The OBSERVER

VOL.20, NO.2 JUNE 1979 PAGE 1

中国科学院上海天文台代表团

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冯大声

1979.4.30.

CHINESE ASTRONOMERS VISIT GREEN BANK

STORY ON PAGE 3

THE COVER

None of us on the *OBSERVER* staff read Chinese either. However, Bob Brown told us the Chinese characters across the top translate to Shanghai Observatory; the column down the right side translates to the names of the visiting astronomers.

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OBSERVER'S ASSOCIATE EDITOR LEAVING

This will be the last issue of the *OBSERVER* for our Associate Editor, Victoria (Vicki) Taylor. Vicki, who began working on the *OBSERVER* in November 1971, is leaving this fall to attend Fairmont State College to pursue an Associate Degree in Veterinary Assistant Technology.

Knowing that Vicki would frown upon a lengthy testimonial, I'll keep this one brief. I do want to acknowledge her almost-eight years of excellent work on the *OBSERVER* and to commend her for improving the *OBSERVER*'s format.

Good luck with your studies and with your daily life, Vicki. May they lead you to your most cherished ambition.

--The Editor

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The *OBSERVER* is a quarterly publication of the National Radio Astronomy Observatory, P. O. Box 2, Green Bank, West Virginia 24944.

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A special thanks to all the people who contributed articles and who helped with the assembly and distribution of the *OBSERVER*.

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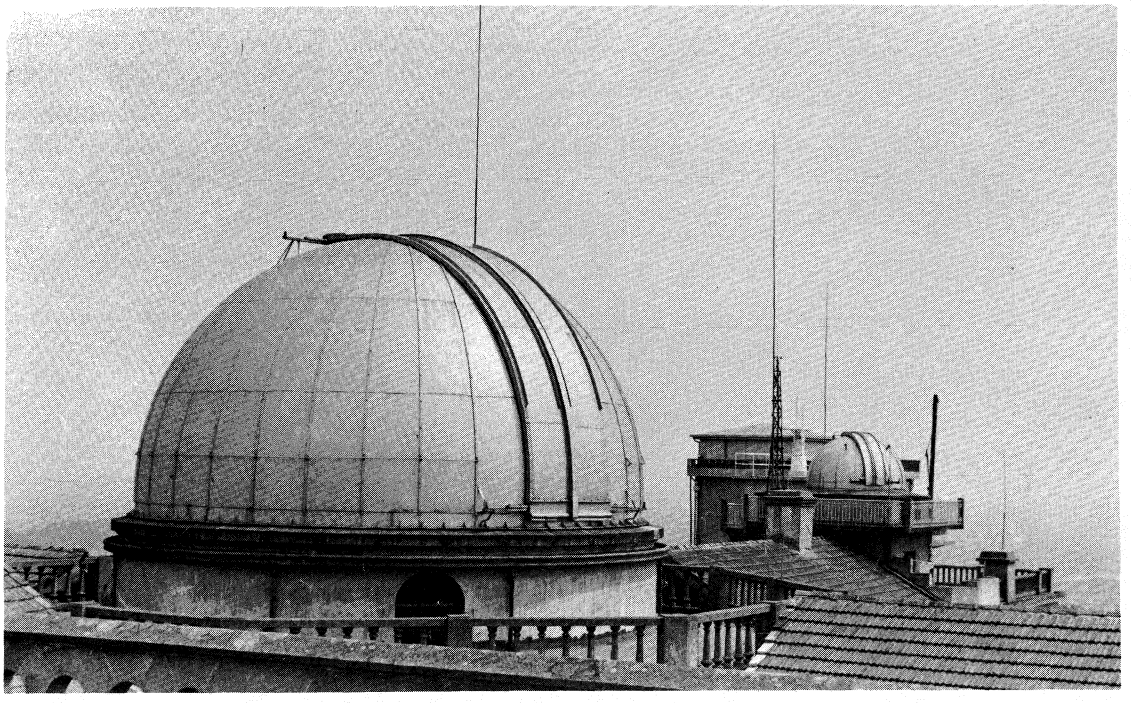
WHAT'S THE BASELINE FROM GREEN BANK TO SHANGHAI?

R. L. Brown

On Monday, April 30th, it was our pleasure to host a visiting delegation of astronomers from the People's Republic of China. The group from the Shanghai Observatory, led by the Observatory director Dr. Yeh Shu-Hua, visited the NRAO as one stop on its tour of VLBI and laser-ranging centers in the U. S.



*ZO - SE SECTION, SHANGHAI OBSERVATORY**

Shanghai Observatory, Dr. Yeh informed us, is the PRC national center for time keeping and time distribution. In this capacity they perform many of the same functions as the Naval Observatory does in this country--they keep track of UT, polar motion, and perform the optical astrometric observations needed for these purposes. In addition, they broadcast time signals throughout China at several frequencies and thereby serve as the National time service. For this latter function they maintain both a Cesium beam time standard and a hydrogen maser. Finally, they are experimenting with a simple radio interferometer which they hope to use to complement their zenith tube measurements in a program similar to that which the USNO is running on the Green Bank interferometer.

Dr. Yeh and her colleagues are seeking to expand the capacity of the Shanghai Observatory to include the newer techniques of laser ranging and VLBI astrometry. In order to familiarize themselves with current instrumentation and ideas in these fields, they spent their 4 weeks in this country visiting Haystack (to discuss the NASA/NGS Polaris project), NGS and USNO in Washington, NRAO, the University of Texas McDonald Observatory (where much of the U. S. laser ranging work is done), OVRO (more VLBI discussions), and finally on to the Haleakala laser facility on Maui. Their whole trip was choreographed by Bill Carter (not the Billy Carter) of the National Geodetic Survey.

While in Green Bank the focus of the discussion was on the VLBI instrumentation particularly with regard to the new Mark III terminal and the K-band maser/upconverter

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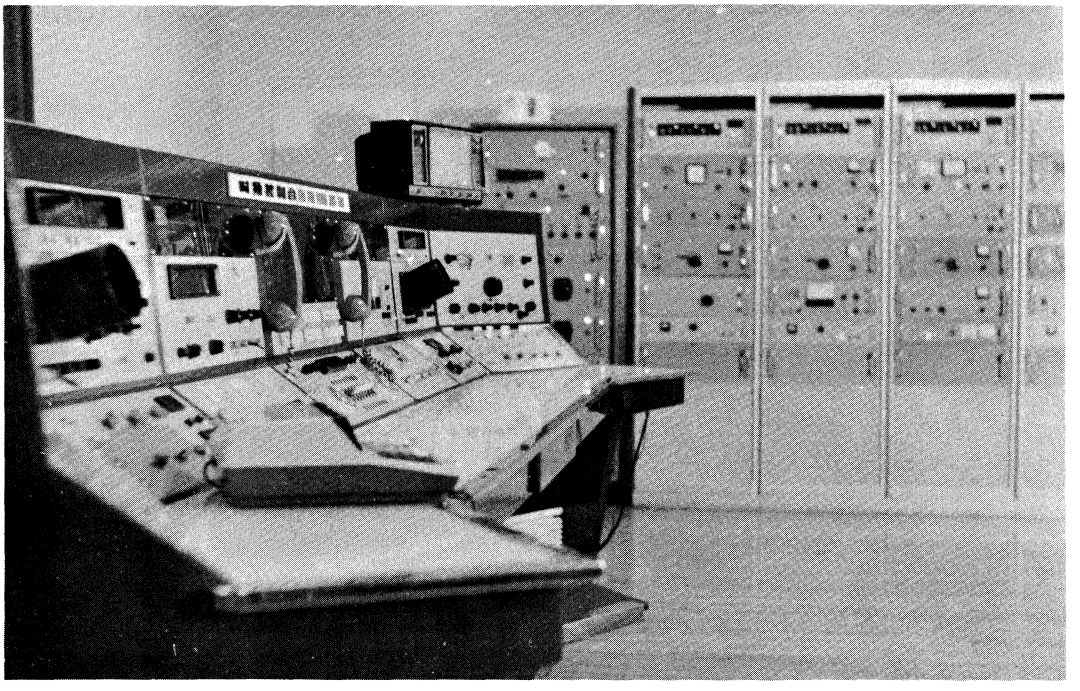
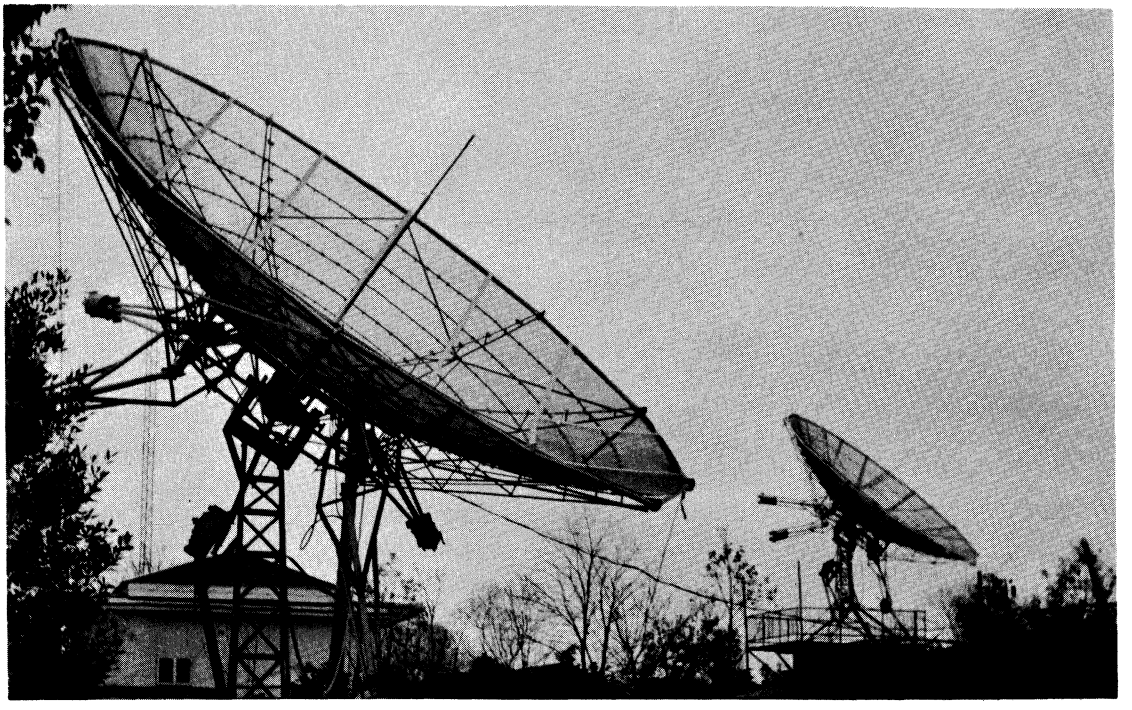


THE TIME SERVICE CONTROL ROOM



EXPERIMENTAL RADIO INTERFEROMETER

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receiver. They are both anxious to establish a VLBI station for astrometry at the Shanghai Observatory and they are optimistic about their chances to obtain sufficient funding for this venture.

The visit of the Chinese astronomers concluded with an evening meal over which kind words, hopeful promises and verbose toasts were exchanged--after which the NRAO VLBI astronomers scurried off to look for good circumpolar sources. Should an NRAO-to-Shanghai VLBI be run in the future, I have no doubt that suitable sources will be found. No doubt also the baseline can be determined. But will hopeful VLBIers ever get the day right here and in Shanghai?

