouse on April 18.

Supplemental Retirement Plan Changes for 1998

The maximum amount employees can contribute annually to the NRAO 403(b) supplemental retirement plan has increased to \$10,000 or 25% of base salary, whichever is less. The limits for 1997 were \$9,500 or 20% of base salary. The new limits may be affected by length of employment, salary level, and prior employee and employer contributions. You can now change your salary reduction amounts as often as once a month, as long as it relates only to future compensation. Formerly only one salary reduction agreement could be made per calendar year.

Also, it is no longer necessary to begin taking mandatory 403(b)(7) distributions starting at age 70 ½. Active employees now have the option of postponing distributions until they reach age 70 ½ or retire, whichever is later. Contact the Charlottesville Personnel Office for further information.

A Reminder To All Employees . . .

If a change in your family status occurs, such as divorce, change in spouse's employer or insurance, or you have a full-time student who drops out of school or graduates, please let the Personnel Office know immediately. These changes in family status do affect your insurance premiums, so please help us identify them immediately.

If you have a change of address or home phone number, please submit a completed Change of Address form to the Personnel Office.

We would like to remind you to carefully review your earnings statement (pay check stub) each payday to be sure that all of your personal information is correct, such as your address, marital status, insurance coverage deductions, tax withholding information, and leave balances. In particular, please be sure that the name on your paycheck exactly matches that on your social security card. If it does not, please let the Personnel Office know immediately.

And finally, please remember that your confidential employment information can only be given or mailed to you, except in situations where your written authorization has been provided. This restriction applies to your spouse as well. Often spouses call the Fiscal Office to request information pertaining to the employee's withholding or salary. NRAO's policy is to refuse such requests. If there is a problem with your salary payment, please be sure you deal directly with the Fiscal Office.

Personnel News . . .

(10/1/97 - 3/31/98)

PROMOTIONS

Dana Balsler to Assistant Scientist, GB
Dennis Beard to Technical Specialist II, NL VLBA
Lawrence Beno to Deputy Head of Electronics, SO
Lisa Foley to Correlator Operator III, SO
Gareth Hunt to Head/GB & GBT Computing, GB
Jeff Kingsley to Deputy Head/MMA Antenna Div, TU
Martin Lopez to Transporter Team Leader, SO
Theresa McBride to Personnel Assistant, SO
Ruth Milner to Asst. to the Director - Computing, CV
Chester Moeller to Telescope Mechanic III, SO
Patrick Murphy to Head, Computing, CV
Gerald Petencin to LO/IF Group Leader, SO
Arthur Pino to Asst Auto Diesel Mechanic, SO
Steven Reeves to Telescope Operator II, GB
John Shelton to Technical Specialist II, GB
Marlin Smith to Senior Telescope Mechanic, SO
Stephan Witz to Scientific Programmer, SO

NEW EMPLOYEES

CHILE

Eduardo Hardy, Millimeter Array

GREEN BANK

Frans Benders, Student Support
James Braatz III, Basic Research
Michael Fowler, NASA OVLBI
Arno Granados, Computing
Simon Hoyle, Computing
Timothy Kelly, Fiscal
Jason Ray, Student Support
Michael Sumner, Student Support
William Vandevender, Plant Maintenance
Annamarie Wester, NASA OVLBI
Lisa Wray, Electronics

SOCORRO

David Alderman, Engineering Services
Kuduvalli Anantharamaiah, Scientific Services
Andre Baca, Engineering Services
Robert Greschke, Array Operations
Adrian Morris, Student Support
Marcus Verheijen, Basic Research
Kate Weatherall, Millimeter Array
William Willems, Student Support

TUCSON

James Schroeder, Millimeter Array

VLBA SITES

Bryan Geiger, North Liberty VLBA

DEPARTURES

Andre Baca
Maxine Foe
J. Rob Gallagher
Miguel Gutierrez, Jr.
Steven Hicks

DEPARTURES (CONT.)

Pamela Jackson
Amelia Lopez, retired 21 years
Christopher McNeel
Nicholas Montoya, retired 22 years
Wanda Morgan
Russell Poling, Jr., retired 31 years
Leonel Porta
David Seaman
Dorothy Tarleton
Melissa Taylor
Geraldo Valladares
Bobby Vance, retired 35 years
Thomas Wilson
Qizhou Zhang

TRANSFERS

Dewey Ross from KP to TU

Scoping the Sites . . . VLBA (continued)

opposite kind of weather, which has been blamed on El Nino. Ron Bates reported that severe weather in late March and early April brought deep snow and ice, which then melted, causing large boulders and rocks to fall onto the 12 mile mountain road leading to the site. Site tech Jack Meadows dubbed the site "Lake Kitt Peak" because they have had to wade into the site compound. Quite a comparison between the two sites!

By Tony Sylvester and Ron Bates

Fiscal Notes . . .

Each payday most of our employees have their paychecks electronically deposited into their bank account(s). When enrolling or making changes to the direct deposit program, please be sure to provide both an account number and a routing or transit number on the Direct Deposit Authorization form. Please be sure that these two numbers are correct by contacting a local branch of the bank involved and verifying them, as well as submitting a voided check or deposit slip. If incorrect numbers are given, it is time-consuming for the Fiscal department to resolve and could cause delays in depositing your salary payment.

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Tess Schlemmer, Editor
Patricia Smiley, Layout and Design

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