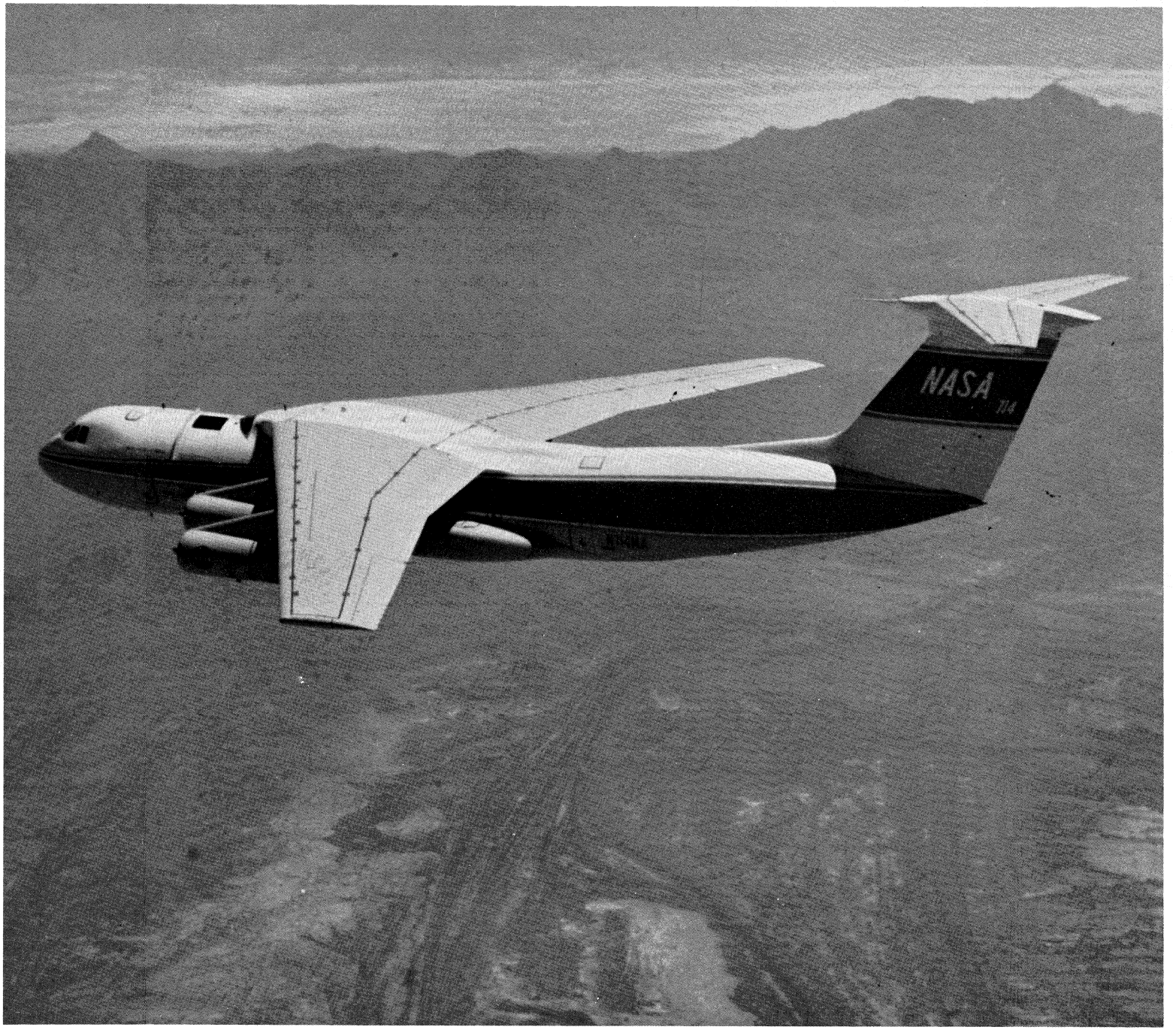
the OBSERVER

VOL. 21, No. 1 MARCH 1980 page 1



story - page - 3

The Cover:

The Sky's The Limit, astronomy from an airplane. Story on page 3.

* * * * * *

The *OBSERVER* is a quarterly publication of the National Radio Astronomy Observatory. Articles and comments should be sent to, P. O. Box 2, Green Bank, West Virginia 24944.

* * * * * *

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

* * * * * *

THE SKY'S THE LIMIT

Lee J Rickard

For those who feel the need for a bit of public recognition, but lack the resources for a presidential campaign, I suggest shaving. True, this is a technique of limited utility. It works poorly for women. It does not work well for men either, if tried too frequently (such as every day). But given a reasonable time for preparation -- say, eight years -- the clamor that results from a simple, close shave can be quite rewarding. One is pressed for explanations, and can spend hours detailing the complex of precipitating motives. Consider, as an illustration, my own line of reasoning.

Suppose you were to browse through the Hubble Atlas of Galaxies. After flipping through about a third of its oversized pages, you come upon the spiral galaxies. Impressive aesthetically, they also raise an insistent question. What is the cause of their spiral patterns, so consistent in their occurrence, and yet so diverse in their specific appearances?

Careful examination shows that these patterns are best delineated by newly-formed stars and the clouds of gas and dust from which they condensed. In our own Galaxy, these star-forming clouds are rich in molecules like carbon monoxide, whose characteristic emissions can be observed in the millimeter band. Indeed, the NRAO 36-foot telescope has been used, for much of the past decade, to map out the structure and distribution of such clouds. So it seems logical to try similar observations on other spiral galaxies, to relate their designs to the global structures of their star-forming gas.

More than five years have passed since I started in this field, and there are now more than a dozen galaxies with known molecular clouds, of which half have CO maps. But there are also lots of questions about the properties of the clouds being observed, about their masses and temperatures. In order to answer these questions, we need to observe as well the far-infrared emission from the dust in the CO clouds.

Unfortunately, one cannot just go to an observatory to observe in the far-infrared. Even at a high, dry site like Mauna Kea, the atmospheric water vapor completely absorbs radiation from 40μ to 800μ, the entire far-infrared band (except for two tiny, 20 per cent transparent windows at 350μ and 460μ). There are, of course, ways to get around this. One could use satellite-borne telescopes, as the UV and X-ray astronomers do now. Indeed, there are many plans for infrared satellites, either free-flying (the IRAS) or operated from the Space Shuttle (such as the SIRTF and the LIRTS). But they don't exist yet. There are also balloon borne telescopes, operated by a number of universities. They reach altitudes of about 41 km (135,000 feet), and so have essentially no atmosphere above them.

But there is a third, equally productive alternative. Airplanes can provide platforms at altitudes of 12-15 km (40,000-50,000 feet). They fly above all but a few tenths of a percent of the atmospheric water vapor. They can carry larger telescopes than balloons and, with a little work, can be made much more stable. They can also carry the experimenters, who can adjust equipment and evaluate data in mid-flight. Unlike a satellite, an airplane-mounted telescope can take a variety of detectors, adapted to the needs of specific scientific problems as they arise and taking advantage of the most current developments in design. That's an important consideration in a field where substantial improvements in sensitivity occur every year.

The trick, then, is to find an airborne infrared telescope. Fortunately, NASA has been operating a program of airborne astronomy since 1965. At first, it made available a Convair 990, called the Galileo. A four-engine jet similar to the Boeing 707, the Convair 990 was principally used to test instruments for weather satellites, but also provided opportunities for auroral, eclipse, and solar system research.

--continued, next page--

A few years later, NASA also provided limited access to a twin-engine Lear Jet, originally used for aeronautical studies at high altitudes (50,000 feet). Most of the early far-infrared discoveries were made with the Lear Jet's 30-centimeter telescope, while the Galileo concentrated on meteorological and earth resource work.

Recognizing the potential utility of a large airborne telescope, the NASA Ames Research Center worked for several years on a plan to install a 0.9-meter telescope in the Galileo. In 1970, however, they shifted their attention to a Lockheed Starlifter, a commercial version of the USAF C-141 transport plane. The C-141 was attractive because, although not much larger than the Convair 990, its design left more cabin space for equipment, its range and flight ceiling were greater (meaning longer flights at lower water vapor), and it was unusually inexpensive.

In July 1975, the C-141 was dedicated as the Gerard P. Kuiper Airborne Observatory -- the KAO for short. It is the centerpiece of the airborne astronomy program, with a basic schedule of 80 7½ hour flights per year. In addition, NASA still operates the Lear Jet and, very infrequently, a U-2. The Galileo crashed in 1973 after a mid-air collision; but another Convair 990 (the Galileo II) is now available, mostly for terrestrial research. All the planes are operated by the NASA Ames Research Center.

The KAO is operated as an international research facility, with proposals ranked each year by outside referees and then reviewed by the Management Operations Working Group for Airborne Astronomy. Its chief difference from an observatory like NRAO is that it has no instruments of its own. Almost all experimenters build their own equipment, generally with NASA support, and bring it to the telescope only for their own flights. However, NASA also operates a Guest Investigator Program, encouraging scientists without their own detectors to propose projects using equipment made available by other experimenters.

So, in order to get some more information about the properties of the molecular clouds in galaxies, I submitted a proposal for the KAO, asking to use a photometer constructed by Paul Harvey, of the University of Arizona. Before doing so, of course, I had checked out the proposal with Paul and his postdoc, Harley Thronson (an old friend from Chicago who'd first told me about the opportunities on the KAO). We verified that it was feasible, and worked out a division of labor in case the experiment was actually scheduled. Scheduled it was, in 1979, on only our second try. We got two flights, one in November and one in April.

Long before the first flight, Paul and I began working out a flight plan. The fact of being in an airplane imposes a lot of constraints on what objects you can observe, and when. The flights are limited to 7½ hours, so the flight path has to return to the point of origin by then. That point is usually Moffett Field, south of San Francisco, home of Ames Research Center. In order to reach sources in the far southern hemisphere, though, there have been C-141 flights originating from Hawaii, Pago Pago, and Australia. Additional restrictions come from the FAA -- we cannot fly over Canada or over various zones restricted for military use.

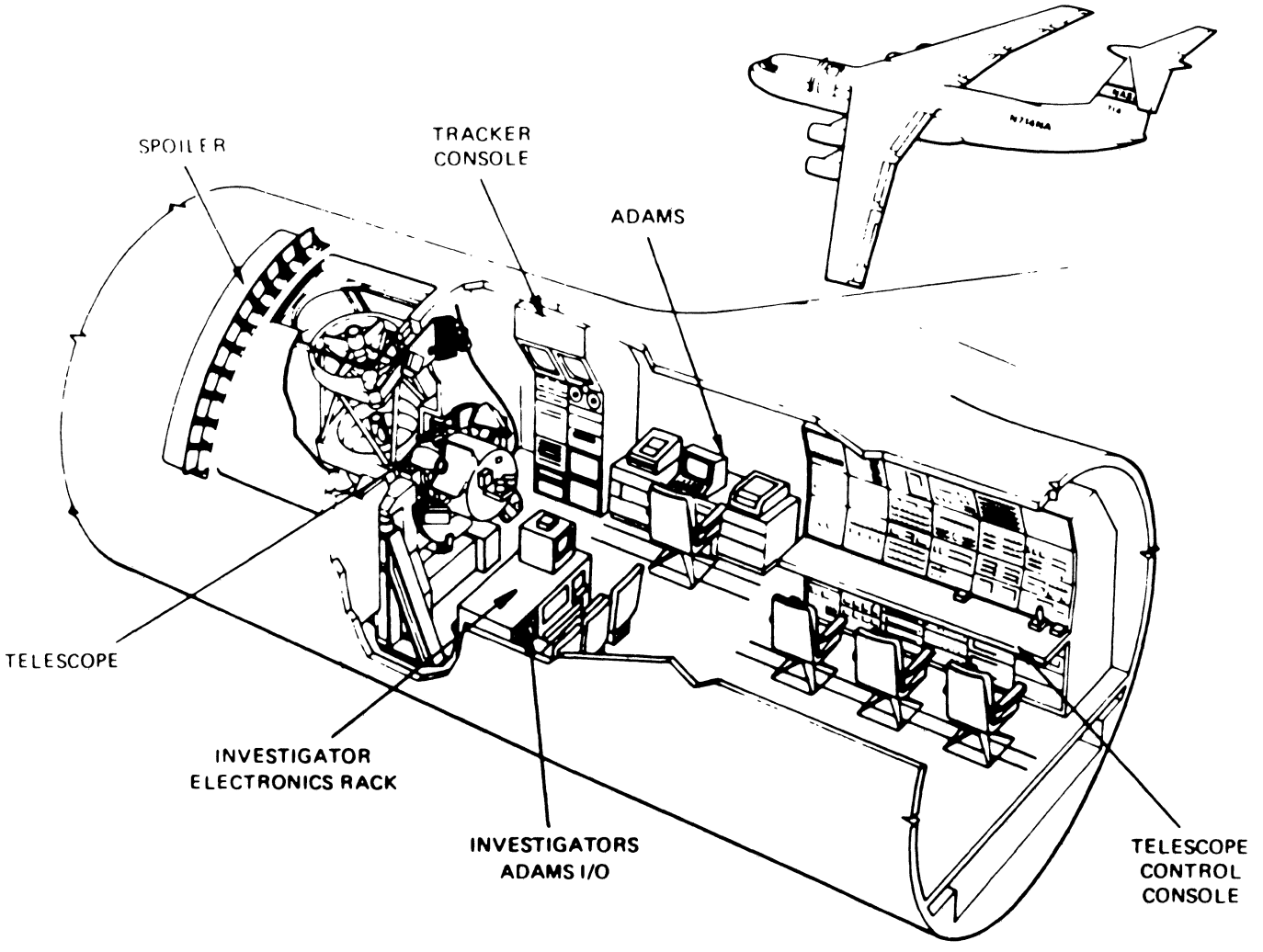
The telescope adds other constraints. It sits in an open cavity on the port side of the fuselage, just forward of the wing (see front cover). The cavity door is wide enough to give 4 degrees of clearance when the beam in centered, and long enough (with a moving shutter) to allow observations at elevations from 35 to 75 degrees. So the flight path must be at right angles to the source, and the time of observation must find the source within the proper elevation range -- at night. Fortunately, there is a computer program to enable working out the schedule in detail.

(In fact, the flight plan is revised daily before the flight, as new weather data are taken into account, and almost constantly during the flight itself, as the actual wind conditions are impossible to predict.)