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* *Photographs in this article were provided by Dr. Yeh Shu-Hua.*

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A SLICE OF THE SOUTHWEST

The following story, contributed by Doris R. Gill, appeared in the January 1979 ENCHANTMENT, *a monthly publication of the New Mexico Rural Electrification Cooperative Association, Inc.*

THE STORY OF THE NEW MEXICO FLAG

Jean M. Burroughs

From the romantic tapestry of New Mexico history, who can ever unravel all the story threads about "how things came to be"? Things as we know them today....

Most old-timers know about Coronado, the conquistadores and colonizers such as Onate and De Vargas. Newcomers eagerly search out Indian legends and customs. History buffs study the Territory's frustrating 50-year attempt to gain admission into the Union.

How many of today's citizens - or visitors - know about the origin and significance of the state flag; its scarlet Zia sun symbol; the significance of its sixteen rays? Who designed it? When was it officially adopted? This story, too, makes good reading.

From the State Records Center and Archives, from the New Mexico Blue Book 1965-66, from the 1923 State Conference of Daughters of American Revolution, and from the 1925 Legislative Record come assorted facts about the flag. An interview with Mrs. Harry Mera, published in the January 6, 1968 *NEW MEXICAN*, gave her personal version as the "Betsy Ross" of the 47th state.

As early as 1915, three years after statehood, a flag was designed by Ralph Emerson Twitchell, noted author of Leading Facts of New Mexico History. More historian than artist, he executed a conglomerate design of a miniature U.S. flag and the numerals 47 in the upper corners, balanced by a replica of the state seal in the lower right corner. Large white letters spelling "New Mexico" were strung diagonally across the blue background.

Though this flag was displayed in public it was never formally recognized by the State Legislature. Neither did it seem to be popularly accepted.

Therefore, in 1923 at a state meeting in Santa Fe, members of the Daughters of American Revolution expressed a desire for a more distinctive flag design. The regent, Mrs. R. P. Barnes, appointed a committee to make an appropriate selection which could be presented to the 1925 session of the Legislature.

The efforts of the original committee headed by Mrs. James Hinkle, Mrs. Reed Holloman and a Mrs. Porter did not generate much public response. The new regent, Mrs. Francis C. Wilson, reorganized the committee which stimulated more interest by offering a $25 prize. This sum (a goodly one in those days) brought an avalanche of entries, 165 at final count. The ladies were overwhelmed, but they could not agree on a design.

They did agree, however, to place all the submitted drawings on exhibition in the Museum of Fine Arts, Santa Fe. A convenient voting box nearby enabled all viewers to record personal preferences. Public voting was considered to be an impartial means of obtaining a "wholly unbiased" selection. But, who can say how much delicate maneuver-

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ing was carried out by the enthusiastic ladies?

A popular physician, Dr. Harry Mera, had been studying Pueblo art and pottery design since his arrival in Santa Fe from Abilene, Kansas. He was therefore well-qualified to submit several characteristic Indian designs, one which was voted the winner by a large popular majority.

His entry was later described: "In the center of a field of orange-yellow is the ancient sun symbol of the Indian pueblo of Zia. The colors are red and yellow of Spain at the period of the discovery of America by Columbus and of the later conquest of Old and New Mexico. It is symbolical of that heroic period of our history."

Satisfaction over Mera's victory was quickly dimmed, however, when those who still favored Col. Twitchell's flag design agitated for the consideration of both drawings by the Legislature. Before the disputes could be finally settled, a bill in support of each idea had to be introduced in the 1925 session. Joint hearings before House and Senate committees were held on two occasions. The resulting gusts of oratory probably fluttered the folds of both sample flags hanging on display.

Memory of whether the early flag made in 1915 was the one displayed before the Legislature by Twitchell supporters has faded with passing time. The wife of Dr. Mera, however, vividly remembered her own frantic haste in sewing together a sample flag of her husband's design. She said later, "It had to be of that sateen material, but we couldn't get any of the right color. So we took it down to the Santa Fe Laundry and had it dyed."

Mrs. Wilson, then DAR regent, enlisted the help of historian Dr. Frank Chapman to approve the final dye job. Mrs. Mera explained further: "He also measured the red ribbon for the rays of the sun symbol as the two inner rays of each group had to be exactly one-fifth longer than the outer rays. In addition, the diameter of the sun circle needed to be one-third of the width of the whole symbol. You might say," she concluded, "he was in charge of production."

After the flags were duly examined, all opinions aired, all voices heard in lengthy debate, the DAR flag bill passed both House and Senate and was signed into law by Governor A. T. Hannett in March 1925.

It is interesting to know that Dr. Mera's first sketch of the Zia symbol included features of eyes, nose and mouth of the sun god. Because the Zia pueblo council disapproved the use of their sacred symbol, the sun's face was changed to a hollow circle. Four groups of four sun rays were set at right angles around the circle. Mrs. Mera also stated that it would have been much harder to embroider life-like features on the sun face.

She later said her husband chose the beautiful symbolism of four sets of rays from Indian heritage. The north rays at the top of the circle represent the four winds that blew from the north, south, east and west. The south rays at the bottom of the sun circle were those of seasons: winter, spring, summer, autumn. The east rays on the right hand rim of the circle depict the stages of man's life: childhood, youth, manhood, old age. The west rays stand for the times of day which are morning, noon, twilight and dark of night.

This distinctive Indian design, in the red and gold of the Spanish flag, created as state symbol by an Anglo of Santa Fe, truly represents the heritage and talent of the three cultures of New Mexico.

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NRAO BUSINESS MANAGERS MEETING

R. K. Moore

During the past four years it has been the practice to hold an annual NRAO Business Managers meeting at one of the four sites. The meetings are normally held in May or June and were initiated at Charlottesville in 1976. The purpose is to exchange information concerning administrative operations of each site and discuss problems of mutual interest. An objective is to provide a measure of continuity and uniformity in

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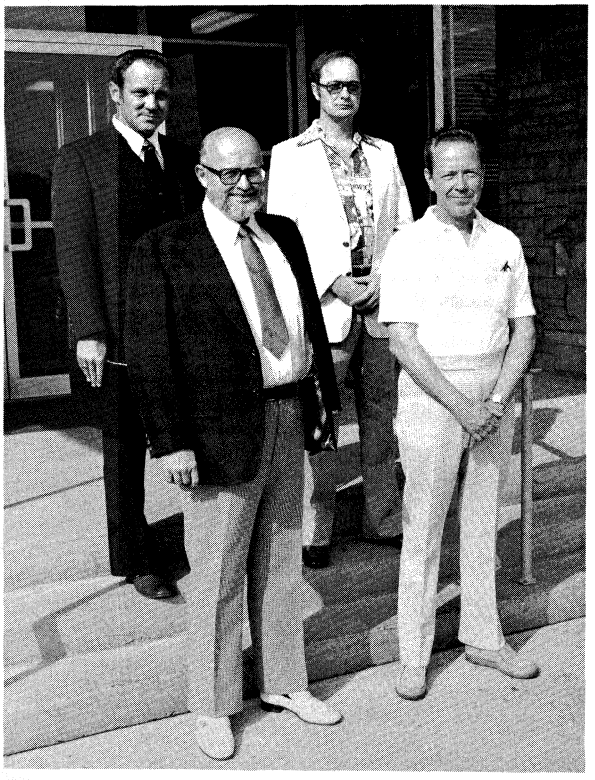
site administrative operations where practical and feasible.



NRAO Business Managers
Clockwise from lower left: Bob Dorr, Dale Webb, Harry Fox, Bob Moore.

This year the annual meeting was held 6-7 June in Green Bank. Attending the meeting were Bob Dorr - VLA, Harry Fox - Charlottesville, Bob Moore - Green Bank, and Dale Webb - Tucson. Monroe Petty attended on 6 June to discuss agenda topics dealing with personnel matters.

All concerned considered the meeting productive and it is planned to hold the 1980 meeting in Charlottesville.

NEW YORK-NEW YORK

Bill Meredith

The National Computer Conference of 1979 was held in New York City. Bob Burns and I attended it, although Bob stayed only one night in New York, then he had to go to the VLA. I had the 'good' fortune to stay for three days and two nights. The computer conference was excellent; every manufacturer imaginable had a booth there. I even ran into George Conant, who is now with Nanodata. Four floors of the New York Coliseum, and large portions of the New York Hilton and the Sheraton Centre were devoted to the conference.

The purpose of this article is not to discuss the NCC. I had promised Wally Oref I would write an article on our third annual male vs. female basketball game at NRAO, Charlottesville. The game was such a ho-hum affair that not much can be said for it. We so thoroughly trounced the NRAO females that they probably won't show their faces next year. Lee J Rickard and George Kessler took some excellent snapshots of the game and they are prominently displayed at Edgemont Road, and copies are available, for a price.

Rather than discuss the basketball game, I would prefer to talk briefly about New York City. I spent a couple of weeks there in 1960 attending a Bendix computer school. (Yes, there used to be a Bendix computer, as some of the NRAO old timers will recall.) I stayed overnight in 1962, either going to or coming from Jodrell Bank. So, it had been a long time since I was there, and New York has deteriorated greatly in the meantime. If I were to describe New York in one printable word, it would be filthy. Not only the physical part, but the moral as well. New Yorkers seem to take filth for granted. The streets are lined with trash and garbage, and no one seems to care. I saw a woman walk past a trash receptacle then throw a paper bag in the street.

Later on a female wino had barricaded herself against a wall with bags of garbage, and was happily drinking a bottle of wine

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while everyone passed her by. I am convinced that if I had stopped for more than a few seconds, anywhere in the city, I would have been permanently glued to the sidewalk. Bob and I arrived at the coliseum before opening time, the second day of the conference. Since the coliseum is located beside Central Park, we walked to the park and sat on a bench there. There were lots of benches, but most of them had the wood seats and back rests missing. The concrete standards were in good condition, but the wood slats had rotted away and had not been replaced. It wouldn't have taken much material and labor to repair them, but it had been a long time since thay had been usable.

Times Square must be the pornographic center of the world. For several blocks surrounding Broadway Avenue and 42nd Street 'adult' entertainment prevails. New Yorkers take this with a blasé attitude. Interspersed amongst the XXX rated theaters are first run plays and musicals.

The most frightening part of NYC, in my opinion, is the traffic. It is just unbelievable. Taxis, cars, buses, and trucks race up and down the streets as if the world were coming to an end. I am convinced the cars and taxis have their horns wired in with their brakes. It seems every time they stop, they blow their horns. The funny thing is that no one pays even the slightest bit of attention to them. I soon learned to completely ignore traffic lights. The only time to cross an intersection is when the way is clear, no matter what the light says. If pedestrians have the legal right-of-way at street crossings, they never exercise that right. It would be instantly fatal to challenge a motor vehicle.

If New York City is described as filthy, I would describe the typical New Yorker as rude or obnoxious. Very little regard is shown for anyone else. Everyone is looking out for number one, and to heck with everyone else.

If the traffic is unbelievable, the prices are out of this world. A four ounce Hershey bar sold for $1.50 in the lobby of the fabulous Lexington Hotel. At a corner grocery store nearby, it was a bargain at $1.39. The same candy bar sells for 71 cents at Dart Drug Store in Charlottesville. A 12 ounce bottle of Miller High Life goes for $1.73 in the Rockefeller Plaza Restaurant. Cigarettes in the vending machine at my hotel were 90 cents per pack. I ate one meal in a Burger Chef fast food place. I had a super hamburger, a small coke, and a small order of french fries. The bill was over three dollars.

I know I am prejudiced against large cities. People live in NYC by choice; I am sure they could move if they wanted to. They probably wouldn't enjoy living in Charlottesville any more than I would enjoy living in New York City. The one thing that bothered me more than any other was that there is no way to be outside and be alone. There just isn't any privacy out of doors. In any place I have ever lived, just a short drive or walk would take me away from all the crowds to blissful solitude.

I did get to see the movie 'Alien'. It cost only $5.00.

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FILM ON MULTIPLE MIRROR TELESCOPE (MMT) AVAILABLE

Recently the Smithsonian Institution and the University of Arizona dedicated the MMT at the Mt. Hopkins Observatory in southern Arizona. The MMT represents the most modern development in telescope building and the first major design change in more than 100 years. A 16 mm, 28½ minute color film documenting the concept and construction of this unique telescope can be bought for $300.00 or rented for $20.00 (shipping and insurance extra) from the Radio-TV-Film Bureau, University of Arizona, Tucson, Arizona 85721 - (602) 626-1434.

"Mirrors on the Universe; The MMT Story", a joint production of the University of Arizona and the Smithsonian Institution, documents the construction of this most extraordinary telescope. Using animation,

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historical footage, and film shot on location in Arizona, Italy, California, and elsewhere, the movie describes the monumental task of building this 500-ton facility on the very peak of a rugged 8,500-foot-high mountain. The 20th century scientific and engineering innovations incorporated in the MMT make this telescope one of the most advanced astronomical instruments in the world.

The film is ideally suited for high school and college courses in astronomy, physics, engineering, and general science. Groups from planetariums, science museums, and amateur astronomy clubs as well as general audiences involved in the progress of American research programs, will also be interested in viewing this film.

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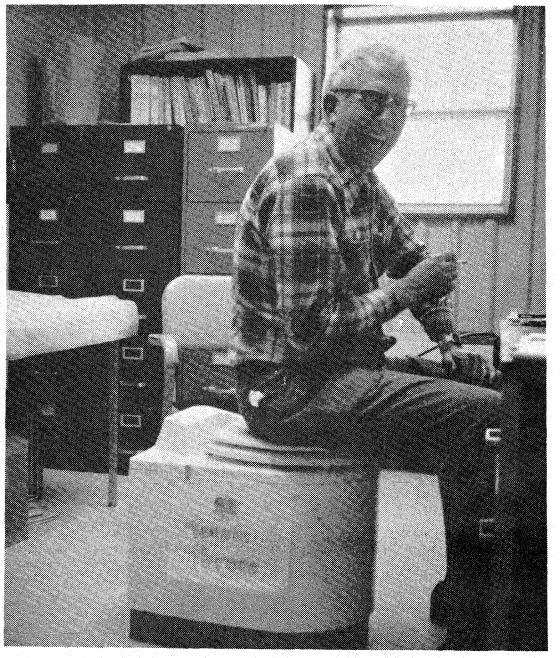
TEMPLE THRONE

The growth of the VLA has presented certain problems and recently one employee in the Technical Services Building complained that with the growing population of that building he was experiencing uncomfortable delays waiting for certain facilities to become available. Unfortunately there appeared no quick solution to the problem which was causing such discomfort and even anguish to this gentleman.

As soon as his plight became more widely known, however, the Site and Wye Division had an answer to the problem. Within minutes equipment which had been salvaged from a remote work trailer was uncovered and installed in the office of the unfortunate sufferer. Now without the nagging fear which constantly cast a shadow of gloom on his mind he is once again an efficient, productive employee and a sparkling member of the office social structure.



Happy employee with personal EEE.*

* *Efficiency Enhancement Equipment*

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300-1000 MHz UPCONVERTER

Al Wu

We do radio frequency observations at the Observatory from 300 MHz to 30 GHz. The receivers we use for these observations must have a great deal of gain in order for us to differentiate the signal from noise. A new receiver is being built in the 300-1000 MHz range for greater sensitivity than what we already have. This new receiver will have a unique circuit called the parametric upconverter. Most low noise receivers we now use, in the range of 1-15 GHz, are parametric amplifiers (paramps). Paramps for 300-1000 MHz are quite bulky and narrow band; therefore, we must look for other circuits to get the low noise and gain that we need for our radio observations. Presently we are using low noise transistor amplifiers;

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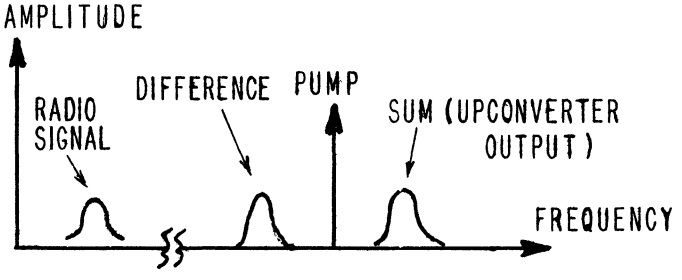
however, they do not provide us with the low noise that is possible with paramps. The measure of sensitivity of a receiver is the amount of noise contributed by the amplifiers in the receiver. The noise contributed by an amplifier is referred to as noise temperature, and it is measured in degrees Kelvin ($^{\circ}$K). When noise is introduced by an amplifier into a receiver system with very faint signals, i.e., radio stars, quasars, etc., it will cause confusion of the signal, thereby lowering the sensitivity of a receiver by not being able to distinguish the very weak signals from noise. Most paramps we use have a noise temperature about 20-50°K. The transistor amplifiers have a noise temperature of 100°K. The parametric upconverter (upconverter) we are building will have a noise temperature of 15°K.

The upconverter uses a non-linear, low-dissipative element called the varactor diode. The idea of using such an element was thought up by a man named Armstrong of Bell Telephone Laboratories, more than 60 years ago; however, technology did not provide us with such a device until the invention of the varactor diode. The varactor diode is a semiconductor device using gallium arsenide (GaAs) as the base material. We've found that some semiconductor material will become an insulator when we cool it below -80°F, whereas GaAs seems to do better when it is cooled down to -400°F. Better conductivity of a semiconductor means there is less dissipative loss in that semiconductor; therefore, GaAs seems like a good material to use for our purpose. We can now get non-linearity characteristics by doping the GaAs crystals with different types of material at different concentrations inside the crystalline structure.

The varactor diode should work fine as a gain element in our amplifier, but when we present it to the incoming radio waves it tends to reflect the radio signal. This reflection phenomenon is similar to light waves reflecting from glass. In this case the varactor appears as a very reflective object. More than 90% of our signal, which we laboriously gather from the large dish antennas, will be reflected by the diode. Obviously, it won't do us any good to use just the varactor diode. We put a buffering medium between the incoming signal and the varactor diode. This buffering medium will reduce the reflection to a few percent, but it absorbs some of the radio waves. The absorption by the buffering medium will be a very small fraction of the incident signal.

To utilize the non-linearity of the varactor diode we must inject a high-frequency, high-power signal (pump) to the varactor diode. When we inject signals into a non-linear device we will notice on the output of this device that there will be the injected signals plus the sums and the differences of these signals. The upconverter uses this fact to translate our original signal to a frequency which is the sum of the radio signals and the pump. In the process of frequency translation we also find our signal has been amplified. The amplification factor is approximately the ratio of the pump frequency to signal frequency. This is another reason why we up convert (translating to a higher frequency). At the translated frequency we can take advantage of the low noise characteristics of the paramp, as a second stage to give us additional gain.



The dissipative losses in our circuit contributes directly to the noise temperature of a receiver system. We've found that by lowering the physical temperature of the losses the noise contributed by these losses are proportionately less. Therefore, we cool the upconverter to 20°K (approximately -400°F). The upconverter being tested in the lab measures about 2°K, which is contributed by the loss in the varactor

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diode. The losses in the buffering medium is an additional 2°K. The second amplifier immediately following the upconverter has a contribution of about 10°K. The total noise contributed by the upconverter-receiver is about 15°K. Hopefully, by this time next year, we'll have this receiver operating on the 300-foot telescope; maybe we'll detect a few more pulsars.

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AUI TRUSTEE SCHOLARSHIP WINNERS

Morton S. Roberts

It is my pleasure to announce the following winners of the 1979 AUI Trustee Scholarship competition at NRAO!

Miss Marie E. Meredith, daughter of Mr. and Mrs. Billy L. Meredith, is a senior at Charlottesville High School where she has been a member of the National Honor Society, the Spanish National Honor Society, and the Society of Distinguished American High School Students. She has been a Class Representative each year since her sophomore year and was active in the Keyettes during her sophomore and junior years. Also, she has participated in the Marching Band and the Jazz Band.

In 1978 Miss Meredith participated in the Bland Music Scholarship competition and the Wednesday Music Club competition. She also accompanied a vocalist in the Bland Music Scholarship Competition in 1978, and this year has competed in the Wednesday Music Club Scholarship program.

Miss Meredith plans to attend Virginia Polytechnic Institute and State University as a Computer Science major. Her interests in this field have, no doubt, been encouraged by her father, Billy L. Meredith, who is Associate Division Head of the Computer Division in Charlottesville.

Mr. Brian E. Hogg, son of Mr. and Mrs. David E. Hogg, is a senior at Albemarle High School in Charlottesville, Virginia. He is a member of the National Honor Society, the French National Honor Society, and the Latin National Honor Society. He was commended in the National Merit Scholarship Program, and has been active in the French Club, the Latin Club, and the Teen Democrats. He is a member of the Albemarle Certamen (Latin) team and in 1978 served as an alternate on the Virginia team which won the national competition. Additionally, he has held the office of Secretary in the Virginia Junior Classical League.

Mr. Hogg is also active in Junior Achievement, and in 1978 he was named Officer of the Year in the Charlottesville area.

Mr. Hogg plans to pursue his studies in liberal arts with emphasis on languages. He has been accepted at the College of William and Mary.

Brian's father, Dr. David E. Hogg is an Associate Director of the Observatory

On behalf of the entire Observatory, I'd like to offer congratulations to Marie and Brian and to their parents.

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GB Graphic Arts on the Move

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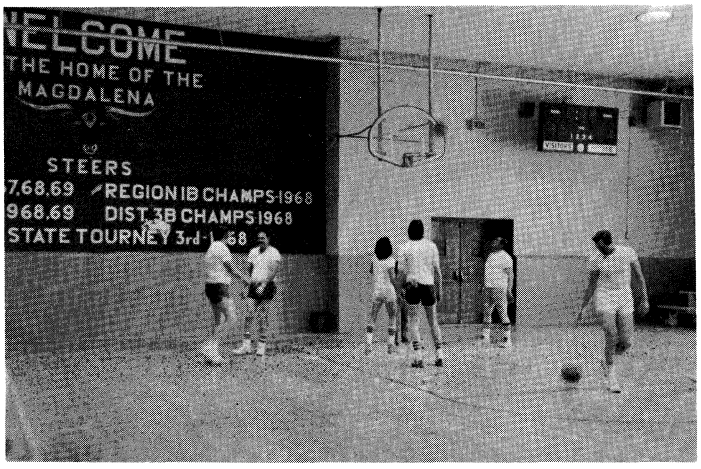
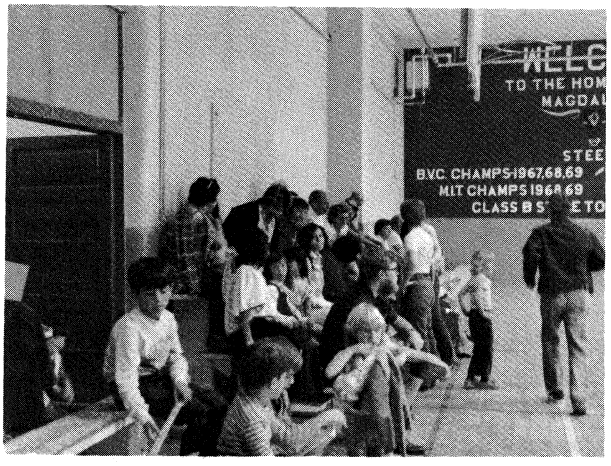
THE BASKETBALL CHALLENGE

Photos by Bobbie Spaulding

Commentary by Doris R. Gill



1968 - "it was a very good year" - oh, but that's a different story....looks like Gene Spaulding is asking for the next dance.... but no - that's just inaction on the "Cheetah" side.....



which gave their cheering section (the packed bleachers) a little apprehension prior to the start of the game. The Armpits had little support (see left side of doorway!!!!.....

the Cheetah Cheerleaders - Itty Bitty Montoya, Fried Eggs Gill, and Trot McGee - gave pre-game instructions - one of which was to explain to the multitudes that the game could only start at 1:06 due to the time needed for TV commercials.....