After arriving at Moffett Field, Paul and Harley concentrated on the equipment

--continued, next page--

An inside view, looking forward, of the observing compartment. To the right is the telescope control console, where the flight engineer, mission director, and telescope operator work. Slightly visible forward of that is the tracker console. (The ADAMS is hidden in this view.) The three seats on the left are for the observers, facing their equipment rack. The round structure at the front is the telescope assembly, where the detector is mounted.



A cut away view of the observing compartment in the Kuiper Airborne Observatory.

filling the detector with liquid helium and mounting it on the plane. Meanwhile, I worked with the tracker operator, specifying guide stars and checking finding charts.

The flight plan is only the zeroth level of telescope pointing, because the autopilot holds position only to about half a degree. Beyond that, the telescope is stabilized by an inertial guidance system. It is balanced on a spherical bearing rendered virtually frictionless by a film of compressed air, and stabilized by three gyroscopes. Beyond that, there is a two-star digital tracking system, using a small telescope mounted parallel to the main telescope, and a TV camera. The tracker camera accesses bright stars within half a degree of the desired field, and generates error signals that further refine the telescope position. The final pointing accuracy is a few seconds of arc.

Those arc seconds, though, are just a measure of the telescope stability. One cannot just go to a position by dead reckoning and find guide stars once there. We have to select stars for guiding ahead of time, determine their offsets from the desired source position, and prepare charts for finding them in the field of the tracker camera. Even with a good finding chart, the tracker operator and observer can spend many precious moments of the flight trying to orient themselves and find the correct guide stars.

The center of all the pre-flight activity is, of course, the C-141 hangar. It's conspicuous among Moffett Field's gargantuan architectures because the plane's tail assemble pokes through the side of the building. (This, I have been assured, is standard procedure for C-141's.) Most of the support staff work there, meeting every day at 1:15 p.m. for a review of the current problems and work assignments. The Operations Office, though, is in a different hangar, with the Lear Jet and Convair 990. One must troop over there for the special pre-flight briefing that is mandatory for all participants.

It's at the pre-flight briefing that you realize how large an undertaking each flight is. The usual crew numbers a dozen: two pilots and a navigator in the cockpit; the flight engineer and mission director, who oversee the whole operation; the telescope operator; the tracker operator; an operator for the ADAMS, the online computer system; a meterologist who operates water vapor sensors mounted around the plane; and three experimenters, sharing the jobs of manipulating the detector, fine-tuning the guidance, controlling the data link to the ADAMS, and keeping the log.

Between briefing and flight, the novice observer gets instructions on safety procedures, checks out his oxygen mask, and stows his gear (mostly notebooks and a sandwich). Take-off is always on time.

Within 30 to 45 minutes of the start of the flight, the plane is sufficiently high (39,000 feet) to begin observing. That first half-hour, then is a mad rush to get set up, unstrapping equipment that was immobilized for take-off, setting up the detector, starting the computer, etc. In normal operation, the telescope beam is sent out through the air bearing to a mounting rack in the middle of the fuselage. Behind this rack and to the left is the observer's rack for support electronics and computer equipment. Behind and to the right is first the tracker console, then the ADAMS console, and then the telescope control console. So almost everyone is trying to work in the cramped space around the telescope rack.

Adding to the apparent confusion is the noise. The C-141 must be one of the noisiest planes flown, with a spectrum of vibrations that goes down into the gut-wrenching zone. Incredibly, the telescope, perched on special shock absorbers inside its cavity, feels virtually none of this. The observer feels it all. To avoid deafness, everyone wears earphones, and communicates via lip mikes. But every time you move around, to go to the tracker console or the telescope or the bathroom, you have to unplug, so communications get to be difficult.

As the plane moves onto the flight path

--continued, next page--

for the first source, the tracker operator finds the rough area of sky and zeroes in on the guide stars. The observer picks one star for display in a narrow field camera, to use for fine adjustments to the guiding. Then the telescope operator turns on the chopper. The chopper is the telescope's secondary mirror, which is moved rapidly on and off the source. In this way, that part of the signal contributed by the atmosphere can be almost entirely removed. As a side effect, the star images in the guide camera look like Q-tips, somewhat fainter than the original images and not all that easy to guide on.

Each observation proceeds until the mission director notifies the observer of the upcoming end of leg, as specified by the latest flight plan (revised only minutes before). The plane moves to the next course, and the observations proceed. If you're lucky, this is how it continues -- seven hours of observing, constantly attending to the telescope the detector, and the data. With bad luck, you get excitement. For example, sometimes you run into a jet stream with strong turbulent winds. The telescope can't track under those conditions, so it pneumatically clamps down on its shocks (with a loud noise similar to blowing four tires) and rides it out. It's spectacular, with the plane bounding around, the star images veering crazily across the camera fields, and the observers gamely trying to stay neat.

Excitement like that, though, is bad for the data. A successful flight is just tiring. Our November flight was quite successful, resulting in three new detections and a map of a known source that we will compare with CO data. But despite the excitement of the flight and the joy of getting good data, I was glad to land.

Our next flight has demanded even more advance preparation. Because of the dramatically increasing cost of fuel, the KAO has had to cut back in the length of flights, to 5½ hours for the remainder of the year. In order to get as much as we can from the data, it becomes even more important to fly at the C-141's ceiling of 45,000 feet for as long as possible. Regulations demand that all participants in flights going above 41,000 feet have taken a high-altitude training course. Indeed, we stayed at 41,000 feet in November only becuuse I hadn't taken the course.

In normal operation, the C-141 is pressurized to an altitude of 8,000 feet, like most commercial jets. There is always a danger of sudden decompression at high altitudes, and 41,000 feet is the normal point at which it is considered that the dangers require a trained response. There are several reasons for this. Oxygen deprivation (hypoxia) destroys your judgement before relieving you of consciousness. In a sudden pressure loss at 45,000 feet, you have only seconds to recognize the problem and go to oxygen before losing the ability to recognize that there's a problem at all. Nor are the symptoms of hypoxia easily recognizable. They are subjective, varying from person to person; each has to learn his own particular cluster of symptoms. Furthermore, at altitudes above about 30,000 feet, you must take your oxygen under pressure. Without training in pressure breathing, it's easy to hyperventilate and collapse.

I took my high-altitude course at Andrews Air Force Base, south of Washington, D.C. The course takes a full day, mostly spent in lectures on the physiology of breathing and pressure changes, typical medical problems of flight, details of oxygen equipment, etc. Some of it is rather technical; it was only after half a dozen admonitions to "perform an effective valsalva maneuver" that I realized I was supposed to pinch my nose and blow air into my ears. But there was also lots of good advice. For example, never wear Chap-Stick on a flight. When the 100 per cent oxygen of the mask hits the petroleum derivative on your mouth, your lips can catch fire.

In the afternoon, the whole class enters a pressure chamber to simulate being at high altitude. We first went to 35,000 feet, to learn how to breathe oxygen under pressure. Curiously, it's impossible to

--continued, next page--

talk into a pressurized mask, unless you call talking the weird reverse belching that happens when you try. We then went to 25,000 feet, and took off our masks to find out our own hypoxia symptoms. In my own case, I went through double vision, dizziness, and a strange mixture of elation and paranoia. Also, after about 3 minutes, I lost my ability to respond to commands -- or at least so they told me later. Finally, we went to 8,000 feet and underwent sudden decompression to about 32,000 feet. That particular test always introduces a heightened susceptibility to the bends for the next half day. For hours afterwards, I mistook every twinge in my knees for a nitrogen bubble.

But I survived, and am now certified to 50,000 feet for three years. The only side-effect that I suffered was due to regulations. The Air Force insists that one cannot maintain a beard and an adequate seal around the oxygen mask simultaneously.

So, I had to shave. Any questions?

* * * * *

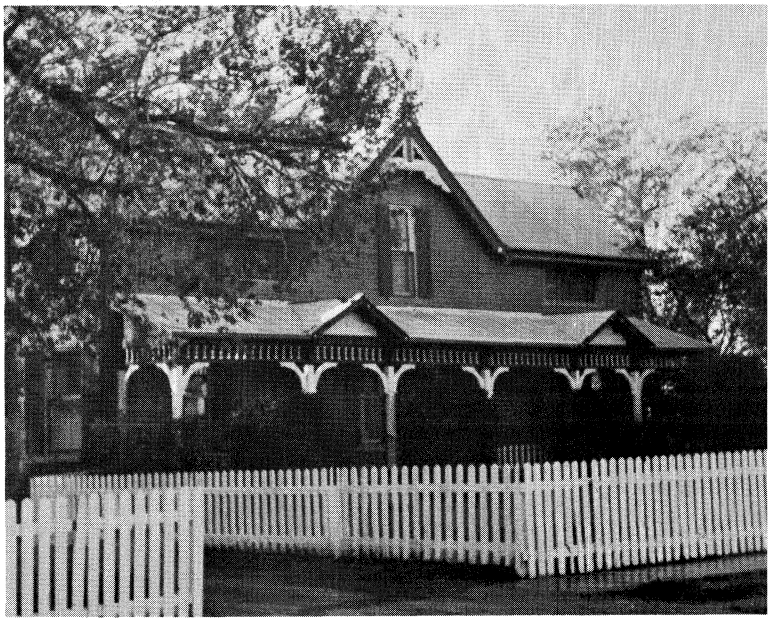
THE BURSUM HOUSE

Bill del Giudice

One of the historic houses in Socorro is the Bursum House. It was probably built in 1887, out of local brick with 14 inch thick exterior walls and copper clad sheet steel roof. The style of the house is Eastlake Victorian. In keeping with the style, there is elaborate wood ornamentation on the exterior, including finials on the gables and filigree under the eaves. While the exterior is quite symmetrical, the interior is not. Although less distinctive than the exterior, the interior is nonetheless impressive. The two front doors are of unique design with brass hardware and a hinged glass panel behind a cast metal grille. The living room, 15 x 35, was originally two rooms, but the division wall was removed. This renovation resulted in a mismatch of the ornate pressed steel panel ceiling but otherwise created a very pleasant room. The living room opens into the dining room, 15 x 20, and den, 15 x 18, through double wood paneled sliding doors. There is also a bedroom, bath, pantry, kitchen and enclosed rear porch and laundry on the first floor. The second floor, originally attic space, has been finished to three bedrooms and a bath.

Behind the house is a two stall carriage house with a full second floor. The lot is well landscaped and there is a small vegetable garden in the rear.

The house was built on what was then the outskirts of Socorro for the Greenwald family by a local mason named Keller. In 1898, Mr. H. O. Bursum, Sr., moved to Socorro and in 1904 purchased the house for $3,000. Mr. Conrad Hilton lived in the house with the Bursums while a student at the School of Mines in 1908. In 1954, Langdon Taylor purchased the house and Mrs. Taylor furnished it with many antiques but did little to the structure except to remodel the kitchen. Dr. and Mrs. David Shortess purchased the house in 1969. They replaced the heating system, remodeled the second floor, did extensive rewiring and much landscaping.



--continued, next page--

When Mr. and Mrs. W. F. del Giudice purchased the house in 1979, there was still considerable work to be done, both inside and out. Much of the trim must be replaced and all of it needs repainting. Some of the interior woodwork must be repaired and the floors require recovering. The structure is sound however, and no work beyond the cosmetics described is necessary.

The house is listed in the New Mexico Register of Cultural Properties and the National Register of Historic Places.

Much of the available information used in writing the above was contradictory or vague, so that selected to appear here is what appeared to be the most factual. Most of this information was gathered from the following sources:

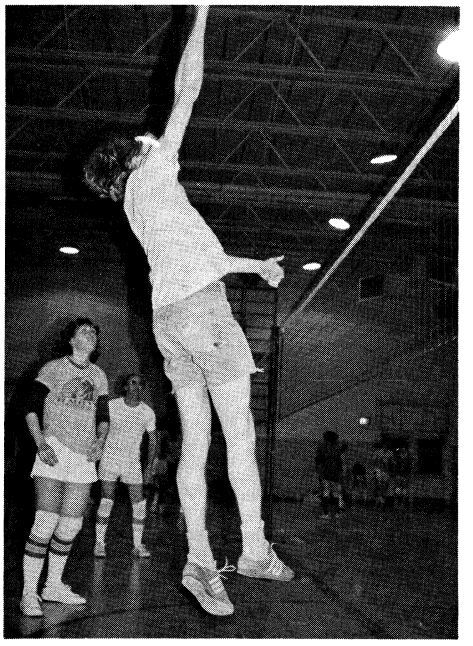
McNiel, A. L., Residential Appraisal Report, 1979
Nomination Form, National Register of Historic Places, 1973
Nieman, Charles, Spanish Times and Boom Times
Shortess, D. K., "A Conversation with H. O. Bursum, Jr.", 1973

* * * * *

VOLLEYBALL-SUPERNOVA STYLE

by Ed Fomalont

A victory dance (celebrating the fact that the other team didn't show up).
Photos by Petra van Albada



Jay Lockman hanging from the ceiling while team members stare in disbelief.

NRAO is full of volleyball freaks... and just because there are 10 inches of snow on the ground doesn't mean some of them won't find a way to play. The opportunity is provided by the City of Charlottesville which has organized volleyball leagues for various combinations of age, day or sex (male, female or both, that is).

The team representing NRAO is called the Supernovas, probably because of the intensity of their play. However, some nights the name of Black Hole (the ball cannot escape from their side of the court), or Super "duds" seem more appropriate.

The team captain, Joan Martin, has this thing about making a lot of noise while playing and Bill Meredith usually obliges when he isn't looking at the pretty girls in the next court. Stephanie Hanna provides plenty of spirit (no, not that kind!) while kamikaze Ed Fomalont finds it difficult to play indoors where he can't get muddy. Jay Lockman (without banjo) and Craig Walker (without VAX) are our front line smashers and Nancy Startup and Petra van Albada complete the team.

Snicker if you want, but as of March 12, the team has compiled an 18-9 record and are sure to make the playoffs on March 26. Wish us luck !!

THE CONFEDERATE INVASION OF NEW MEXICO

by David Weber

To the Socorro history buff, the Confederate invasion of New Mexico is a fascinating subject because a major battle was fought nearby, and the Socorro neighborhood was on the invasion/retreat routes. In addition, the personalities of the leaders are interesting studies in contrasts. The New Mexico Civil War conflicts are generally considered strategically unimportant by historians because of the relatively small military forces engaged and the distance from the eastern and mid-western battlefields. The issues involved were control of virtually the whole western US and access to the wealth pouring from the Nevada and California mines. (Nevada was granted statehood during the war to secure allegiance of its people to the Union.)