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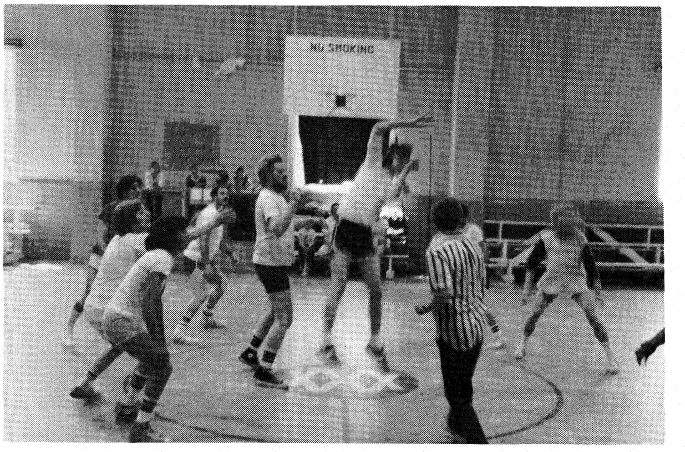

aha - there was in fact some action:

Armpits - 40	Cheetahs - 67
Mike Duggan - 2	Ramon Molina - 18
Larry Miller - 10	Ramon Gutierrez - 21
Steve Mitchell - 14	Gene Spaulding - 16
Kerry Hilldrup - 8	Al Miller - 2
Emilio Vallez - 4	Jon Spargo - 4
Bill Randolph - 2	Pat Temple - 4
	Joe Ortiz - 2
	Ernie Caloccia
	Rey Serna

- Jim Oty, referee, in pictures - also officiating were Rey Serna, Bill Randolph and Larry Miller -

Pictures were not taken at the warm-up session (bending elbows) following the big game. Lighting was bad at the den of iniquity called Water Canyon Lodge.

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CREF UNIT VALUES - 1979

January	- $40.90
February	- 39.47
March	- 41.60
April	- 41.61
May	- 40.59

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DISTRIBUTION OF SCHEDULED OBSERVING TIME IN VARIOUS RESEARCH AREAS, BY PER CENT

	36-ft	Interferometer	140-ft	300-ft	1978 Summary
I. Solar System--Sun, Planets, Satellites, Interplanetary Medium, Astrometry	5%	10%	0%	0%	3%
II. Galactic Sources--Continuum Stars, X-ray Sources, HII Regions, Supernova Remnants, etc.	4	23	4	36	17
III. Galactic Sources--Line Dust Clouds, HII Regions, IR Sources, Molecular Searches, etc.	57	11	54	2	31
IV. Galactic Structure--Line and Continuum Spiral Arms, Halo, Galactic Center, High Velocity Clouds	5	1	7	1	4
V. Extragalactic Sources--Continuum Normal Galaxies, Radio Galaxies, Quasars, VLB Studies	18	47	21	37	30
VI. Extragalactic Sources--Line Hydrogen, Molecules in Galaxies, Quasar Absorption Studies, etc.	11	8	14	24	15

ARBOVALE'S TROPICAL GARDEN

Leona Brown

Fannie Kane has a way of making her own dreams come true. In 1979, when she was teaching elementary school in Florida, she sometimes had the urge, as she was driving home from school, "just to keep on going". At the end of that school year, she did just that. In a self-contained van-type camper, along with a female companion who could not drive, she set out for Alaska. It was a trip most of us can only dream of--by camper up the Alaska Highway to Fairbanks, by small plane to Point Barrow and back to Fairbanks, by camper and ferry back down to the west coast, and home to West Virginia with stops in California and other points along the way. The fact that she was 68 years old at that time did not deter Fannie Kane in the least.

She has had many adventures in her life, and the latest is making another dream come true in Arbovale.

Most housewives like houseplants. They enjoy them as gifts, exchanging "starts" with friends, tending them, and using them as part of the household decor. Fannie Kane's love for houseplants turned into a super hobby, a sort of on-going adventure that occupies a good part of her time and gives her great pleasure.

About three years ago, behind her small white house across from the funeral home in Arbovale, she built what her neighbors refer to as her "playhouse". It is an eighteen by thirty foot one-room building (a small addition containing a bath was added this year). The outside walls are mostly windows, to provide light for Fannie's plants, which she tends, not for profit, but simply for her own pleasure.

To visit Fannie's "playhouse" is to step into a tropical garden. Plants are everywhere, hanging from the ceiling, in jardinieres on the floor, on tables and plant stands. Though some of them are the ordinary houseplants found in every home, many of them are exotic, and there are many varieties of even the ordinary plants, such as African violets. Two stands in one corner hold about fifty of these, all blooming, and in many different colors.

Dizigotheca elegantissima, an imposing plant with an imposing name, shares a table with Rheo discolor, or Moses-in-the-cradle, so named because its small white flowers appear in boat-shaped bracts near the junction of leaf and stem. Several asparagus ferns hang from the ceiling.

The tropical plants include several palms and a Bougainvillea from Florida. In large containers in the floor are several trees, many of which Fannie grew from seed. There is a four-foot mango tree, as well as orange and grapefruit trees and a Surinam cherry. There is at least one Norfolk Island pine and a chestnut tree.

Several pieces of rattan furniture add to the tropical effect of the garden. Products of Fannie's other hobbies are evident, also. An ornate swag lamp made of styrofoam egg cartons, beads, and marbles lights one corner. A large macramé and wood etagére provides space for more plants. Many of the plant containers are interesting in themselves. One large pot was brought from Japan by Fannie's son.

A wicker stroller in which Fannie's son rode as a child holds several plants. It used to be occupied by a large doll rescued from the dump and restored to reside in the "playhouse", but the doll has since found a new home.

The "playhouse" is not a greenhouse with controls for heat and humidity. These are regulated by Fannie's sense of what is good for her plants. She mixes her own potting soil (1/3 sand, 1/3 leaf mold, and 1/3 good dark loam, preferably from around a barn) and sterilizes it. She waters her plants, feeds them on demand, mists and sprays their leaves, and "doctors" them with sulphur when they get sick.

Fannie's dream has survived a couple of near-disasters. The winter after the plant house was built, she was injured in a fall and had to go away to spend the rest of the winter with her son. The plants were moved into her other house, and a neighbor cared for them during the winter. This past winter, an overheated stove raised the temperature

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in the "playhouse" to 120 degrees, and by the time Fannie discovered this, many of her plants were literally cooked. A friend advised discarding them and starting over, but with tender loving care Fannie managed to save most of them.

To avoid such disasters, Fannie has arranged to simply move in with her plants for the worst months of the winter. Since there is plumbing, heat, and electricity, she has a cosy home among the plants.

This winter, when the rest of us are huddled close to the fire, praying for a break in the weather, Fannie Kane will be luxuriating in her tropical garden in the middle of Arbovale.

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FROM MAMMOTH HUNTING TO THE WORLD'S LARGEST RADIO TELESCOPE

Patrick H. Beckett

Introduction

In February 1978, an archaeological team from New Mexico State University, under the direction of Patrick H. Beckett, arrived upon the cold, snow-white Plains of San Augustin. Little did any crew member realize that the weather would not improve other than becoming warmer for the next three months. Although the weather warmed somewhat, in the next several months the excavation proceeded through snow, sleet, rain and dust driven by high winds. The crew braved Mother Nature's worst elements day in and day out; it really made one wonder why anyone would ever want to become an archaeologist. Nevertheless, the excavations were finished by the middle of May, strangely enough, as the weather started to clear.

Prehistory of the Area

From the big game hunters of 13,500 years ago, to the recently arrived astronomers who occupy the buildings of the world's largest radio telescope, the Plains of San Augustin in west central New Mexico have provided mankind a variety of uses throughout their history.

At one time, during the Pleistocene, the vast grasslands of the Plains of San Augustin were filled with water. As the American glaciers retreated northward, the climate in the region became drier and the water level of the lake gradually receded. These changes left behind a vast, wide-open plain dotted with occasional playas that at present hold water only during periods of heavy rain or snowfall.

The earliest evidence of man on the Plains was found in the collections of local residents. The collections included Clovis and Folsom points, which indicate an antiquity of at least 13,500 years for mankind in the area. These early hunting tools seem to have been used by the hunters of the Llano Complex, which includes the Clovis and Folsom Traditions. The name Llano is derived from the "Llano Estacado", a plain in eastern New Mexico and west Texas where many sites of this complex are found. The people of the Llano Complex belonged to what was mostly a nomadic society which depended on hunting and killing large migratory herbivores, such as elephants and mastodons, most of which are now extinct. In all probability, these hunters also utilized and exploited the wild plants they found during their quest for these herbivores.

The Folsom Tradition follows the Clovis in the Llano Complex. Folsom dates fall between 9,000 and 8,000 B.C. (Haynes and Agogino 1966). The Folsom economy is also thought to be based on the hunting of large herbivores, especially an extinct species of bison.

With the advent of the altithermal or thermal maximum about 5,000 B.C., a much warmer and drier climate prevailed. The new, relatively harsh environment forcefully emphasized to prehistoric people the reality that both hunting and more extensive gathering were necessary in order to bring human life into adjustment with the changing natural environment, within the Great Basin and Southwest.

This temporal span covering several millennia before Christ has been termed the Archaic Stage. While its projectile points

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and other tools are not as aesthetically pleasing as those of the big game hunters, and while the technology of the Archaic is not as spectacular as the pueblo peoples', the Archaic period is the foundation on which later demographic groups were to build their technology and social concepts. In the San Augustin Plains the peoples of the Archaic have been termed the Cochise Culture by Dick (1965).

The introduction of pithouses, pottery and improved strains of maize stabilized the culture and moved it in a sedentary direction. Hunting and gathering did not cease, but these activities tended to be limited to the areas surrounding fields and villages. It was at this point in the sequence that the Cochise Culture gave way to the Southwestern Cultural Tradition (Willey 1966:182), known locally as the Mogollon Culture.

The Ake Site

The Ake Site is located on the far end of the southwest arm of the VLA Wye. Named for Marvin Ake, the rancher who owns the land, the site was originally located and recorded during the 1974 survey of the Wye, by Dr. Stanley D. Bussey and Billy J. Naylor. These men asked the author to evaluate the site and its importance (Bussey and Beckett 1974). The site extends

Completed excavations in Area 1, part of a Cochise Culture camp site.

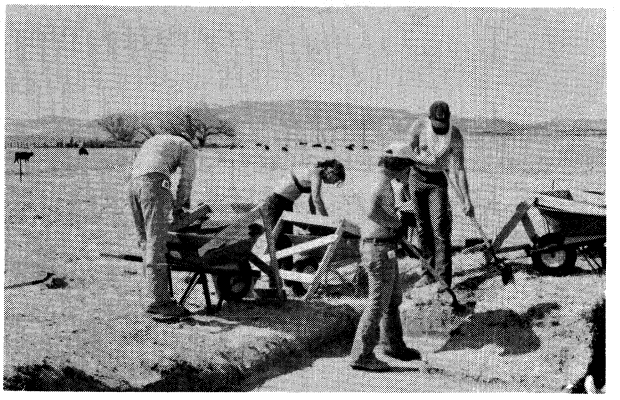
along the VLA right-of-way for over a half a mile. The amount and types of artifacts initially indicated that the site had a good potential for providing a long-term archaeological sequence within the low dunes that overlooked the old playa.

The lower part of the site (Area 4) still holds water after rains or snowfalls. This characteristic, in conjunction with the presence of Indian ricegrass, is what probably drew the Archaic hunters and gatherers to this locale during the Altithermal Period.

The Folsom component is the oldest part of the site. These big game hunters evidently killed bison and muskrat locally and then feasted after the hunt at their camp on the playa edge about 10,000 years ago. The primary evidence of this visit is a burned muskrat bone in a hearth, and the great quantity of bison tooth enamel remains found in direct association with a number of Folsom points and tools.

After the camp was deserted, the playa level rose and indurated the hearth, the artifacts and the faunal remains. A clay layer then covered the material remains. This clay level, which was later covered and uncovered by sand during the Altithermal Period, prevented the strong, incessant winds from scouring the basin down to the Folsom level. Thus, the clay level of the playa preserved the stratigraphic context of the Folsom component.

The next group of visitors to the site



Archaeological crew excavating in Area 4, a Folsom camp/kill locale overlooking the playa in the background.

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were hunters and gatherers of the Cochise Culture. The site appears to have been visited many times during this period, especially during the late summer or early fall, when water would have been present in the playa and the Indian ricegrass was mature. Metates and manos (grinding implements) are found in quantity suggesting that early Archaic inhabitants were indeed processing wild foodstuffs such as Indian ricegrass.

While the women and children gathered the native plants for grinding and cooking, it is very likely that the men were in the hills to the west gathering welded tuff, a material used in stone tool-making. These cores were brought back to the dune campsite and further "reduced" and shaped into tools and projectile points by flint knapping techniques. The amount of non-indigenous knapping debris and the large amount of unfinished and broken tools on the site attest to this.

Sometime after the advent of the Christian Era, the site was again briefly visited by members of the Mogollon Culture. The only remnants of their visit were a few sherds of a pot (Alma Plain) found on top of a more recent dune surface. They may have been passing through or they may have been gathering wild foodstuffs, as their ancestors had done.

If the site was later visited by the Apaches many years later, the people left no archaeological traces of their visit. Thus, it is quite possible that the Ake Site had been abandoned for about 1,000 years until the advent of cattle ranching and homesteading.

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AT THE FRONTIER

Wally Oref

On 17 and 18 May a six-member crew from Open University and BBC were at NRAO-GB filming the four-element interferometer. The interferometer will be featured in a television program about general relativity under the title of At the Frontier and is scheduled for showing on 15 August 1979 on BBC-TV.

At the Frontier focuses on Fomalont's and Sramek's classical experiment in which they successfully tested Einstein's general theory of relativity. Their experiment confirmed, to a high degree of accuracy, that radio waves passing near the sun bend in the amount predicted by Einstein's theory.

The photography crew filmed most of the first day from a helicopter. Although aerial footage of the interferometer (including the 45-foot) and the microwave relay system were the crew's main interest, they also filmed, rather extensively, the other telescopes. From late afternoon and through most of the second day, they filmed on the ground, particularly along the baseline, in the interferometer control room, and from several ridges south and west of the site. Ground shots were necessary for

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the explanatory narration and for supplementing the aerial film. The weather for both days of filming was exceptionally good: clear, warm, and sunny. "Such weather," the chief photographer said, "virtually assures excellent film footage of NRAO-GB."

Sixteen documentaries such as At the Frontier make up a series of programs for a college-level course, Understanding Time and Space, being co-produced by Open University/BBC and the University of California. The course, through the sixteen programs, charts our progress in understanding the physical universe beginning with Galileo and Newton and leading into Einstein's general theory of relativity.

Understanding Time and Space will be offered as a television course by Open University over BBC-TV. The University of California plans to use the series in its physics, astronomy, and extension courses. In addition, there seems to be some thought to, perhaps, televising the series over the California public broadcasting system.

There is little likelihood that non-travelers at NRAO will get a chance to view At the Frontier on TV. However, there's a slim possibility that we might get to look at some of the footage. Andrew Crilly, producer/writer, said he would send us some film clips.

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TIME AND POLAR MOTION (I)

W. Klepczynski[1]

The Earth, today, still offers astronomers interesting and challenging problems. Newton, in the late 17th century, laid the foundation for the astronomer's interest in the rotation of the Earth when he predicted the phenomenon known to us today as Polar Motion (PM). PM describes the displacement of the instantaneous rotation axis of the Earth relative to some "fixed" "geographic" reference frame.

Early attempts to astronomically observe and verify PM were unsuccessful because of the lack of precision attainable with early nineteenth century instruments. The variation in latitude, as PM is also known, was first observed and measured in the latter part of the nineteenth century. This discovery quickly led to the formation, in 1899, of the International Latitude Service, now known as the International Polar Motion Service, to monitor PM on an international basis.

Through the introduction of improved instrumentation, such as Photographic Zenith Tubes, it became possible to monitor not only PM but also the Earth's rate of rotation (TIME). With the use of improved clocks, it also became possible to measure changes in the Earth's rotation rate instead of only using the Earth to set our clocks. This led to the formation of another service associated with the Earth's motion, the Bureau International de l'Heure (International Bureau of Time, located in Paris, France).

PM and TIME have associated with them short period fluctuations on the order of a year or less, intermediate term fluctuations of irregular character, and secular or long-term motions. In addition to the periods showing slight variations, the amplitudes of the terms also vary from year to year. After some 80 years of observation, we are still not very close to completely understanding the causes of these motions and are only able to predict its future by empirical extrapolations.

Both PM and TIME exhibit a variation with a period of about one year and an amplitude which ranges from 0".04 to 0".10 for PM and from 20 to 25 milliseconds (ms) for TIME. These motions can be explained by the seasonal variations in the geographic distribution of the mass of the atmosphere.

TIME, or length of day, shows variations with periods of 2 years, ½ year, 30 days and 14 days. The amplitude of the former two terms is about 9 ms, and 1 ms for the latter two terms. Besides the annual term, the most interesting and predominant motion for PM is that known as the Chandler wobble or Eulerian torque-free wobble. It has a period of about 14 months and an amplitude of about 0".15. It

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is caused by the fact that the Earth's rotation axis is not aligned with a principal moment of inertia. Its existence and persistence is one of the most interesting geophysical problems. Since the Earth is an elastic body, this motion should eventually be damped out. The exact cause which continues to excite this motion is still unknown.

Intermediate and long-term changes in PM and TIME are inferred from historic optical observations, such as eclipses and occultations. From them, it can be seen that the Earth's rate of rotation has undergone changes such that the length of the day has changed by several milliseconds over a few decades. These variations could be associated with geomagnetic secular variations of the Earth's core.

Knowledge of PM and variations in the Earth's rotation rate are also useful for many practical problems. Geographic coordinates are referred to some reference point fixed on the Earth's surface. Astronomically determined positions are referred to the Earth's axis of rotation. Thus, in order to relate astronomically determined coordinates to geographic coordinates, we must know the location of the Earth's axis of rotation with respect to some reference point, for instance, the Conventional International Origin (the BIH, North Pole) and the deviation of the Earth's rate of rotation from some nominal value.

In order to use the 35 km 4-element interferometer to determine PM and TIME, the fundamentals of the classical field of astronomy known as astrometry must be rigorously applied. Utilizing a catalogue of positions of unresolved quasars, we daily determine the baseline orientation of the interferometer referenced to the instantaneous axis of rotation and a cesium beam frequency standard whose rate is offset to match that predicted for the Earth by the BIH. The observed daily changes in the baseline orientation are directly related to changes in PM and TIME.

Currently, the interferometer is determining TIME to an internal precision of about 2 ms. This corresponds to a precision of about 2 cm in baseline length between the 35 km legs of the interferometer. Keeping in mind the fact that the system was not originally designed with such precision in mind, the results are excellent. However, a precision of 1 ms is sought. It is hoped to attain this goal through careful monitoring and improvement of the various subsystems of the interferometer.

To be continued.

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[1] *U. S. Naval Observatory, Dept. of the Navy.*

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THINGS RIFE AND RUINOUS

Lee J Rickard

A prime tenet of scientific method is that argument by appeal to authority is not valid. At least in the physical sciences, the older, the more respected the sage, the less likely that his side of a truly controversial issue will prove to be the correct one. But who among us is so rigorous in his daily life, in the world of common experience, where grey eminence is often a shortcut to proof? Certainly, I have the usual weakness for Walter Cronkite. When he says that chewing Bubble Yum bubble-gum will not cause spider webs to grow on my face, I am inclined to believe him.

Of course, in that case, who wouldn't? But the answer would surprise. For Cronkite was in that case pitting his authority against the more plebian, but more compelling authority of rumor. Children all over the country were convincing one another that this particular bubble-gum was made with spiders' eggs. The presumably terrible consequences of chewing spiders' eggs were leading to financial troubles for the manufacturer. Squibb Corporation spent some $100,000 in advertising just to counteract after-school gossip (hence the interest of the news services).

Rumor is a fact of life in the business world. With the imminent arrival of a new

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boss, some secretary will surely cite a reliable source as to the expected wholesale firing of the sales department (to be re-stocked by stock clerks). Stock prices fall as hot-dog vendors advise investors to expect a Russian invasion of China. Last year, a rumor that the state of Delaware had gone bankrupt led to a sharp rise in gold prices.

Because a company's fortunes literally rise and fall with the quality of its market rumors, the possibility of rumor manipulation is considered a serious threat. The New York Stock Exchange has sanctions invokable against rumor-mongers, although the difficulties of determining origins make their application rare. But rumors can switch direction so quickly that few companies are likely to risk using them on purpose. For example, the story that Wendy's added worms to its hamburger meat eventually attached to McDonald's instead. The suggestion than Anheuser-Busch Inc. provided financial support for gun-control lobbies later bedevilled the Adolph Coors Company as well.

The first major psychological theory about rumors was based mainly on business-type rumors. Developed by Gordon Allport and Leo Postman, it depends heavily on Gestalt psychology, which holds that people try to fit their perceptions into simple, "complete" forms. Uncertainty creates tension; and the mind tries to relieve that tension by creating reasonable, consistent, but arbitrary information. The more ambiguous the situation (or the more significant its outcome), the greater the number of rumors created about it. The pressure to believe rumors, then, comes directly from the fundamental need to know the forces acting on one's life.

Such rumors are necessarily short-lived, as the uncertainty is relieved when the new boss is hired and actually does fire and promote. But there are longer-term rumors, the study of which (e.g., by Ralph Rosnow and collaborators) suggests that the important factor is not uncertainty, but rather anxiety in general. These are rumors that occur under conditions of "cognitive dissonance" - which means essentially that a lot of things are happening, none of them good. Anxieties arise from specific big problems, like an earthquake, or from a collage of small problems, ranging from aching feet to worry about Albanians having nuclear weapons. Rumors focus the anxieties that can't be dealt with into specific problems that are amenable to action.