The Confederate invasion and strategic objectives were primarily the conception of a Southern army officer, Henry Hopkins Sibley, who was stationed in New Mexico when the Southern states began to secede from the Union. Captain Sibley was promoted to Major on May 13, 1861 and submitted his resignation from the army on the same day. Five days later, while awaiting action on his resignation, he was appointed commandant of Fort Union, located northeast of Las Vegas, NM. A few days later, he left for the South and apparently conceived the invasion plan during his trip to join the Confederacy.

On his way down the Rio Grande Valley, he visited Forts Marcy (Santa Fe), Craig (Socorro) and Fillmore (Las Cruces) and noted and perhaps contributed to the demoralized condition of the army. A large portion of the army officers were Southerners and were resigning their commissions to join the Confederacy. Notable among officers who were in New Mexico at that time were Longstreet, Loring, Crittenden, Ewell and Fauntleroy - all were to become famous generals in the Civil War. Sibley journeyed on to Richmond and convinced President Jefferson Davis of the feasibility and value of acquiring New Mexico, Arizona and California for the Confederacy. His description of the ease of the invasion was based upon his conviction that the Federal army in New Mexico was seriously demoralized and had few competent officers left. He also claimed that the invasion forces would be welcomed by the populace (which was the case in Mesilla but nowhere else) and that supplies could easily be obtained from the New Mexico populace. This assumption was to be his undoing as the necessary supplies needed by his invasion army just did not exist in the quantity required; even if the natives had been willing to sell or donate them. This shortage of food and munitions was carefully exploited by his opponent, Colonel Edward Richard Sprigg Canby, who did his best to keep these supplies from Sibley's forces.

With a Brigadier General's commission and the title "Commander of the Army of the Confederate States of America in the Southwest", Sibley went to San Antonio, Texas to recruit his army and secure the arms, transport and supplies necessary for the campaign. This proved to be more difficult than expected with the result that Sibley's army was not able to leave San Antonio until October 22, 1861.

The Confederate invasion of New Mexico came in two waves: the first group consisted of about 400 Texans under Baylor who reached the Las Cruces area in July 1861, and Sibley's later invasion which reached Ft. Bliss on December 12, 1861.

Captain John Robert Baylor of the Texas Mounted Rifles, Confederate States of America, was an energetic Texan who quickly recruited an army of about one thousand men in the San Antonio area for the ostensible purpose of a buffalo hunt; but, many of his recruits dropped out during the 700 mile trip to New Mexico. The 400-man remnant was a formidable force of hardbitten Texans, ready for anything.

Canby heard rumors about Baylor's army and ordered the Federal troops at Ft. McLane (near the Santa Rita copper

--continued, next page--

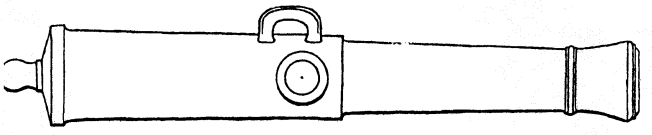
mines) to join the garrison at Ft. Fillmore (near Las Cruces) in repelling the invasion. These troops were under the command of Major Isaac Lynde and consisted of about 700 men, mostly infantry. Canby was confident that with this larger force, Lynde could defeat Baylor and recapture Ft. Bliss. Baylor occupied Mesilla on July 25 where he was enthusiastically welcomed by Southern sympathizers. On the afternoon of July 25, Lynde moved out of Ft. Fillmore and engaged his troops in some inconsequential skirmishing around Mesilla. Lynde returned to the fort in a state of nervous agitation, convinced that it could not be defended against Baylor's artillery. In historian Keleher's words: "In what he conceived to be a desperate situation, Lynde decided, in a moment of panic, to abandon Ft. Fillmore and attempt to reach Ft. Stanton, 154 miles to the northeast....For several hours before abandonment, the garrison at Fillmore slept fitfully, with arms in hand. The wagons were loaded with ammunition and supplies; ambulances were made ready for women and children; horses and mules were fed and watered .... In and about the loading of supplies it was all too evident that some of the supplies were to be left at the fort. Word was whispered about the barracks that boxes of hospital brandy and kegs of medicinal whiskey in goodly number were to be abandoned. As the soldiers appraised the situation, abandonment of a military post under orders was one thing, but abandonment of high class liquor was a much more serious matter, one that required consideration and reflection. The soldiers met the situation sensibly, and in the beginning with discretion. First one trooper, then another, and then many took a moderate swig of the soon-to-be abandoned liquor; then each helped himself to a drink that seemed more appropriate to the occasion. One sergeant of the "Old Army" decided that a drop of brandy or perhaps two or more on the road to Ft. Stanton might be eminently fitting under the circumstances. Pouring water out of his canteen, he replaced it with liquor. Others, recognizing the sergeant's commendable conduct, substituted liquor for water in their canteens. But on the cross-country march from Ft. Fillmore to Saint Augustine Springs (on the east side of Organ Pass), soldiers with liquor in their canteens suffered severely from thirst. Long stretches of rough sandy road without a drop of water to touch lips and burning throat, proved the undoing of many a good fighting man. Soldier after soldier collapsed and fell by the wayside, begging for water.

The evacuation of Ft. Fillmore was accomplished during the night of July 26, 1861. By daylight of July 27, Lynde's command of some seven hundred men, together with the women and children of the post, traveling on horseback, walking, riding in buggies, wagons and ambulances, were on the road which led to Ft. Stanton.

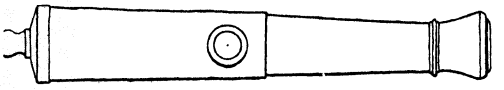
Baylor's scouts, up and about by sunrise, saw heavy clouds of dust in the air in the direction of the Organ Mountains. Sensing the significance of the dust, Baylor sent a detachment to take Ft. Fillmore. In a moment, Baylor was in the saddle, in hot pursuit of the fugatives. Baylor quickly overtook the stragglers of Lynde's army. There was no need to ask them to surrender. All they wanted was water - cool water - any kind of water. Baylor's men handed their canteens from one to the other of the stricken soldiers and quickly made them prisoners. Baylor hurried on to a pass in the Organ Mountains, four miles south of San Augustin Pass, from that day to this known as Baylor's Gap. Galloping through the gap, Baylor and his troopers rode north until they reached San Augustin Pass where they suddenly and dramatically confronted the Union troops."

As a result of this debacle, Ft. Stanton was also abandoned and its stores burned. Canby had lost arms, men, and supplies and now had to revise his strategy. He also attempted to cope with wild Indians, who took advantage of the situation to increase their raiding and pillage.

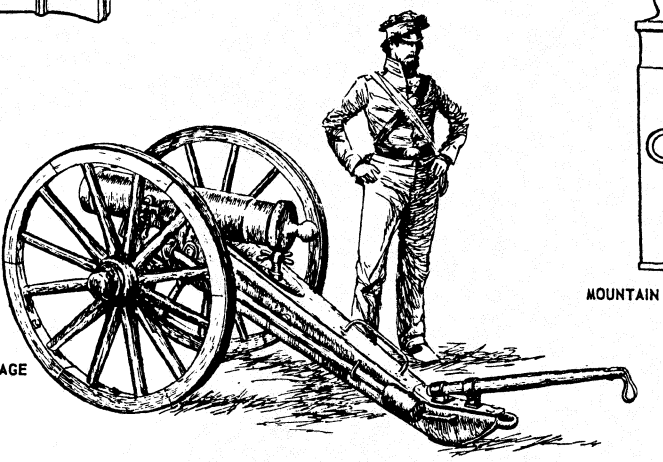
--continued, next page--



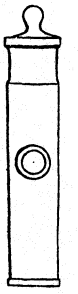
12-PDR GUN, MODEL 1841



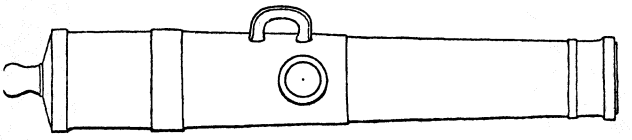
6-PDR GUN



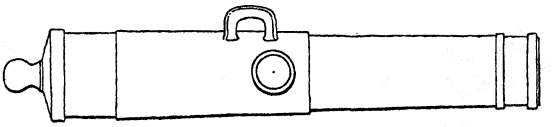
MOUNTAIN HOWITZER ON CARRIAGE



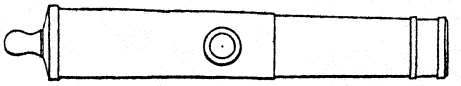
MOUNTAIN HOWITZER



32-PDR HOWITZER

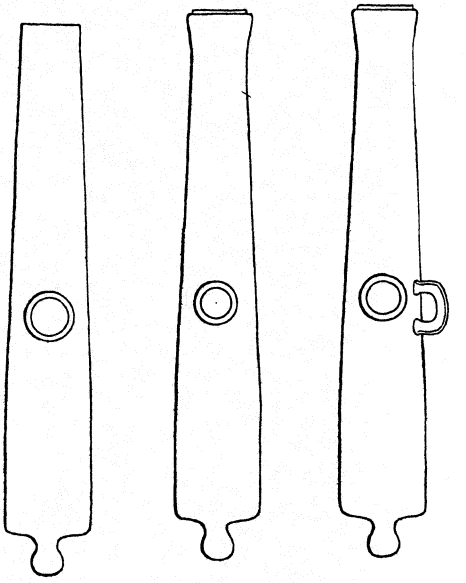


24-PDR HOWITZER

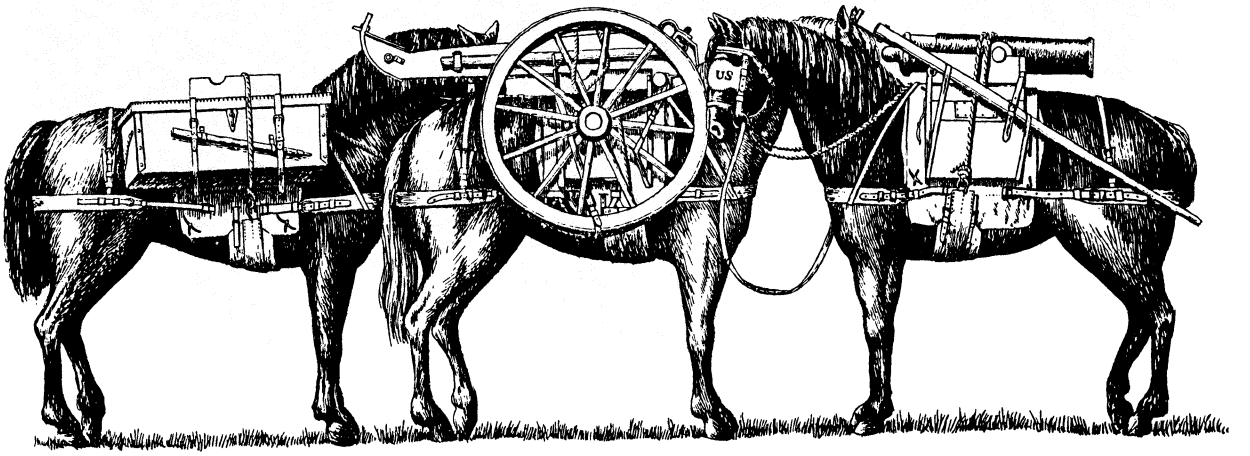


12-PDR HOWITZER

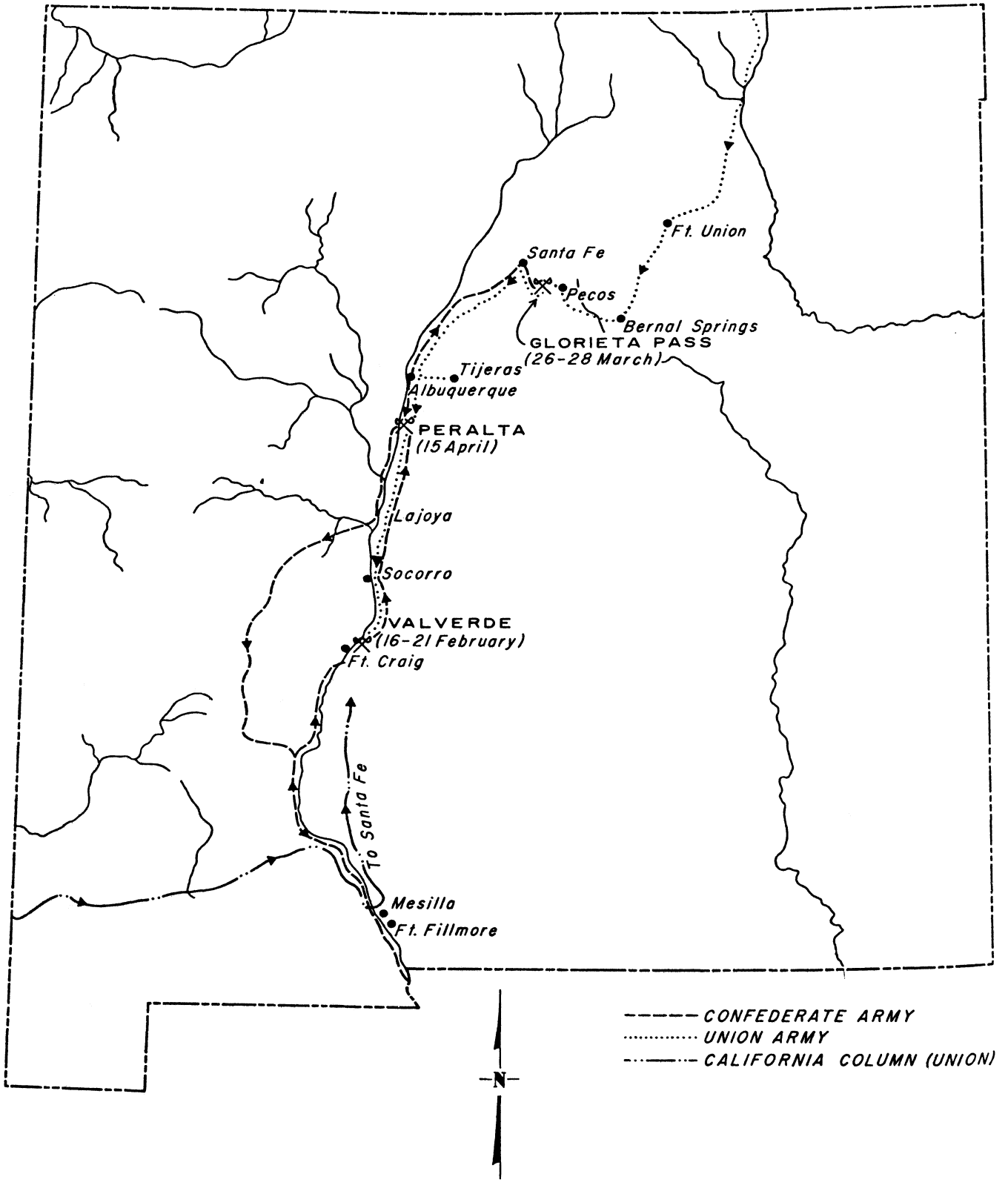
NAPOLEON GUN-HOWITZERS MODEL 1857



CONFEDERATE TYPE STANDARD UNION TYPE UNION 1ST TYPE



MOUNTAIN HOWITZER, CARRIAGE AND AMMUNITION CHESTS PACKED ON THREE HORSES



MILITARY OPERATIONS DURING THE CIVIL WAR, 1862

When Baylor heard of the recruitment of Union Volunteer armies in California and a plan to land additional Union troops in Guaymas or Mazatlan and then to march them overland across Mexico to reinforce Canby, he sent requests for reinforcements to Sibley and the Department of Texas. This cross-Mexico plan was abandoned, but the California Volunteers were quickly organized, although they did not arrive in New Mexico in time to oppose Baylor or Sibley.

Baylor actively scouted southern New Mexico from Ft. Fillmore in order to determine Canby's intentions. There were several skirmishes with Indians and with Union detachments from Ft. Craig where Canby had concentrated his forces. One light skirmish took place in Alamosa (on the Alamosa River near Truth or Consequences) on September 25, and a more serious one below the Alamosa the next day. These battle sites would be interesting to locate as they are near Socorro. Baylor's scouts briefly occupied Ft. Stanton in one of these scouting expeditions.

Canby's strategy during this time was to concentrate his forces at Ft. Craig and wait for Sibley's army to attack him. Canby had 1200 regular army men and 2800 irregulars, consisting of New Mexico volunteers under Kit Carson and some Colorado volunteers (nicknamed Pikes Peakers).

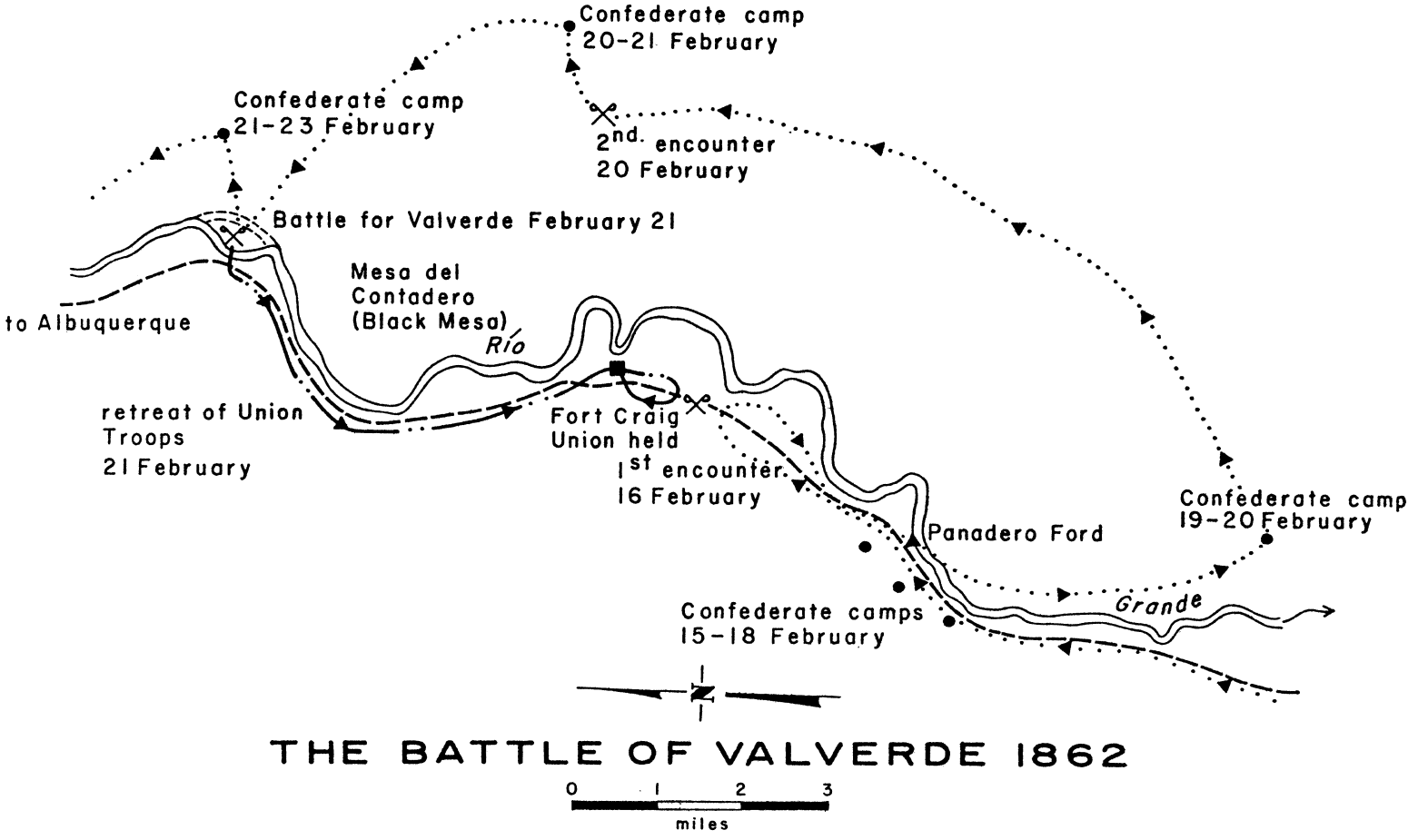
Sibley's army consisted of 2500 men and fifteen pieces of artillery. Sibley reached the Ft. Craig area on February 19, 1862 and sent out scouting parties to estimate the size of the Ft. Craig garrison and to determine Canby's intentions. Canby also sent out scouting patrols and there were skirmishes whenever the scouting parties came into contact. Canby assumed a defensive posture, hoping that the Confederates would attack the fort which was very defensible because of the extensive earthworks (still visible). In addition, Canby had some reservations about the volunteer troops in his command who had no previous military training or experience. Sibley decided against attacking the fort and tried to draw Canby's army out into the open country where Sibley's greater mobility would be an advantage.

Sibley decided to bypass Ft. Craig and cross the river at the Val Verde ford, four miles north of Ft. Craig. He believed that this would draw Canby out of Ft. Craig. The next day, February 20, Sibley's transport wagons were seen in a long train on the mesa east of the river and Canby concluded that Sibley was going to bypass Ft. Craig. Canby brought his army out of Ft. Craig to attack Sibley's army but was in an awkward position because the Confederates had placed artillery and sharpshooters on higher ground on the east side of the river. Their fire was so effective that Canby's men couldn't make much progress in their attack.

On February 21, Canby sent a cavalry detachment to hold the Val Verde ford and at 9:00 a.m. they attacked the van of Sibley's army. When Canby heard the gunfire, he took the balance of his army up to Val Verde to reinforce the cavalry detachment and the battle began. Canby held the west bank of the Rio Grande and had a battery of artillery under Captain McRae (a South Carolinean) and two 24-pound cannon. The battle was an intense fire fight which gradually swung to Sibley's advantage but there were large losses on both sides. The McRae battery soldiers were killed to the last man and Sibley captured their guns - 6 and 12 pound mountain howitzers.

Canby's losses were: 68 men dead, 35 men missing in action, and 157 men wounded. The Confederate losses were: 36 dead, 150 wounded and one missing. The dead on both sides were buried in the field under a flag of truce and the Confederates obtained medical supplies from Ft. Craig, also under a flag of truce. The Confederate wounded were taken to Socorro and Albuquerque where they set up hospitals. The site of the Confederate Socorro hospital is the parking lot of the laundromat across the street from the present Socorro

--continued, next page--



hospital. The VLA buses pass by it every day. The Confederates who died in the Socorro hospital were buried somewhere in the area as human bones and artifacts have been found.

After the battle, Canby retreated to Ft. Craig while Sibley took his forces north to capture Albuquerque and Santa Fe. He was on his way to attack Ft. Union when he met the troops from Ft. Union and more Colorado "Pikes Peakers" at the Pigeon ranch in Apache Canyon. The battle was nearly a draw but the decisive blow was the loss of Sibley's supply train which was attacked and burned by the Pikes Peakers. With this set-back, Sibley had to retreat to Santa Fe for supplies; and on the way, apparently decided that the campaign was a failure in view of the growing strength of the Union forces and his serious supply problem. He retreated south to Albuquerque (Old Town) and encountered Canby who had left Ft. Craig with an army of 2400 men on April 10. There was a minor battle in Old Town with artillery fire on both sides but no serious losses. The Confederates continued their retreat and near Peralta, another skirmish took place in which Canby's men took a large number of prisoners. Canby's tactics were to harass the Confederates with continuous skirmishing attacks which were just short of pitched battles. This prevented Sibley's men from foraging for food (there was not much to be had anyway). The retreat continued to the Rio Puerco area near Bernardo, where the Confederates camped in sight of the Union army that was camped at La Jolla.

--continued, next page--

Kit Carson was still at Ft. Craig with ten companies of NM Volunteers. Sibley recognized that, as he retreated south toward Ft. Craig, he would be in an awkward position because he could be attached simultaneously from the front and rear. Sibley's ammunition supplies were so low that he could not fight another battle; he had to find some way of escape from the impending disaster. His choice was to "cut and run" to the southwest. In the middle of the night, the Confederates quietly left their camp site with fires burning and abandoned their tents, part of their wagon train, and personal baggage. Morning found them in great difficulty in the sand dunes along the Rio Salado. Realizing that the heavy vehicles were limiting their speed, they burned most of the wagons, buried their three pieces of artillery (6 pound mountain howitzers) and abandoned their wounded. Colonel Scurry (whose regiment had captured the 6-gun McRae battery at Val Verde) insisted on taking these guns along and they manhandled these guns out of the sand and up and down hills all the way back to Ft. Bliss. The retreat route is not known exactly but the general course was southwest from Bernardo to the mesa west of the Lemitar mountains (the VLA buses cross it every day) through the Magdalena town site, down the west side of the Magdalena mountains along Milligan Gulch. In the southern part of Milligan Gulch they turned west and crossed the San Mateo mountains through Blue Canyon, and then turned south again, using the San Mateo mountains as a shield. They finally came out to the Rio Grande at Sheep Canyon, five miles below Alamosa, which put them about 40 miles below Ft. Craig. This circuitous route added about 100 miles to their retreat but enabled them to elude Canby. The retreat from Rio Puerco was a disordered, straggling affair with individuals or groups traveling at their own speed. The detachment Sibley had left at Ft. Bliss brought up food and helped the remnant to reach the Mesilla - Ft. Bliss area where they camped to recuperate for their arduous, 700-mile Ft. Bliss to San Antonio trip.

The Confederate losses were high - Sibley invaded New Mexico with 2500 men and only 1800 returned to Ft. Bliss; the balance had been killed or died of illness (smallpox, scurvy and pneumonia).

Sibley was an imaginative officer, sanguine in outlook, but not a very good leader. He was in poor health and was considered by some to be a "walking whiskey barrel." During the battle of Val Verde, he had to leave the battlefield as he was too sick to stay in the saddle. Sibley apparently did not realistically assess the difficulties and risks inherent in the invasion and had not anticipated the reorganization of the Union forces in New Mexico or the volunteer forces raised in New Mexico, Colorado and California.

Canby possessed one quality which Sibley lacked - good judgement - which he put to good use. He upgraded the morale of his troops and utilized his army effectively, even though half of them were green volunteers with no military background.

Sibley and Canby had known each other before the war - Sibley was second in command to Canby before the war in campaigns against the Navajo. They were West Point classmates . Canby had been Sibley's best man. Canby was married to the cousin of Sibley's wife.

Ft. Craig is about 30 miles south of Socorro and may be reached by going south from San Marcial along the river channels. The fort is on private land and is fenced but the writer has visited the site several times without difficulty. The remnants of walls and earthworks are still intact, though there has been a lot of digging by bottle and artifact hunters. Ft. Craig is described in "Life and Death of a Frontier Fort: Fort Craig, New Mexico" by Marion Grinstead, published by the Socorro County Historical Society. The Val Verde battle-site is most easily reached by ranch roads on the east side of the river. The writer has not visited it yet but plans a trip soon.

For many years artifact hunters have been searching for abandoned equipment and debris that littered Sibley's path--particularly in the Rio Salado area where one of

--continued, next page--

Sibley's cannon was found by a sheepherder in the early 1900's. There should be two more cannon and the remnants of wagon hardware and baggage. A quantity of buried confederate explosives was excavated near the Rio Puerco when I-25 was being graded. Some of the Confederates camped for several days at Texas Spring on the west side of the Magdalenas, but no artifacts have been found in that area.

Sibley's campsite, on the mesa east of the Rio Grande, opposite Ft. Craig, has also been searched. A Bowie knife, buttons and the remnants of 30 supply wagons which Sibley burned have been found. Sibley had to abandon these wagons because the wagon mules were captured by Union soldiers when they went to drink at the river.

The cannons on display in Albuquerque's Old Town were buried in Albuquerque by Sibley during the retreat. They were dug up by Sibley's artillery officer 20 years after the war as he happened to be passing through New Mexico.

During the skirmishing around Ft. Craig, a volunteer officer named Paddy Graydon tried an experiment with explosive mules. In "Life and Death of a Frontier Fort: Fort Craig", Grimstead says, "Paddy Graydon managed to convince the brass that it would be a fine idea to load a few condemned mules with explosives, take them across the river and point them toward the Texan camp. After dark, Paddy, a few men and the four-legged bombs crossed the river and sneaked in close to the enemy camp. The fuses were lit and, with a little urging, the mules took enough steps toward the Texans to convince Paddy that he and his men could leave the scene. As the men neared the river on their return to the fort, one of them heard a suspicious noise and looked over his shoulder. . . . for the rebellious mules, who knew which way breakfast was, were right behind them. In the mad scramble for the river, the mules didn't make it."