The classic case of a cognitive dissonance rumor happened on October 30, 1938. The Mercury Theater broadcast a radio adaption of H. G. Wells' War of the Worlds, recast for natives of Newark. Although the program was clearly identified as drama at the start, and was several times interrupted by commercials, it still panicked thousands of people. Families fled their homes. Sober militiamen reported to police to volunteer service against the invaders. One alert fellow even shot down a Martian fighting machine (which turned out to have been a water tank). In his 1947 book, The Invasion from Mars, Hadley Cantril showed that much of the susceptibility to the rumors of interplanetary war originated in fears about the very real possibility of a European war.

A more recent story seems to have developed from the poor condition of the farm and cattle economy. In late August, 1974, Nebraska farmers began reporting strange "cattle mutilations" - dead cattle found with obscure parts of their carcasses missing. The cause was variously said to be Satan-worshipping cults, UFOs, some variety of Bigfoot, or a dangerous psychotic practicing for more horrible crimes. The frequency of reports increased with the number of newspaper stories. Eventually, though, the originally baffled law-enforcement officials, veterinarians, and farmers realized that the phenomenon was a natural one. Some cattle die of natural causes while foraging, lying unobserved for days on end. Small predators attack the remains, selectively feeding on the softer organs. The combined effects of predation and decomposition produced the mutilations.

But as the truth became obvious in Nebraska (mutilation reports declined to zero in September), the same rumors began in neighboring South Dakota. The same

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stories of Satanic blood-cults and vicious UFO assaults began appearing in late September, peaking in October. Again, the reports declined after the natural explanation took hold. But the rumor moved on. In late summer 1975, it flourished in Colorado, until the Colorado Bureau of Investigation and the veterinary lab of the Colorado State University independently settled on the predator explanation. By 1977, it had gone through 22 mostly western states. It reached Virginia last year. One can only assume that it will go on until it drowns in mid-Atlantic.

One particularly interesting facet of these rumors is the tendency for normal phenomena to appear strangely new and unnatural. The odd cattle have been dying and decomposing without comment for years, apparently until the angst of the times invested them with a significance that actually transformed them. Similar phenomena have occurred elsewhere. In Seattle, Washington, in the 1950s, for instance, there was an epidemic of windshield pitting. Although windshield pitting is a natural part of the aging of a car, most people don't notice it. After all, you don't look <u>at</u> windshields; you look <u>through</u> them. So for a while, windshield pitting became a sinister new phenomenon, popularly attributed to some corrosive chemical in the air. Similarly, the occasional case of "blahs" took on new significance in Mattoon, Illinois, in the 1940s, when the rumor of a deranged "phantom anesthetist" began circulating. More recently, some West Virginia farmers still blame the droughts of 1977 on mysterious "cloud-seeders". The evidence? They saw planes.

As rumors can sometimes transform everyday events into strange phenomena, so they can also incorporate bizarre and even ridiculous reports into acceptable accounts. Thus, in the difficult times at the start of World War I, Londoners were relieved to know that a detachment of Russian soldiers had arrived at King's Cross station, as support for the war effort. How could people be sure they were Russians? Well, they still had snow on their boots, didn't they?

There is a third category of rumors that can be used to support the "cultural deviance" theory. In these cases, it is argued, people tend to hold beliefs that are different from the mainstream because they belong to a subculture that encourages such deviation. The reasons can be quite varied. Sometimes a subculture distinguishes itself by its distinct belief patterns. An obscure political group may remain distinct and vital by binding its members to the belief that the Rockefellers were secret communists, responsible for the assassination of the Kennedys. One can recall the many rumors that freaked the subculture of the 1960s - from the death of Paul McCartney to the psychedelic properties of banana peels.

In other cases, deviant beliefs may be used to enhance an individual's status among his peers. Among children, this most often appears through the intimation of risk. After the rumor has spread about that kid on the next block who ate three packages of Pop Rocks, drank a soda, and died when his stomach exploded, the next kid to eat Pop Rocks becomes braver than a trapeze artist. Other times, rumors elevate one group by ridiculing another. Thus the story of the Great Cabbage Memo elevates commonsense folks by ridiculing government bureaucrats. As it appeared in a Mobil ad in 1977, the Memo story goes: "The Lord's Prayer has 56 words; the Gettysburg Address, 266; the Declaration of Independence, 1348. So how come it took the federal government 26,911 words to issue a regulation on the sale of cabbages?" The rumor about that memo first appeared in World War II, as an attack on the Office of Price Administration. It has subsequently been attributed to foghorns and duck eggs as well.

Along with politicians, doctors are common targets of ridiculing rumors. Thus H. L. Mencken fabricated the story that Millard Fillmore installed the first bathtub in the White House, and that he was unanimously condemned by medical men for using such a dangerously unhealthy device. The story proved so attuned to public beliefs that Mencken's own debunking of it nine years later was a complete failure. The story reappears with amazing vigor, sur-

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facing in 1966 on the Johnny Carson show, and in 1976 on the evening news programs of all three networks!

Come to think of it, I wonder how many rumors about rumors I could get away with in this article, as you bask in the relative satisfaction of not having been as gullible as the people I invented.

For the sake of completeness, we should note a fourth theory of rumor, recently supported by a study at the University of Washington. Sociologist William Bainbridge was looking for the psychological factors that underlie acceptance of occult and pseudoscientific beliefs. His results were in part consistent with the cultural deviance theory; but in addition, they suggested that gullibility can be a distinct personality trait. Some people, either because of early learned behavior patterns, are intrinsically more likely to believe whatever they're told. Thus some rumors may propagate because there are always people willing to believe them, no matter what the conditions.

One intriguing aspect of the problem of rumor is that some of the patterns of belief are common to scientific research. In a loosely-defined way, the scientist's job is to sift through confusing, incomplete perceptions, imposing reasonable, consistent, but possibly arbitrary explanations. Uncertainty is possibly a stronger source of anxiety for the scientist than for the layman. What saves scientific knowledge from being no more than a random collection of rumors about the world is the yoking of the rumor-mongering drive to a stubborn sense of skepticism. It is the skepticism that reminds one that reasonable explanations must fit into larger webs of explanations; and that some bizarre facts require no explanation at all, because they arise from errors or accidents.

But the need to believe is innate. Skepticism is only a trained behavior. When we slip, it is almost always by adopting an erroneous belief, which conditions the forms of our theories, the directions of our experiments. And our rumors can be very long-lived indeed.

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GREEN BANK CAFETERIA HAPPENINGS

Rufus Chappell

None of the ladies at the Green Bank cafeteria are Italian but, nevertheless, they make good pizza. The Wednesday noon meal is a favorite with employees because their pizza is a regular item on the menu. Acting on suggestions that the cafeteria also have pizza for an evening meal, we started "Family Pizza Night" in March 1979.

The third Thursday of each month is Family Pizza Night. Its popularity with NRAO families rivals that of the noon meal on Wednesdays. On Family Pizza Night, pizza is available with almost any combination of toppings. A serve-yourself salad bar is also a special of the menu. The salad bar has such a wide variety of ingredients that it is ordered almost as often as the pizza.

Since people tend to forget that Family Pizza Night is on the third Thursday of the month, notices of the up-coming pizza night are posted on all bulletin boards two weeks in advance. Orders must be placed beforehand along with the time one would like his pizza served. This information enables the ladies to schedule their pizza making and baking so that one doesn't have to wait long to eat.

Recently a quick-heat oven was installed in the kitchenette of the Residence Hall lounge. It's for late-working observers to use if they want a warm snack before "hitting the hay". A variety of food items for cooking in the oven can be ordered through the cafeteria. Items ordered will be placed in the kitchenette refrigerator and marked with the observer's name. Correct temperature and time setting for each item are posted in the kitchenette.

You don't have to eat steak every night, nor do you have to eat the same food for lunch and dinner. Our menus have a reasonable selection and, from time to time, new items will be added to the dinner and luncheon menus for more variety. These items will be changed as their appeal dictates.

The goal of the Green Bank cafeteria

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is to offer Residence Hall guests and NRAO employees the best food and service possible. We will continue to try to reach this goal.

Bon Apetit!

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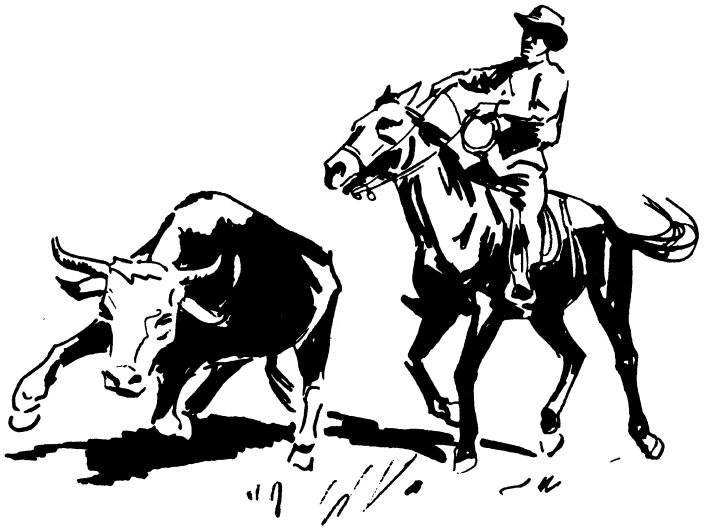

THE FIRST ROUNDUP BUT UNDOUBTEDLY NOT THE LAST

Daryl Grant

Around the first of March, Larry Miller, Gene Spaulding, and myself were invited out to Leo Sanchez's ranch to participate in the spring roundup and branding. The auspicious occasion was to be held Easter weekend.

At the VLA Site the pre-roundup kidding ensued at a lively pace. Mainly it was revolving around the fact that Larry Miller of Green Bank origin had only been on a horse once or twice in his life; Gene Spaulding, the VLA's resident Texan, hadn't been involved in a roundup for over 25 years; and I, a nice Massachusetts-raised eastener, had never been on a horse at all! Considering all these facts the roundup was insured to be an experience long remembered no matter how it came out.

Mother Nature, not to be left out, decided the Wednesday before to drop 13 inches of snow for our pleasure. The snow caused a slight trauma Thursday morning as Leo was going to do some pre-roundup chores Thursday and did not come into work. So with the snow we didn't know whether the roundup was going to be postponed or not. Usually the situation could easily be resolved with a phone call - except Leo's ranch is 30 miles southwest of Datil - you guessed it - no phone. We had no choice but to go ahead with the roundup as planned.

My wife and I arrived at Leo's Friday morning. Most of Friday was spent doing some preliminary rounding up and feeding the stock. I also got a chance to ride a horse a little so I at least knew a little about riding before Saturday.

I might add at this time - Mother Nature did have a change of heart and the weekend was bright and sunny. By the end of Friday half the snow was gone - and by Saturday most of the snow was gone. The snow having melted so fast, however, did leave us with a very muddy ranch.

Very basically a roundup is riding out, on horseback in this case, and rounding up the cattle, cutting the cattle without calves out of the rounded up cattle, and roping, branding, vaccinating, and castrating the calves.

Saturday morning Gene and Larry showed up and we were off to do these things. Leo was a little tense. The reason for this tension was best vocalized by his wife to my wife as we rode off - "I wonder, are they going to be help - or trouble!?!"

The pictures on the following page should best tell the rest of the story without me rattling on.