For more information on the Confederate invasion of New Mexico, the following books are recommended:

1) Turmoil in New Mexico 1846-1868 by Keleher
2) Life and Death of a Frontier Army Fort: Fort Craig by Grinstead
3) Fort Union by Utley - National Park Service Handbook series No. 25
4) The Confederate Army of New Mexico by Hall
5) Historical Survey of the Socorro District by Alvin Sanders, BLM publications
6) Sibley's New Mexico Campaign by Hall
7) Historical Atlas of New Mexico by Beck & Haase

* * * * *

MORE ABOUT THE 100-METER RADIO TELESCOPE

Anders Winnberg

Some of you may still remember an article about the 100-meter (328-foot) telescope in the *Observer* back in 1974, written by Ivan Pauliny-Toth. At that time the telescope had just been completed so that Ivan couldn't give you any details on its performance or on any astronomical results obtained with it. Now, after six years of regular operation, one can certainly say a good deal more about these matters and I'll try to do so in this article. I'm going to give you some impressions of how the telescope is behaving and what its technical limitations are and then I'm going to pick out a couple of astronomical areas where I think the telescope has given significant contributions to science. Quite naturally the latter section will reflect my subjective point of view.

Let me start by pointing out that the telescope really has turned out to be very good and in many respects better than expected. This is probably a unique situation for a radio telescope and the full credit for this must be given to the Krupp Company who designed it. The quality of a radio telescope may be evaluated by looking at three major fields of technical properties:

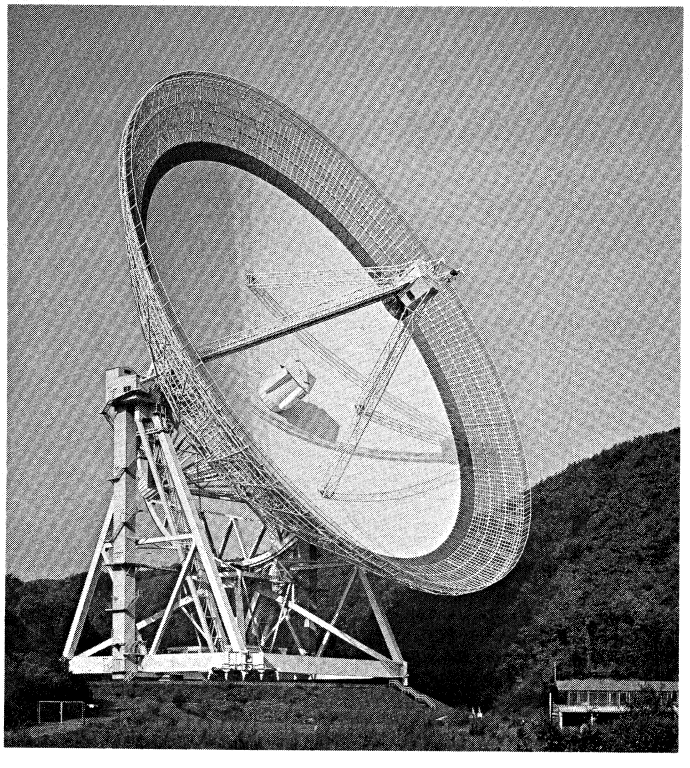
--continued, next page--

the surface accuracy, the pointing and the instrumental polarization. First, looking at the surface accuracy, perhaps you remember that the telescope has a so called homologous design. This principle, invented by Sebastian von Hoerner, means that its reflector is being deformed by the gravity by a large amount when the telescope is tilted towards the horizon but that the shape remains that of a paraboloid. This is the only shape that focuses parallel rays on to one point. The deformations cause the focal point to move but this is easily compensated for by moving the receiver horn under computer control so that it tracks the focus. This design has been working remarkably well even at high frequencies as shown by the relatively minor changes in telescope efficiency and beamwidth with elevation.

Today, the surface accuracy is even better after a readjustment of the reflector panels. The typical deviation from a best-fitting parabola over the inner part of the surface with a diameter of 75 meters (246 feet) is now only 0.5 mm (0.02"). This accuracy holds when the telescope is pointing between zenith and about 45° elevation. Below that there is a slight deterioration but at 10° elevation and a wavelength of 7 mm, for example, the efficiency is still about half that at the zenith. However, at high frequencies only a smaller part of the dish is used, e.g., 80-meter diameter at 1.3 cm and 75 m at 7 mm wavelength. One of the reasons for this is to keep the beamwidth from becoming too narrow to avoid pointing problems.

The pointing accuracy is remarkably good for a telescope of this size. This is due to its simple and symmetric alt-azimuth mounting. Making proper use of position calibrators, it is possible to determine positions of strong radio sources to an accuracy of a few seconds of arc. For example, positions of water vapor sources have been determined to an accuracy of 2". The beamwidth at this wavelength (1.35 cm) is 40". The computer pointing program allows for errors in the directions of the azimuth and elevation axis and for atmospheric refraction. The real limitation in the pointing accuracy is therefore the thermal effects, i.e., bending of the support structure caused by temperature differences between different parts of the structure. This is of course most severe in sunshine and at dawn and dusk. By the way, the beautiful red and blue support structure mentioned in Ivan's article is now long gone and the beams have been painted with the same white paint as the rest of the telescope. This decreased the thermal deformations considerably.

Every radio telescope has a polarizing effect on the received radio radiation. That is to say: even if the incoming waves are unpolarized, the measurements indicate the presence of polarization. When measuring radio polarization it is important that this "instrumental polarization" be as small and/or as constant as possible. At decimeter wavelengths the 100-meter telescope has a very low instrumental polarization indeed:



The Bonn 100-meter telescope

--continued, next page--

about 1% in the primary focus and less than 0.15% in the Gregorian focus. (The lower instrumental polarization in the Gregorian focus is due to the longer focal length.) These low values are the result of a very low "flattening" deformation of the reflector rim due to the homology, i.e., the shape of the aperture stays very close to that of a circle. It is now customary to measure the complete polarization properties of the radiation when mapping extended continuum sources on the sky.

This leads me into the question, "What interesting or important things have been observed with this radio telescope?" The fact that the telescope is an "all around" instrument makes it quite difficult to select important scientific results simply because of the large quantity of papers spread over practically the whole range of radio astronomy. I think the telescope has given its most important scientific contributions in the following areas: pulsars, nearby galaxies, giant radio galaxies, VLB-interferometry of radio galaxies and quasars, and galactic and extra-galactic spectral lines. The last mentioned area is of course a very big one.

In pulsar research the high sensitivity of the 100-meter telescope has been utilized for observations at high frequencies, where the pulsars generally are weak, and for observations of individual pulses. This research has had two main objectives: determination of radio continuum spectra of pulsars and the statistical study of microstructure mode changes and polarization of pulsar radiation. All this has served as the basis of several theoretical studies of the radiation mechanism of neutron stars.

On nearby galaxies work of two kinds has been running. On the one hand observations at decimeter wavelengths (21 and 6 cm) have been combined with observations of the same galaxy with an aperture synthesis instrument (mainly the Westerbock Synthesis Radio Telescope in the Netherlands) to obtain the so called zero spacing data, i.e., essentially all the data missed by the interferometer because of resolution effects. On the other hand several nearby galaxies have been mapped at shorter wavelengths to study the differences in radio spectra between different parts of the galaxy. This is necessary in order to answer questions like: Where in the galaxy are the magnetic fields and the very fast electrons causing the synchrotron radiation? Where are the ionized regions (and young hot stars) causing the thermal radiation?

During the last couple of years an interesting but still controversial series of observations has been carried out. These observations utilize the fact that the telescope has an alt-az mount. When tracking a source, the sky therefore rotates with respect to the telescope beam pattern. This can be used to separate the beam pattern response of a very strong unresolved source from the background map consisting of weaker sources. In this way weaker components apparently associated with the strong main components of a number of extra-galactic radio sources have been discovered. For example, the radio galaxy 3C123 has been mapped using this technique and two much weaker sources have been found on either side of the main component. There are weak "bridges" of emission between the main component and the "satellites" and, furthermore, the polarization of the radiation from the main component is in that same direction. If the two "satellites" are real, the extent of this radio source would be enormous -- some 30-40 Mpc! No wonder that this subject is controversial!

In VLBI the 100-meter telescope is playing a very important role because of its sensitivity. Also, the Max-Planck-Institute is now a center for VLBI in Europe because of the VLB processor which is stationed and operated in Bonn. The number of scientists active in VLBI has increased considerably during Ken Kellermann's 2 years' directorship in Bonn so that the institute now has a leading VLBI position in Europe. It is difficult to point to any specific contribution in this area of research which can be ascribed to the 100-meter telescope alone. Not only are the results due to the simultaneous use of several telescopes but the scientific

--continued, next page--

ideas and the analysis of the data are often spread between persons stationed at the various participating observatories.

Several important scientific results have been obtained with the 100-meter telescope in spectroscopy. Starting with the most famous radio line — the 21-cm line from HI. The 100-meter telescope is the only radio telescope for which very accurate line profiles of galactic neutral hydrogen can be obtained. Since the 21-cm line is distributed all around the sky, a considerable part of an observed line profile (for higher galactic latitudes as much as 50%) is due to radiation entering the far-off sidelobes of any telescope. Therefore the line profile observed in a certain direction may look quite different at various times of the year and day. This problem has been known for many years but before now no one had invested the considerable time necessary to write a program to correct for the stray-radiation. Although this has nothing directly to do with the performance of the 100-meter telescope, I wanted to mention it because the solution of this problem is of great importance for further work based on 21-cm observations.

The most interesting and unique spectroscopic results from the 100-meter telescope have been obtained at the shorter wavelengths, say shorter than 6 cm, where its effective area is so much larger than that of any other existing radio telescope. Several recombination line transitions from hydrogen, helium, carbon, and sulphur have been studied both in HII regions and in surrounding dark clouds. Extremely broad lines have been observed in the Galactic Center indicating mass motions of the order of 200 km/s.

Some new molecular lines have been discovered with the 100-meter telescope. I would like to mention three of them. The first one is a line from formic acid (HCOOH) at 6-cm resulting from a transition between two rotationally excited levels. (See Figure 1) The line from the ground levels had been detected at the same position in the sky with the 140-foot telescope several years earlier but this

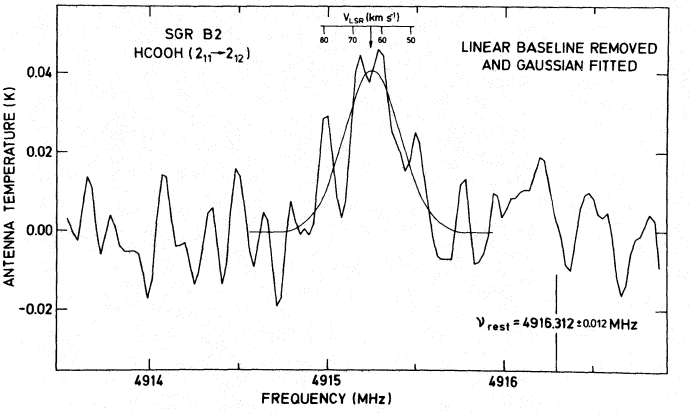


Figure 1.
A spectral line of formic acid (H_2CO_2) observed close to the Galactic Center at 6-cm wavelength with the 100-meter telescope. Winnewisser and Churchwell, 1975.

detection was controversial since it was contaminated by two strong absorption lines of ^{18}OH. The observation of the excited line firmly established the existence of formic acid in the interstellar space. Later on, the ground state line was confirmed with the 100-meter telescope. This line was seen uncontaminated by the OH lines because of the narrower beam width as compared to that of the 140-foot telescope.

Another molecule whose existence in the interstellar space has been established using the 100-meter telescope is methyl formate ($HCOOCH_3$). Two spectral lines from this complicated molecule were detected at 18-cm from the same cloud near the Galactic Center called Sagittarius B2 (Sgr B2) where formic acid had been seen. An earlier detection with another radio telescope had been very uncertain.

The third line I would like to mention is from OH — a well known and abundant

--continued, next page--

molecule in space. Two lines from the highest excited levels so far observed from this molecule were discovered at Effelsberg at a wavelength of 1.3 cm. They were seen in absorption towards the compact HII region W3 (OH) and they tell us something about the energy output in the infrared from this HII region.

A large number of dust clouds have been studied in lines from the molecules formaldehyde (H_2CO), ammonia (NH_3), cyanoacetyline (HC_3N) and cyanodiacetyline (HC_5N). The ground-state formaldehyde line at 6-cm is usually seen in absorption even if there is no background continuum source. This is due to a cooling mechanism -- a kind of inverse maser. However, a rare case of emission has been observed with the 100-meter telescope.

A very dense and cold cloud embedded in a bigger and more rarified dust cloud in Taurus has been studied in HC_3N, HC_5N, and several other molecules. This cloud has a mass comparable to the mass of the sun, and a temperature about 10 degrees above absolute zero. The cloud probably is collapsing to form a star.

High quality observations of ammonia lines from dust clouds have also been obtained. The great advantage with this molecule is that there are so many lines over a wide range of excitation levels but within a very narrow range of wavelength (about 1.3 cm). This means that one can sample all these lines with the same receiver and about the same resolution and therefore determine quite reliable temperatures of the cloud. Interesting results have been obtained from the dense dust clouds around W3(OH) where the ammonia lines turn up in a complicated mixture of emission and absorption.

Nearly all kinds of maser amplified molecular lines (including 7-mm 5:0 lines) have been observed with the 100-meter telescope. Particularly notable is a long series of observations of a class of water vapor sources at 1.35 cm wavelength associated with very young massive stars. From this study, which was followed up by several VLBI studies, considerable insight into the violent phenomena close to

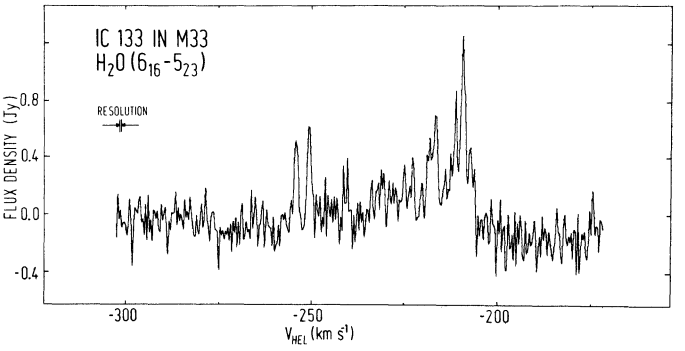


Figure 2
A maser amplified spectral line of water from the nearby galaxy M33. The peaks are Doppler striffet versions of the same line from clouds with various radical velocities. Churchwell, Witzel, Huchtmeier, Pauliny-Toth, Roland, and Sieber, 1977.

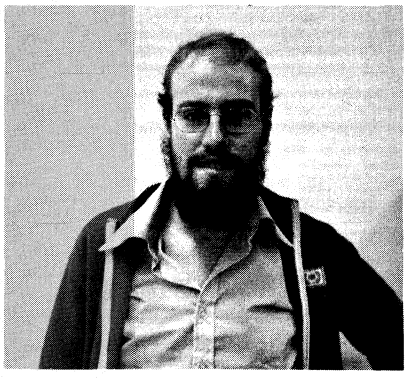
these young stars has been gained and a large number of previously unknown water vapor sources of this kind have been discovered. Since these sources are intrinsically very strong, they are an ideal tool for finding places of star formation throughout the Galaxy. By the way, the first detections of water vapor lines in other galaxies have been made with the 100-meter telescope -- 3 in M33 (See Figure 2.) and 2 in 1C342.

I think this is sufficient as an overview of scientific results obtained with the 100-meter telescope. I am convinced that it still has a long, productive future ahead. The most important results are likely to come from observations at wavelengths shorter than 1-cm where the telescope has not been used very much yet. We now know, however, that it is still very powerful at 7-mm and probably quite good down to 6-mm, where atmospheric oxygen absorption puts a natural limit. The telescope has been tested at 4-mm wavelengths but this test indicates that the efficiency is quite low and variable. Good receivers are now planned for the frequency range 20 to 50 GHz starting with a maser receiver for 18-26 GHz.

* * * * *

PERSONNEL UPDATE

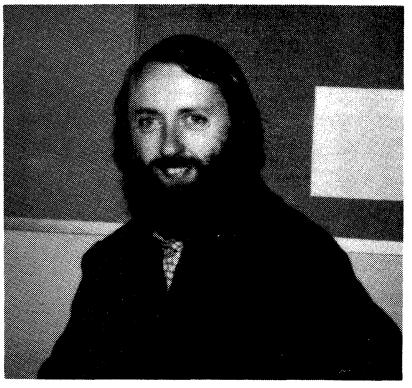
NEW EMPLOYEES



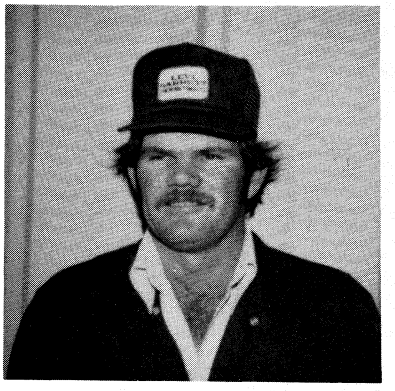
Tom M. Brookes
Research Assistant
Electronics Division - CV

William D. Cotton, Jr.
Systems Scientist
Computer Division - CV

Susan T. Eveleth
Clerk Typist
VLA Project Management - VLA

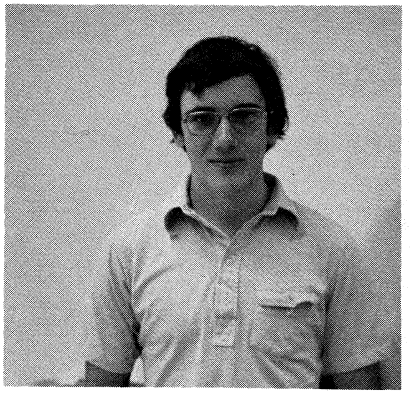


Eric Graham
Scient. Programming Analyst I
VLA Scientific Services - NM

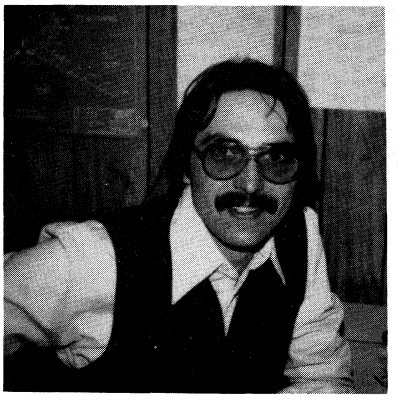


Steven G. Grayson
Telescope Mechanic
VLA Antenna - NM

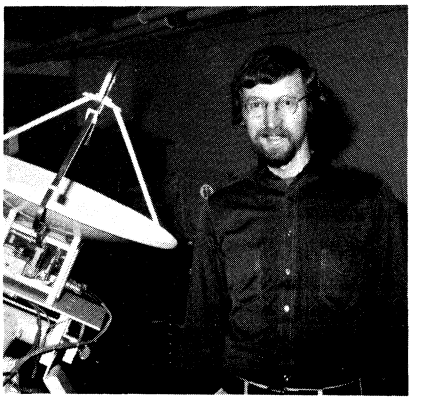
Stephanie J. Hanna
Clerk
Director's Office - CV



Mark A. Harig
Technical Trainee I
Computer Division - CV

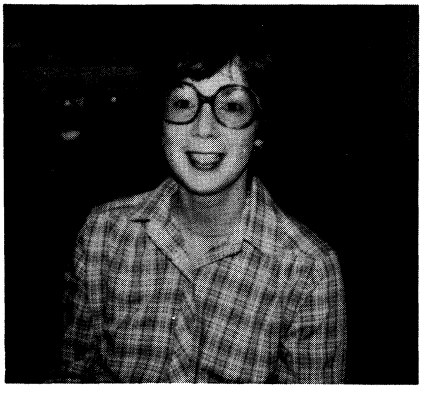


Paul J. Riehle
Designer
VLA Antennas - NM



Michael P. Schwantke
Technical Specialist III
Telescope Operations - GB

NEW EMPLOYEES (Continued)



Linda L. Staley
Secretary A
VLA Project Management - NM

OTHER NEW EMPLOYEES - PHOTOS NOT AVAILABLE

Eugene L. Aragon	Maintenance Trainee	VLA Project Management - NM
Patrick E. Palmer	Visiting Scientist	Basic Research - NM

REHIRE

Rosalie G. Douglas	Technical Specialist	Tucson

TRANSFERS

Kerry C. Hilldrup to Computer Division - CV

LEAVE OF ABSENCE

Robert L. Brown

RETURN FROM LEAVE OF ABSENCE

Kenneth I. Kellermann
Rick J. Bearfield

TERMINATIONS

Frederic Bandle	Florence C. Foster	Charles Puffenbarger
Roger D. Blandford	Mark R. Kostora	Ronald Silver
Michael D. Crist	Eric R. Nelson	Michael F. Thomas

NRAO CHILI FIESTA

Stephanie Hanna

Question: What has 68 legs, an enormous appetite, and smells like Mexican food?

Answer: The participants in the First NRAO Chili Fiesta, of course.

Our very own Pat Smiley and Monroe Petty provided the main course -- award-winning chili con carne. To create the proper atmosphere in this cold Virginia climate, Galen Gisler donated a Mexican blanket and poncho; in no time at all, the Edgemont Road auditorium was converted into a veritable cantina. Background music came to us courtesy of Joan Martin and the Tijuana Brass. Although several people suggested bringing dancing girls, no one actually carried out the offer.

Besides the main course, the partakers downed tortillas con queso, krupuk (what's an Indonesian dish doing at a Mexican luncheon?), corn muffins, garlic bread, salad, crackers, corn chips, three dozen bottles of soft drinks, and Jalapeño peppers. Alka Seltzer, anyone?

Galen Gisler, our resident (New) Mexican, dishes up the chili.

RENO RED CHILI

From the Kitchen of Monroe Petty

3 lb.	round steak, cut into small chunks
3 lb.	chuck, coarsely ground
8 T.	chili powder
3 T.	cumin seed, crushed
6	medium cloves garlic, smashed
6	dried red chili peppers. stem, seed, and boil 30 minutes in 3/4 c. water
1 T.	oregano -- brew in 1/2 c. beer
3	medium onions, chopped
2 T.	paprika
2 T.	cider vinegar
2	cans beef broth
1	can stewed tomatoes

Brown meat, adding black pepper to taste. Add chili powder, cumin seed and garlic. Cook 30-45 minutes, using as little liquid as possible. Add cooking water from peppers as necessary. Scrape pulp from boiled chillies and add to meat mixture. Add onions, oregano and beer mixture, paprika, vinegar, beef broth and tomatoes.
Simmer 45 minutes. Add additional salt, chili powder and oregano to taste. Simmer 45 minutes. If desired, add 30 oz. can kidney beans 10 minutes before serving.

NOTE: This is best if chilled and reheated.

WHAT'S COOKING

WACKY CAKE

Pat Crane

3 c. flour
2 c. sugar
6 T. cocoa
2 t. baking soda
1 t. salt

Put all in one 9 x 13 pan; make 3 holes:

In first hole put -- 2 T. vinegar
second hole -- 3 T. vanilla
third hole --12 T. oil or melted shortening

Over all this pour 2 c. water. Stir until well blended. Bake 40 minutes at 350°.

MISSISSIPPI MUD CAKE

Karen Collins

Mix the following ingredients:
2 sticks margarine
1/3 cup cocoa
2 cups sugar

Beat 4 eggs into the above one at a time.

Then add the following ingredients:
1½ cups flour
1 tsp. baking powder
1 cup coconut (optional)
1 cup nuts (optional)

Grease and flour 9 x 13 pan. Bake at 350° for 35 to 40 minutes. While hot, put a 7-ounce jar marshmallow cream on cake.

FROSTING for MISSISSIPPI MUD CAKE

1 stick margarine
1 lb. confectioners sugar
5 to 7 tablespoons milk
1/3 cup cocoa

Bring to boil. Add 1 tsp. vanilla. Let cool slightly before pouring on cake.

CARROT CAKE

Irene Varner

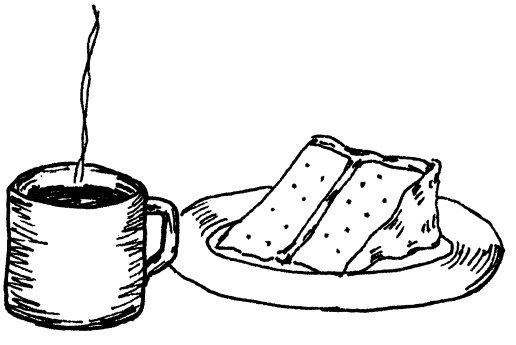
2 c. sifted flour
1 t. baking powder
1 t. baking soda
1 t. cinnamon
¼ t. salt
4 eggs
1½ c. salad oil
2 c. grated carrots

Combine 1½ cups of salad oil and 2 cups sugar. Mix well. Add, one at a time, 4 eggs; beat well after each addition. Gradually add dry ingredients, mixing well. Then add 2 cups finely grated carrots (approximately 1 pound); stir in with spoon. Turn into 3 8-inch layer cake pans which have been greased and floured. Bake in oven at 350° for 50 to 60 minutes. When completely cool, frost with nut icing.

NUT ICING

½ c. of butter or margarine
1 pkg. of cream cheese (8 oz.)
1 box of confectioners sugar
1 t. vanilla
1 c. chopped walnuts

Blend ½ cup butter or margarine and 1 package cream cheese. Beat until light and fluffy. Gradually add, while beating, 1 box confectioners sugar. Add 1 tsp. vanilla. Stir in chopped nuts.



THE UNITED STATES NAVAL OBSERVATORY

The mission of the Naval Observatory is to provide means for safe navigation and accurate time, as well as to contribute to the general advancement of navigation and astronomy. The Naval Observatory serves as the sole authority in the United States for astronomical data required for navigation, civil affairs, and legal purposes. It discharges this primary function through the publication of The Nautical Almanac, The Air Almanac, The American Ephemeris and Nautical Almanac, catalogs of positions and motions of stars, numerous scientific publications, and the dissemination of accurate time through comparisons of clocks around the world with its master clock. In its work the Observatory has gained a leading position since World War II in comparison with the efforts of other nations.

The staff of the Naval Observatory has to provide the large body of fundamental research required to predict, for the use of navigation in the broadest sense, the positions of planets and stars, as well as provide the most accurate time. The scientific staff must have both the research and the production expertise needed to provide a reliable product for the Navy, the Department of Defense, the Nation, and other countries. It is the only scientific institution in the U. S. with this unique combination of research and production. Because of this, the spinoff of the mission of the Naval Observatory, the Department of Defense, the scientific community, and industry is considerable.

The Naval Observatory is the only observatory in the United States, and one of the few in the world, with an ongoing program for determining fundamental positions of the Sun, Moon, planets and selected stars. These observations, made with transit circle telescopes, are utilized in the establishment of a fundamental celestial coordinate system. This is absolutely essential for the determination of the position of fixed and movable objects on the surface of the Earth, and in space, i.e., for all aspects of navigation in the broadest sense of the word. A continuing research effort is conducted to improve the equipment, the methods of observation and the complex mathematical methods of data reduction, in order to comply with the ever increasing demands for more accurate positions dictated by more sophisticated weapons and defense systems. Following are a few examples of such research. The vastly more accurate position determinations possible through the use of radio telescopes are being explored using a complex radio telescope in West Virginia. Research is conducted into methods to better determine refraction of light in the Earth's atmosphere, one of the major sources of uncertainty in optical position determination. Accurate stellar colors need to be taken into account in position determination, and are measured at the Observatory's Flagstaff Station in Arizona. A highly automated transit circle telescope is being developed, which requires extensive research and development in the areas of electronics, computer technology, optics and mechanical engineering.

Because the stars move in the sky (motion which is imperceptible to the human eye even over a period of hundreds of years, but which would create havoc in highly accurate navigation if it were not known), the position determinations have to be repeated essentially continuously to update the star catalogs. These observations also utilize the observational equipment at the Flagstaff Station in Arizona, as well as sophisticated measuring machines utilizing new principles invented, designed, and built at the Naval Observatory.

In the production of the almanacs, extensive use is made of these fundamental position determinations in order to predict positions of stars and planets for several years in the future. In the case of the planets, this prediction requires a very precise knowledge of their orbits. This involves a research effort of formidable

--continued, next page--

magnitude requiring some of the most accurate mathematical calculations ever made in any field of science. The planets in turn, through their gravitational force, have an influence on the motion of the Earth, and therefore precise knowledge of planetary masses and positions is essential for determining the position of the Earth in space and its motion, again needed for accurate navigation.