There were, however, three unsung heroines who do deserve a lot of thanks for their help that day. Shela Sanchez, who, after we rode off, rushed madly through the kitchen cooking up a burrito feast with homemade tortillas which was delivered - still hot - to us 12 miles from the ranch through 8 inches of sloppy mud. Donna Grant, my wife, who took the pictures to preserve this occasion forever. And Cinda Sanchez, who was gracious enough to allow me to ride her horse.

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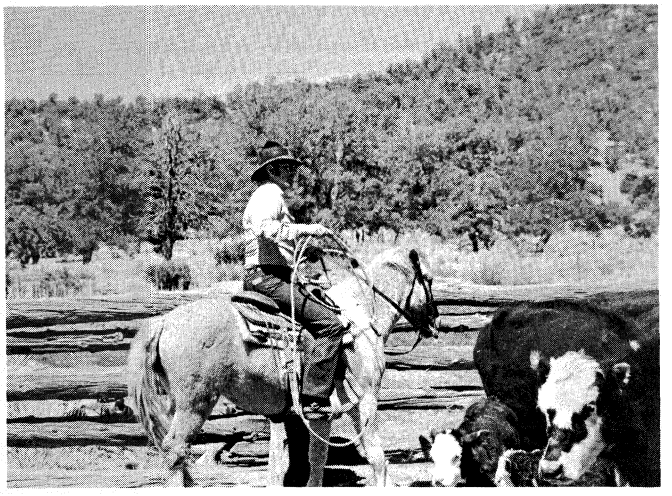
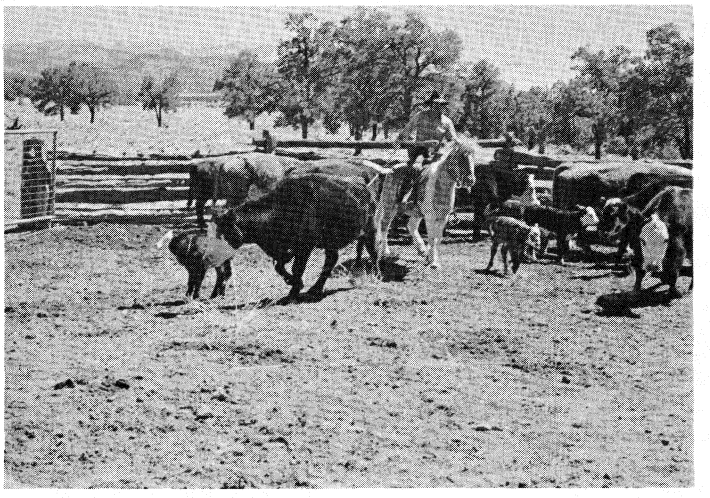
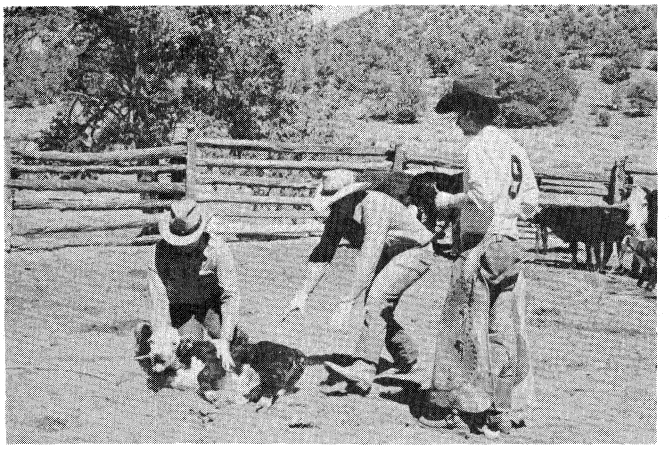


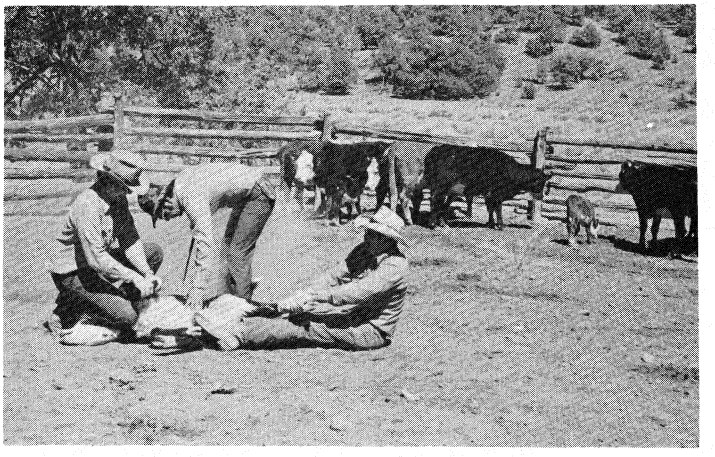
Leo getting ready to rope a calf.



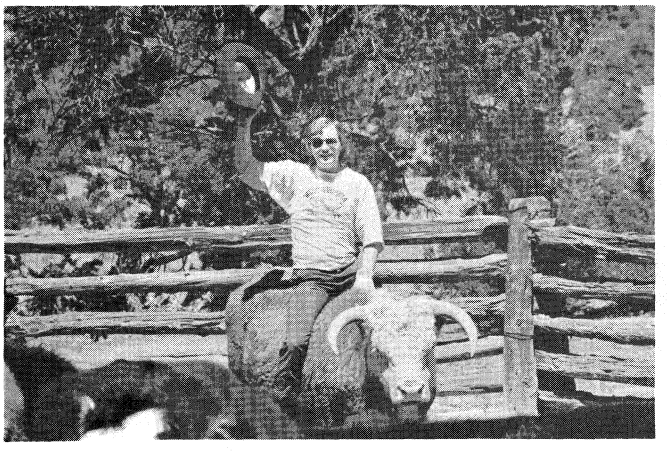
Leo has roped the calf.



Daryl is flanking with Gene's help - while "Doc" Miller prepares the shot.



Leo brands.



This proves Larry can ride it almost as well as he throws it.

THE WILD BUNCH, not of Butch Cassidy fame, but of VLA fame.

* * * * *

NRAO ROUNDUP

Reprinted from the NRAO Quarterly Report for January 1, 1979 - March 31, 1979

ELECTRONICS DIVISION

Charlottesville

Mixers utilizing BTL diodes in the frequency range 70-100 GHz have been shipped to Tucson. Cooled mixers utilizing improved University of Virginia diodes have also been completed. These units have 152 GHz mixer noise temperature of 900 K SSB at room temperature and 300 K at a physical temperature of 15 K. A method for determining the equivalent circuit of a millimeter-wave mixer is being developed. This will allow prediction of mixer performance, and show what changes will improve sensitivity.

A new mixer mount for use from 70 to 115 GHz is being developed. This mount will allow wider frequency coverage and easier re-whiskering of diodes.

A theoretical study of the effect of feedback on FET low-noise amplifiers is in progress. Simultaneous noise and power match can be achieved, but realization at microwave frequencies may be difficult. Investigation of balanced, hybrid-coupled, amplifiers has begun.

The VLBI Mark III terminal has been completed and expansion of the Mark II processor has started. Construction of the Model IV autocorrelator is continuing.

Green Bank

Work is continuing on the first channel of the 5-26 GHz upconverter/maser receiver for the 140-foot telescope. AIL has just delivered the 12-16 GHz upconverter to NRAO. The 5-7 GHz upconverter is currently being manufactured and should be delivered next quarter.

The 300-1000 MHz cooled upconverter/FET receiver is progressing slowly due to late delivery of critical components. Prototype upconverters have been fabricated for both ends of the frequency band. Work is progressing on the design of wideband feeds for this receiver.

A filter designed to eliminate pump leakage between the K-band maser ruby structure and circulator did not prove successful, and it has been decided to use an external filter to eliminate pump leakage from the maser input port.

The 40-50 GHz maser structure is currently being manufactured in the shop. The evaluation of the cooled circulator continues and an existing magnet structure has been modified for testing.

The IF interface for the digital standard back-end at the 300-foot telescope is being constructed and should be completed soon. The digital group has completed the design of a digital interface to the 140-foot on-line Modcomp for the Model IV autocorrelator.

Tucson

During this quarter work has started on a bolometer system operating at 0.3 K that will be used for continuum observations. Interchangeable filters will permit observations in the 1 mm, 2 mm, and 3 mm atmospheric windows. Beam switching will be used at a 30 Hz rate. Work has started on a nutating subreflector capable of these high switching rates.

The dual-feed, four-channel, 9-mm receiver has been equipped with a fast-acting mechanical switch that will allow more efficient observing techniques to be used with this receiver.

Work continues on a high-voltage power supply for our 180-230 GHz carcinotron and also on a system for phase locking this tube.

The cooled version of the 1-mm receiver is almost complete. We expect to have this receiver finished by July, 1979.

A device for the suppression of the standing waves that prove troublesome in spectral-line observations has been fabricated. We plan to test this on the telescope during the next quarter.

ENGINEERING DIVISION

Design was started on modifications to the 140-foot Cassegrain house for the new generation of receivers and feed horns. Further checks were made on the surface

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variations of the 140-foot, as weather permitted. Checks and modifications were started on the deformable subreflector. The major part of the design for the traveling feed for the 300-foot was completed. Design was started on a ground-level facility to thoroughly test the traveling feed before installing it on the telescope. Conceptual design and research continued for the proposed 25-m millimeter wavelength telescope. Some inspection assistance was provided the VLA project. Routine engineering assistance was provided operations and maintenance in Charlottesville, Green Bank, and Tucson.

COMPUTER DIVISION

Plotter

A model 1051 drum plotter has been ordered from California Computer Products, Inc. This is a replacement plotter for the present model 763 plotter, which Cal Comp will no longer maintain. Installation of the new plotter is planned for May, 1979.

VLBI

The on-line computer program is being rewritten to include the retarded baseline correction. This will enable users to process data utilizing phase closure.

Map Processing

Two map processing systems using common software written in FORTRAN are being developed in Charlottesville. One system will be taken to the VLA site in early 1980. The hardware for this system is now being procured. The other system will remain in Charlottesville and will be based on the existing Mod Comp computer now being used for map processing.

An array processor has been delivered and installed on the Mod Comp system.

36-foot Telescope

A dual-port disk has been ordered which will permit the connection of a second computer at the 36-foot site at a later date.

VERY LARGE ARRAY PROGRAM

The array was scheduled for observations and tests on an average 57 percent of the time during the first quarter of 1979. First fringes were obtained on Antennas 18 and 19 during the quarter. Sixteen antennas are currently operational on the 18-km baseline.

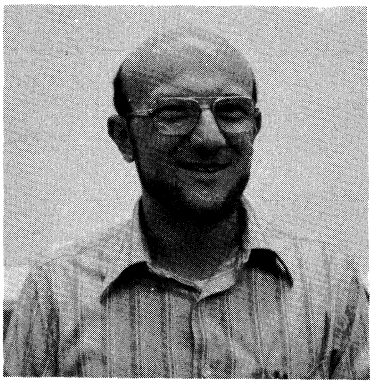
Further tests of the modifications to reduce RFI from modules F2 (upconverter pump) and F3 (17-20 GHz LO) have verified the value of the modifications. On Antennas 3 and 11, which have modified F2's and F3's, the 1400 MHz birdie produces 40 mJy in 1.5 MHz bandwidth, compared to 25 Jy on unmodified antennas. The strength of the 1450 MHz birdie is 63 mJy in 1.5 MHz bandwidths. During the month of March, the delay-multiplier system was used for the first time in spectral line mode. For preliminary tests the system was used to synthesize the bandpass responses for the three filter bandwidths currently available in the IF system: 50 MHz, 12 MHz, and 1.5 MHz. No attempt has been made to observe an astronomical spectral line. The prototype of the new baseband system (modules T3, T4, T5, T6) was installed in the D rack of Antenna 5 and system tests were started. Solutions for several spurious signal problems discovered during the testing have been found and are being implemented in the prototype system.