The Naval Observatory is, by Department of Defense directive, charged with the sole responsibility for Precise Time and Time Interval determination, dissemination, and management. It has developed the world's most accurate atomic clock, a composite clock which has also achieved supreme reliability. Increasingly accurate and reliable time information is required in many aspects of military operations. All modern navigational systems depend on the availability of highly synchronized clocks. This holds for such ground-based systems as LORAN-C as well as for the Department of Defense satellite-based NAVSTAR Global Positioning System. The reason is that they are all based on light-travel time: accuracy of 10 nanoseconds (10^{-8} seconds) corresponds to 3 meters. In communications and the intelligence community, time synchronized activities are essential. The Naval Observatory is the time standard for all of these systems: they are all referred back to its master clock.

Thus, the Observatory must maintain a clock system which is at least one step ahead of the demands made on its accuracy, and must anticipate expected developments many years ahead. Such activities require a major research effort in addition to the day-to-day operations. Maintaining accurate time in naval bases and other defense facilities around the globe requires a continuous transporting of highly accurate clocks in airplanes. Future possibilities for accurate time synchronization which are being implemented are the use of radio telescopes as well as satellites (Transit, GPS). The use of laser ranging of satellites for time synchronization is being studied. In turn, the positions of such satellites must be known with the highest possible accuracy, which can only be accomplished by measuring their motions against a well-calibrated background of stars and measuring the irregularities of the rotation of the Earth through astronomical observations.

* * * * *

GREEN BANK MUD DAUBERS

Leona Brown

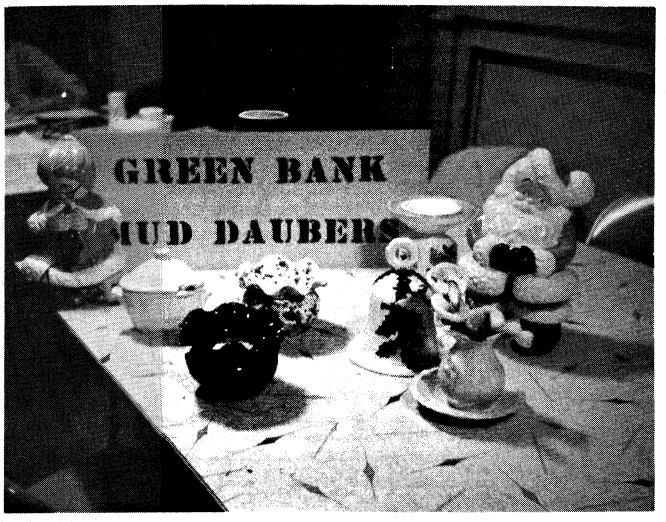
"While ceramic art is one of the oldest forms of expression known to man, its magic, mystery, and excitement keep ceramics a constantly new and challenging adventure ... The magic that lures the ceramist is the timeless magic of earth and fire. The mystery that intrigues him is the process by which dull mud can be formed into a hard, jewel-like object."

These sentences from Joan B. Priolo's Ceramics -- and How to Decorate Them (Sterling Publishing Company, New York) help explain the interest in various phases of ceramics that has persisted for over a decade at NRAO in Green Bank.

About 1962, the Recreation Association installed a kiln and a potter's wheel in the Arbogast House on the observatory site. About thirty-five people, children and adults, were interested in glazing and firing greenware, which was purchased in Pittsburgh and brought to Green Bank by Harry Wooddell, who was then on the NRAORA board.

An article by Perryn Fleming and Jean Davis in the September 1970 issue of the *Observer* reports on "Clay Day", a pottery workshop for children and adults conducted by Mary Bridle, wife of a visiting astronomer and a potter and occupational therapist by profession. Clay for this workshop came from Johnnie Hill's farm at Hillsboro. (The availability of native clay makes Pocahontas County an ideal location for pursuing this hobby.)

--continued, next page--



In 1972 the wheel and kiln were moved to the Hannah House. With Perryn Fleming and Bette del Guidice the "prime movers", the Hannah House became a craft studio available for many projects -- candle making, tie dyeing, block printing, silk screen printing, and, of course, ceramics. An open house in January of 1973 featured hand built and wheel thrown pottery along with other crafts.

About four years ago, beginner's classes in glazing greenware, funded by NRAORA, sparked a new interest in ceramics. Although only about twelve people took these classes, by 1979 the interest had grown and Green Bank Mud Daubers came into being. This organization of about thirty-two people, which is independent of NRAORA but composed of employee members and guests, was organized to facilitate handling orders for greenware and supplies. Since the group is so large, it divided into two groups, one meeting on Monday evenings and one on Wednesday mornings. Janet Warner became the "general overseer" of activities, and officers were elected: Becky Warner, president; Karen Brown, vice president; Linnae Madron, treasurer; Linda Snyder, Monday secretary; and Juanita Hunter, Wednesday secretary. Officers handle money and orders for greenware, glazes and supplies which are purchased from a dealer in Charlottesville. Volunteers are scheduled for loading and unloading the kiln and doing switch-ins.

On November 5, members exhibited some of their finished products (see picture) and elected new officers for 1980. These are: president, Karen Brown; vice president, Mary Ralston; treasurer, Linnae Madron; Monday secretary, Pearl Clarkson; Wednesday secretary, Juanita Hunter.

Interest in ceramics is spreading into the community. This fall, there was an evening adult education class at Pocahontas County High School, with people from as far away as Marlinton attending, and more classes are contemplated for the spring term. A new ceramics shop, offering glazes, supplies, and firing services, has opened at Arbovale.

Those who, down through the years, have "gone to pot" (ceramically, that is) at the Hannah House, have found a fascinating, fulfilling, and yes, even therapeutic hobby.

* * * * *

SILLY SNOW IN CHARLOTTESVILLE

Sarah Martin

Here it is early March and I'm marveling over the unpredictability of the weather and wondering how I shall remove the foot of "partly cloudy" that surrounds and covers my lemonmobile. I find myself thinking of the silliness that strikes Charlottesville simultaneously with the first flake. Although one (especially this one) hopes this particular silly winter season is about over, I feel it my bounden duty to alert potential sojourners in our fair city as to what to expect if you're here during an unexpected snowstorm (and they're all unexpected).

First, one is well advised to stay away from grocery stores. For some strange reason, the first flakes always convince every Mother (and Father) Hubbard that their cupboards are bare and being also convinced that they'll be cut off from the rest of the world for the next three years, they rush out to stock up. This fact was unfortunately brought home to me this past weekend when I journeyed out early on a Saturday morning to do my weekly shopping. I deliberately shop

--continued, next page--

early on Saturday mornings because there's seldom anyone in the stores outside of me and the stock clerks. Well, the three flakes that had fallen by the time I arrived had been enough to unleash the teeming hordes and I witnessed supposedly civilized people at their sillist.

By the time I had picked up my usual gruel mix and sundry portable vices, passed through the check out counter and pushed my shopping cart outside, the situation had gotten out of hand. I was followed out of the store by a woman with a desperate look in her eyes. I left the basket and started carrying the bags to the car, while this woman sort of hung over my cart like a vulture waiting for the last breath. As I lifted the last bag from the basket, the woman grabbed with her claw-like hands, cackled ominously, and captured the cart. It seems the store had run out of super market buggies and she'd been trailing me for the last 20 minutes, waiting for me to release the valuable commodity.

Second to be considered in Charlottesville snow is the day of the week on which the white stuff comes down. Luckily, this particular storm started on the weekend. The weekday ones are even more exciting. Public officials, knowing that there's a world-wide overpopulation problem, consistently recommend release of employees when traveling is most hazardous, so as to increase the likelihood of accidents. This serves several useful purposes besides decreasing the surplus population: it lines the pockets of insurance adjusters, increases employment in car repair establishments and mental health clinics, and saves the city lots of snow removal money since cars of homewardly rushing workers melt the accumulation.

The University of Virginia officials decided a few years ago that too much time was wasted by employees waiting for news of snow closings, so they adopted a policy whereby the University never closes. This innovative approach lasted until the first big snow when they buckled under pressure from Crozet commuters and began again to release employees during the height of the snow storms. (They probably also realized that the amount of time being spent discussing "how I made it through the storm to my trusty desk" was equal to or greater than the amount of time spent wondering when employees would be sent home.)

Part of the reason that the University and other employers decide to send workers home early during storms is so that the workers can go out hunting for their children. The schools, you see, have muddled about so much in closing that parents are never sure whether their kids are still in school or not.

There is, what I hope, an apocryphal story about the District of Columbia schools concerning the morning city schools closed after the kids had gone to school and their parents to work. This resulted in 4,123 kids missing and presumed lost. Actually, I don't think they're lost at all. I think the cancellation notice came while the kids were still on the school buses and the poor bus drivers got so confused, they're just aimlessly driving around DC and the kids are on a ride around forever, like poor Charlie on the MTA (I will be pleased to explain that reference to any post-Kingston Trio babies who don't understand).

Cabin fever is the name given to the affliction that strikes many local residents about three hours into any storm. There's an innate fear of <u>having</u> to stay in one's home. Soon after recovering from the five hour trip home from the office, they suddenly find it necessary to get out. During the last snow storm, I was fascinated to watch literally all of my neighbors venture out in their automobiles despite the six inches of snow on the ground and the white stuff still falling steadily.

I, on the other hand, was much more sensible. I walked over to a friend's house for dinner. There's nothing crazy about that - a free meal is a free meal. Besides, it gave me the opportunity to see up close the crazies who insisted on driving during the blizzard.

The only really good thing about a Charlottesville snow is that it's usually

--continued, next page--

gone within a day or two. However, it has one long-term deteriorative effect. You have to listen to the seemingly endless stories of "what I did during the big snow", one of which you have just spent your time reading. Silly person.

* * * * *

GREEN BANK BOWLING

Roger Norrod

Bowling in Green Bank? Not exactly. Every Tuesday night five brave NRAO souls bundle into a car and head over Cheat Mountain to bowl in the Elkins 6:30 p.m. league. The results are in for the first half of the season and, despite the team's protests, will be reported here.

Bowling on the NRAO team during the first half were:

E. Arbogast	M. McGreal
H. Brown	W. Monk
H. Crist	R. Poling
M. Damashek	B. Vance

Wendell Monk showed the best results on the team with the high average (174), six 200 + games, and the two highest series (604, 605). Rus Poling had the high game (255) and the third highest series (594). Bob Vance bowled the second best average (162) and also bowled two 200 + games.

Green Bank is at an obvious disadvantage since few team members get to bowl except on league night, yet still manage to finish near the middle of the twelve team league. With five new members, the team has started slow in the second half but everyone is concentrating on beating their average and hopefully our record will improve. Most members consider the night a success if they stay out of the gutter and don't slide off the side of Cheat coming home.

The bowling season runs from September through May and we're often looking for someone to substitute. If you're interested or would like to bowl regularly next year, contact Dick Hiner or any other team member.

TAX TIPS

Marty McGreal

At this time each year the government asks us to take our eyes off the stars long enough to study and plot the course of our personal finances for the last year. Most of us have been doing this for a number of years and have figured out the basics or found a good tax advisor. But, there usually is some doubt in our minds that we have forgotten to report some income or failed to take some deductions. Therefore, I have compiled some items that you may have overlooked. I am not going to list everything but just some of the items you may have overlooked.

Income: Have any life insurance policies? Those dividends are not income (unless they exceed the accumulated net premiums paid), but the interest is taxable. How about last year's refund? If you itemized deductions for 1978 and also got a refund on your state tax return (you didn't get it until 1979) you must include it in income for 1979. If you didn't itemize for 1978, don't worry about it. If you got a refund on your federal return, it is not taxable either way.

If you won a contest and received merchandise, it must be included in income to the extent of its fair market value (this could be less than the manufacturer's suggested retail price, so get substantiation such as newspaper ads for the same item, etc.).

If you received reimbursement from the company for educational assistance it is not taxable (look for more on this subject under deductions).

Here's a new item this year: if you received unemployment compensation, it may be taxable. Check the instructions for Form 1040 line 20 to see.

Adjustments to Income: Did you move during the year because of a change in job location? If you haven't hit that $3,000 maximum, here are some things you may want to include: costs of selling or buying a house or getting out of your lease. You

--continued, next page--

can deduct such things as legal fees, real estate commissions, title costs and appraisal fees.

Did you travel on company business? Yes, but you were reimbursed by the Observatory so it's a wash, right? Wrong. You were reimbursed for your mileage at 18¢ per mile. The IRS allows you to deduct 18.5¢. A half cent is not much but if you kept accurate records, you could deduct the actual expense of operating your vehicle. This could be considerably more. The way prices are going, it could be even more in 1980, so you may want to watch your expenses closely.

Deductions from Income: First, remember qualified expenses are deductible only in the year they are paid. However, if you charge it on your bank credit card, the IRS considers it paid the date it is charged, doesn't matter when you repay the bank (except to the bank).

Medical: You probably already know medical insurance premiums are deductible, but did you know that contact lense replacement insurance qualifies? And medicine and drugs don't have to be prescribed. As long as it is recommended by your doctor. This includes special foods or drinks prescribed by your doctor. Also, don't forget about transportation. You can deduct 8¢ per mile for your car plus parking fees and tolls.

Home improvement costs might even qualify. A Hawaii District Court decision allowed the full cost of constructing a swimming pool as a medical expense.

Taxes: If you bought a new car, truck, trailer, boat, etc., you can deduct the sales tax in addition to the normal allowance given in the sales tax tables. If you want, you can forget the tables and save your receipts, add up the actual tax paid and deduct that. (I've never done it but I've heard you can get a much bigger deduction this way. But, if you do, be prepared for some work).

Interest: Don't forget the interest on charge accounts. Also, the interest on that loan you paid off back in February or March.

Contributions: Those old clothes you gave to the Salvation Army or other charitable organization -- you can get a deduction for them at their fair market value.

What about your time spent working for a qualified organization? Sorry, you can't deduct that, but you can deduct your out of pocket expenses and transportation expenses (including your personal auto at 8¢ per mile).

Casualty or Theft Losses: With higher deductible on insurance, you may have some deductible expenses here. Here's an example: You wreck your car. It costs $750 to repair. Your insurance only covers $500 because of a $250 deductible. You can deduct $150 on your return. If you had no insurance, you could deduct $650.