PDP-11/70 mapping software has been opened for general use. Work on making the IMPs' image processing and display system more generally useful is progressing. The spectral line sorting system hardware has been delivered, and work has started on bringing the system up. We have tentative agreement on an image interchange tape format with Kitt Peak National Observatory. We will also circulate this standard to Westerbork and try to get agreement on a universal standard for astronomy.

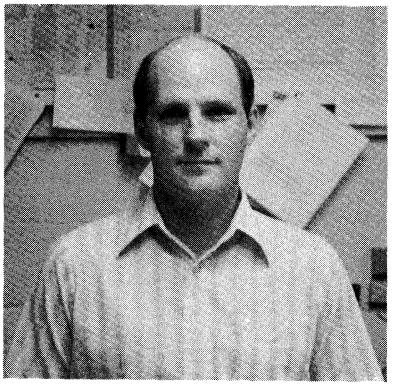
Phase IV work was 71.2 percent complete by the end of the quarter. Bids for Phase V construction were opened on March 27, and a contract has been prepared and forwarded to NSF for approval in the amount of $2,820,000. The New Mexico gross receipts tax case was scheduled for hearing on April 2, 1979 in Santa Fe, New Mexico.

PERSONNEL UPDATE

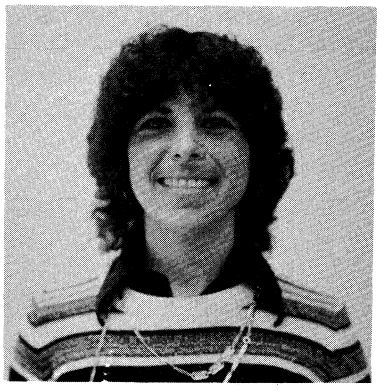
NEW EMPLOYEES



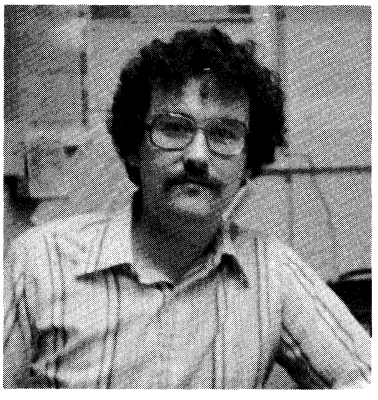
Robert J. Havlen
Assistant to the Director
Director's Office - CV



David C. Haynes
Technical Specialist
Telescope Operations - GB

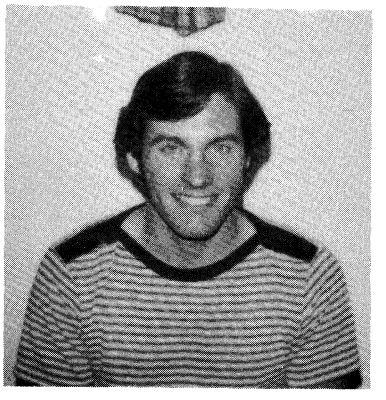


Bonnie LaVault
Receptionist/Telephone Operator
Business Office - CV

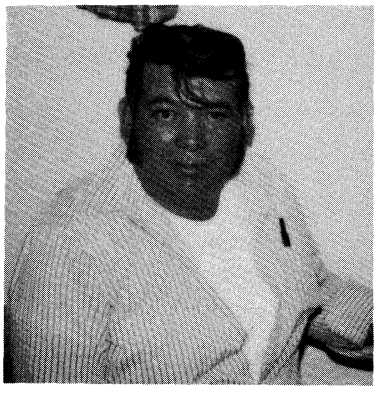


Martin P. McGreal
Accountant
Fiscal Office - GB

Joan K. Martin
Personnel Assistant
Personnel Office - CV

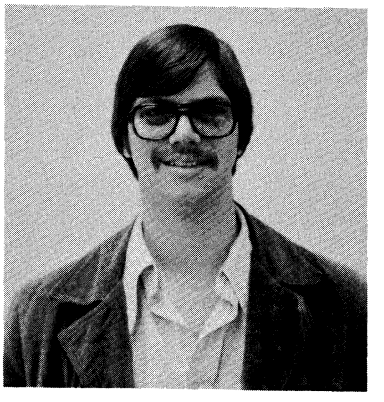


Andrew W. Strong
Intermediate Technician
VLA Electronics - NM



Luis Torres
Waveguide Foreman
VLA Construction - NM

Blanche M. Wade
Technician Trainee
VLA Construction - NM



Jimmy D. Whipkey
Advanced Technician
Central Laboratory - CV

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OTHER NEW EMPLOYEES - PHOTOS NOT AVAILABLE

Lawrence A. Beno	Electronics Engineer	VLA Construction - NM
James C. Brannan	Draftsman	VLA Construction - NM
Mary Rose Chavez	Maintenance Trainee	VLA Project Management - NM
Arsenia G. Lucero	Assistant Cook	VLA Project Management - NM
Robert T. Newell	Jr. Research Associate	Basic Research - NM

REHIRES

Ellen G. Ary	Assistant Cook	VLA - NM
Philip E. Hardee	Visiting Asst. Scientist	Basic Research - CV
Susan G. Neff	Jr. Research Associate	Basic Research - CV
Roger D. Norrod	Electronics Engineer I	Electronics - GB
Alfred M. Zerwas	Staff Shop Technician	VLA Antenna Maintenance - NM

SUMMER STUDENTS

James A. Anderson	Green Bank
John A. Biretta	Charlottesville
Patricia L. Bornmann	Charlottesville
Valentin Bujarrabal	Green Bank
David Cook	New Mexico
B. Kevin Edgar	Charlottesville
Dan Leroy Fenstermacher	Charlottesville
Paolo Fontanelli	Charlottesville
Julie E. Fouquet	Charlottesville
Barbara L. Ganzel	Charlottesville
Suzanne E. Hammond	Charlottesville
David H. Hough	New Mexico
Edward D. Knapton	Green Bank
Robert J. Kummerer	Charlottesville
Tod Lauer	Charlottesville
Delvin A. Lindley	New Mexico
Kenneth J. Mitchell	New Mexico
Harold S. Morton, III	Charlottesville
Eric R. Nelson	New Mexico
Terence Percival	New Mexico
Sterl Phinney	Charlottesville
Christopher K. Walker	Tucson

LEAVE OF ABSENCE

Sandra Treppa-Richards

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GB SUMMER EMPLOYEES

Left to Right - First Row: Nathalie Dolan
Melinda Crist
Greg Brubaker

Second Row: Mike Hogan
Steve Gillispie

TERMINATIONS

Ernest M. Caloccia
Inez R. Carbajal
Barbara A. Coerper
Donna B. Eason
Robert E. Elcox
Stanislaw Gorgolewski
Cindy G. Hearn
Michael R. Lawson
Elaine I. McKee
Michael F. Plaster
Gloria N. Racey
May L. Rigby
Richard D. Sizemore
Martin L. Tester
Li-Kong Wang

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WHAT'S COOKING?

RHUBARB STRAWBERRY ROLY-POLY

from the kitchen of
Anna Grace Ware

1 cup sugar
2 cups water
2-3/4 cups flour
1-1/2 teaspoons salt
2/3 cup shortening
1 cup milk, sweet
3 teaspoons baking powder
2 cups rhubarb, cut (raw)
1 cup strawberries
1/3 cup sugar
1/2 teaspoon cinnamon

Combine sugar and water in 9" x 13" pan. Heat until sugar dissolves. Set aside. Spoon flour into measuring cup. Pour into bowl; add baking powder and salt. Cut in shortening. Add milk. Knead gently. Roll out almost as thin as pie crust. Spread with fruit which was mixed with sugar - cinnamon mixture. Dot with chunks of oleo or butter. Roll like jelly roll. Slice in 1-inch circles. Place in pan of syrup. Bake 25-30 minutes. If strawberries are not available you can use 1/2 of small box of strawberry jello in the syrup for extra flavor. You can use strawberry jello with strawberries also.

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MOLASSES WHOLE WHEAT BREAD

from the kitchen of
Bill Brundage

6 fluid ounces unsulfured molasses
1/4 cup brown sugar
1/8 pound oleo margarine
1 package dried yeast
1 cup powdered non-fat milk
1 cup cracked wheat
2 cups whole wheat stone-ground flour
1 cup baker's choice: oat cereal, or granola, or Cheerios cereal, or Special-K cereal, etc.
2-4 cups unbleached flour

Makes two loaves.

Step 1. Mix into a large pan: molasses, 2½ cups warm water (approx. 100° F), brown sugar, yeast.

Step 2. Let mixture stand 10 to 30 minutes for yeast growth.

Step 3. Stir each of the following into the mix: powdered milk, cracked wheat, baker's choice, melted oleo (not too hot - less than 110° F).

Step 4. Stir in unbleached flour until it thickens to kneading consistency.

Step 5. Knead in more unbleached flour until dough just stops sticking to your hands. Too-moist dough will rise and collapse. Too-dry dough will not rise properly. Experience will tell you best.

Step 6. Put dough back in mixing pan and cover with moist towel. Let stand for 30 to 90 minutes for first rising.

Step 7. Cut in two. Knead each vigorously and place each in standard bread pan (5½" x 9"). Place in warm (about 80° F) area for final rising. This will take from 4 to 8 hours.

Step 8. Place in oven preheated to 375° F. Bake 35 to 45 minutes depending on moistness of the dough. Experience will establish the best time.

Step 9. Cool and eat. MMMMM.....Good!

Hints for novice bread makers:

A large plastic dishpan serves well as a mixing bowl for the double recipe which makes four loaves.

The best mixing tool I have found is the type with a double or triple loop of heavy wire rod on a long wooden handle.

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Teflon coated bread pans need no greasing. Grab pan at each end and twist. The bread loaf will fall out if adequately baked.

My first attempt ever at making bread was with a variation of this recipe from Pepper Moore. It was a disaster, but I persisted. The second attempt was fairly good, otherwise I might never have continued through the next five or so disasters.

Bread making is an art. It requires persistent experience to achieve consistently good results. Once past the novice stage, I experimented with the recipe. Ingredients and proportions are not critical. Variation is the spice of culinary enjoyment.

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VANILLA-BUTTER AND NUT POUND CAKE

from the kitchen of
Becky Warner

3 cups sugar
½ cup crisco
3 cups flour
2 sticks margarine
5 large eggs
¼ teaspoon salt
1 small can milk (add water to make 1 cup)
2 tablespoons vanilla-butter and nut flavoring*

Cream shortening, sugar, salt. Add eggs one at a time. Add flour and milk alternately, ending with flour. Fold in flavoring by hand. Bake in greased tube pan for 1 hour and 45 minutes at 325° F. Start in COLD OVEN. Do not open door while baking. Remove from pan immediately.

* *This flavoring is made by McCormick.*

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RHUBARB JELLY

from the kitchen of
Becky Warner

Cook 5 cups chopped rhubarb in ¼ cup water until stringy. Add 4 cups sugar; stir thoroughly. Add 1 large box strawberry jello. Stir, then put in jars and seal with hot paraffin wax.

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