Miscellaneous Expenses: Here's a check list from the IRS.

Employee Expenses:

- Dues to professional societies
- Employment-related education
- Laboratory breakage fees
- Liquidated damages to former employer
- Malpractice insurance premiums
- Medical examinations required by employer
- Occupational taxes
- Part of home used regularly and exclusively in work
- Research expenses of a college professor
- Seeking new employment
- Small tools and supplies
- Subscriptions to professional journals
- Uniforms not for general use
- Union dues and expenses

Expenses of Producing Income:

- Certain interest
- Certain legal and accounting fees
- Clerical help and office rent in caring for investments
- Custodial fees in connection with property held for producing income
- Expenses of an income-producing hobby -- (see Nondeductible expenses)

--continued, next page--

Fees to collect interest or dividends
Gambling losses (but not more than gambling winnings)
Investment counsel fees
Safe deposit box rental

Other Expenses
Certain appraisal fees
Tax counsel and assistance

Remember that education expense I mentioned before? Well, here's the scoop. If the education relates to your job, you can deduct expenses including tuition (less company reimbursement), books, supplies, lab fees, and similar items, and certain travel and transportation costs.

If you thought those deductions were good, here's something better, credits -- dollar for dollar reductions in tax.

You can deduct half of what you contribute to a candidate for public office. The maximum credit is $100 on a joint return with $50 for single persons or married persons filing separately.

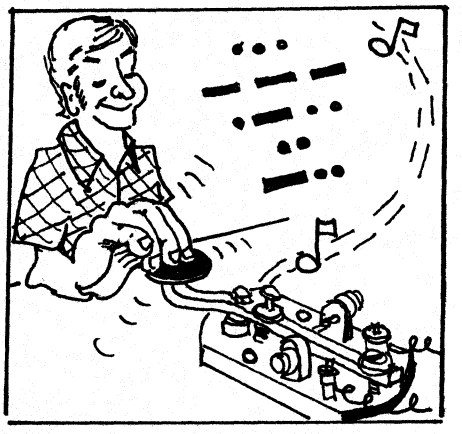
Credit for child or dependant care. If you both work and you have a child under 15, you can take a credit of 20 per cent of the first $2,000 of child care expenses ($4,000 if you have 2 or more children under 15).

There's the residential energy credit. Everybody knows about that, right? Here's where it differs from other deductions and credits. You can go all the way back to April 19, 1977, for qualified expenditures; not just current year expenditures. Gee, I hope you saved those old receipts!

A few final notes. 1. This article should not be used as a handbook to complete your tax return. I'm just trying to get your brain thinking about the right subject. 2. If you think something applies to you, check it out with (a) your tax adviser (his fee is tax deductible), (b) a good tax guide (less than $10 will buy a good one and it's tax deductible too), or (c) call the IRS, they have a toll free number and will answer your questions free. (I'm not going to give it to you, look it up in the phone book yourself).

Wally tells me this issue is due out at the end of March, but because of the print shop's priorities may not be out until after April 15th which would mean you already filed this year's return. If you overlooked something, you have three years from the time you filed the incorrect return to file an amended return.

* * * * *



HAMMING IT UP FROM NEW MEXICO

by Paul Harden KA5CNE

In the December 1978, *Observer*, Dave Shaffer, W8MIF, wrote an interesting and informative article about amateur radio. This article briefly presents some of the amateur radio activities at the VLA and the Socorro area, in the hope that the readers find it as interesting as we did Dave's.

Socorro, a community with an unofficial population of about 6500, has a ham population of 33, a rather high density by national standards. The VLA with a more or less population of 120 has its share of hams as well. There are ten of us at last count, tabulated below:

Bill Dumke WB5TCO
Chuck Broadwell W5UXH

--continued, next page--

Paul Harden	KA5CNE
Larry Beno	WA6GFE
Bob Mitchell	K5WXR
Jim Oty	WB5GWH
Al Miller	KA5FCT
Daryl Grant	W7LHO
Walt Clayton	W5FZ
Mark Jenkins	WBØSKP

Most of the VLA hams have been licensed for a good number of years. Al Miller is the newest, licensed in mid-1979. Bob Mitchell, whose first license was obtained in 1930, has held a valid license for fifty consecutive years.

I like to compare amateur radio to stamp collecting. It too is a fascinating hobby in which one may collect only U. S. stamps, others prefer foreign varieties and yet another collects stamps of a specific topic (say, stamps about space or famous persons). It's all the same hobby. Amateur radio also takes many forms: communciations via Morse code, single-sideband phone, teletype, slow and fast scan TV, via satellites or moon bounce, etc. As discussed in Dave's article, the reasons for communicating with other ham radio operators is just as varied: to test out new equipment, seeing how "far" one can communicate with distant stations (called DX), talking to friends about one thing or another (called rag-chewing or round-tables), to participating in various types of contests to sharpen operating skills and competing for numerous certificates and awards.

Many hams also participate in a system specializing in passing personal messages from non-hams to their friends and families to virtually any place in the United States and Canada. These are called "message nets". These nets become highly active and mobilized during an emergency (such as the Wichita Falls tornado disaster, hurricanes, floods, etc.) A tremendous number of messages are handled into and out of a disaster stricken area through these nets and the efforts of individual amateur radio stations. Passing thousands of routine messages by the month keeps many amateurs in a high state of readiness for when our emergency services are called upon.

Another method by which many amateurs keep themselves in a state of emergency readiness are numerous activities that simulate such emergencies. One such event is an annual occurrence known as "Field Day". This is an emergency readiness exercise in which local ham clubs "go to the field" to set-up a self-contained station, generating their own electrical power needs and simulating an emergency environment. The goal is to contact as many other stations also operating under these conditions as possible, during a 27-hour period, which also must include the station set-up time. Last year the local amateur radio club in Socorro, the Socorro Amateur Radio Association (SARA), participated in this event by establishing a two transmitter station in an old box-car near Socorro's city park, generating our own electricity from a Sears gas generator.

The SARA/VLA hams accumulated a score of 2100 points, representing over 900 contacts in which stations in all 50 states, 7 Canadian provinces and 5 foreign countries were contacted. It is interesting to note that over 1700 other clubs participated in the 1979 Field Day, representing a total of 23,612 U. S. hams taking part in a venture that mixes fun with a purpose.

The accompanying photographs were taken by Donna Grant (W7LHO's wife) during the last Field Day. It does emphasize the extreme mobility of today's solid-state equipment, a true advantage should an emergency occur.

The SARA/VLA hams also maintain a 2-meter (146 MHz) repeater atop Socorro's "M-Mountain". Dave's article discussed the importance of maintaining communications on a local level during emergencies, power outages, etc. Throughout the country there are hundreds of these 2-meter repeaters that allow hams, usually from their cars (mobile) to contact hams in nearby towns to report adverse road conditions, accidents, request police or medical assistance to even finding out where the best place is to eat and sleep for the traveling ham. Many repeaters (but not ours yet) have "auto-

--continued, next page--

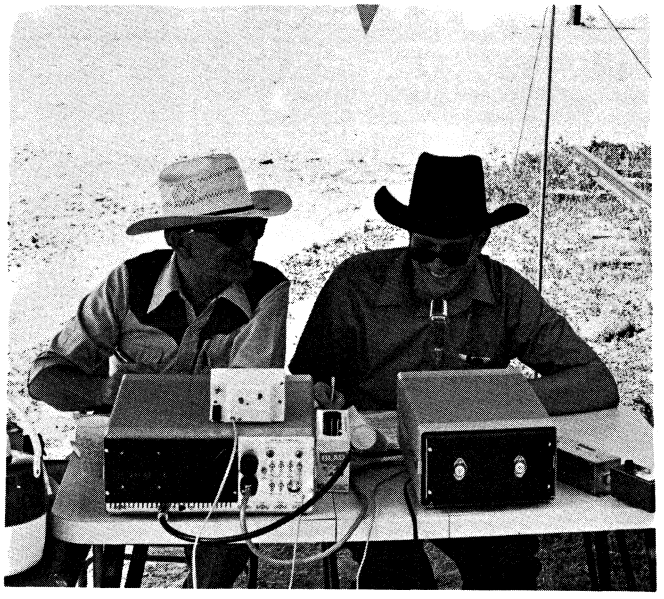
Part of the Field Day station. Two dipoles and one 20M vertical antenna were used (barely visible).

patching" facilities, which allow a ham, through a touch-tone keypad, to connect the repeater to the local telephone system so that he can place a call directly. Many hand-held and mobile 2M transceivers have this feature, giving amateurs a remote link to Ma Bell.

The SARA/VLA hams have done some novel work with our repeater for local search and rescue operations and with the direction finding capabilities in detecting and locating a downed aircraft. This is a paramount problem in this part of the country with miles of open airspace between towns and cities. A downed aircraft can go undetected (and certainly not be found) for days. Bill Dumke, WB5TCO, has designed and built for the club a direction finding unit for the detection and location of ELT (Emergency Locating Transmitter) signals that are activated upon impact of a troubled plane. Bill's unit has become a prototype for other installations and has obtained some national acclaim. About half of the VLA hams are active on 2-meters and the area repeaters.

What about the other half? Paul, KA5CNE, Daryl, W7LHO, and of course Chuck, W5UXH, are primarily Morse code operators. Many people tend to think that with today's technology, Morse code (or CW as it is known) is an obsolete form of communications. To the contrary, CW is still a very reliable form of communications, especially during less than favorable conditions and when using low power levels. Paul is regularly active with the aforementioned traffic nets, in which nearly all of the messages are relayed across the country by Morse code. The other hams find satisfaction communicating with hams around the world using single side-band phone. Larry Beno, WA6GFE, for example is an accomplished DX'er, meaning that he has managed to contact and receive confirmation from hams in 336 different countries. Confirmation is accomplished by exchanging QSL cards; similar to a post card, it contains specific information about the two-way contact with the amateur's call-letters printed on the

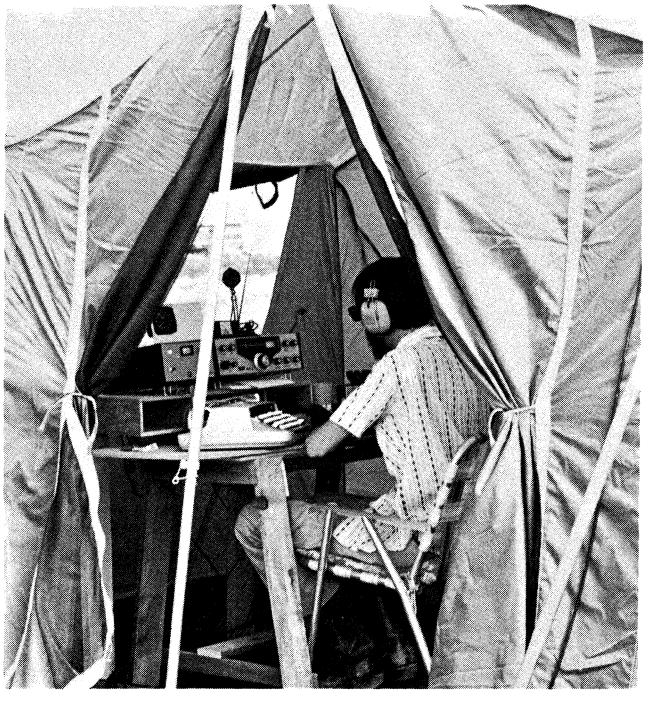
--continued, next page--



Bill Dumke's 200 watt SSB station. Bill is on the right, a non-VLA ham is on the left (K1RGD/5)

face of the card. Currently, there are 318 politically recognized countries, some of which do not have a single ham operator. Occasionally, hams from elsewhere will visit these countries to establish a station to allow amateurs around the world to work these "rare countries". Also, some countries come and go, for example, the Canal Zone ceased to be recognized as a country in October 1979. Though it is counted as one of Larry's 336 countries, it can never be contacted again under the "Canal Zone" recognition. Just for interest, Larry has contacted all but four of the possible countries in the world. He is lacking Glorioso Island (Indian Ocean), Juan de Nova Island (near Tasmania), Mt. Athos (a special autonomous region in Greece similar to the status of the Vatican) and South Yemen (where amateur radio activity is strictly banned). Larry's record is envied by many hams, representing countless hours of operating skill and patience.

There is another interesting satisfaction of amateur radio I would like to point out with a vivid example: international fraternalism. Bob Mitchell, K5WXR, for a long time, has been talking to a handful of hams in Europe nearly every Saturday. This has developed into a lasting friendship with Claus Gerlach, DK9FE, and Eberhard Koehler, DF3AX, both in Germany. In April and May 1979, Claus and his family traveled to the United States in which they used Bob's home in Socorro as a home-base for their U. S. travels. Then in September, Eberhard and his wife came to the U. S. and lived in the Mitchell's home for a month. At the same time, Bob and his wife went to Germany, and stayed in the Eberhard's home in Hamm/Rhynern, Germany. During this time, the Mitchell's traveled through the Netherlands, England, France, Switzerland, Italy, Austria, Spain and Morocco. In Bonn they enjoyed a visit with a good friend, who had been a high school exchange student in 1960-1961 and lived with the Mitchells. They also spent time in Bebra, Germany with Claus and his family. In Morocco they received a first class tour of that area by yet



Paul Harden's 200 watt morse code station (using Chuck Broadwell's keyboard).

--continued, next page--

another long standing ham with the call letters of EI9EA. During much of Bob's extended vacation, he was able to make new acquaintances over the air (he had taken some radio equipment with him plus the stations of the hams he visited) in addition to keeping in touch with us here at the VLA through pre-arranged schedules on the ham-bands. These friendships made "over the air" developed into a most rewarding experience for all the hams involved.

Along this same line of international friendships is yet another interesting example. One of the VLA's Associate Visiting Scientists, Dr. Marcello Felli from the "Osservatorio De Arcetri" in Florence, Italy, has for the past several months kept in contact with his home observatory through amateur radio. Though not a ham himself, Marcello talks to either Mauro Meco, I5MEC, or Sergio Paloschi, I5PLS, in Florence through the stations of Paul, KA5CNE, or Bob, K5WXR. This is possible through regulations known as "third party agreements", which basically states that a non-licensed amateur may communicate over amateur radio providing a licensed operator controls the transmitting equipment. A secondary stipulation to this regulation is that an amateur radio operator cannot accept money for providing such services (not that we would anyway!). Through this hobby Marcello is able to "keep up with the news from home". (See accompanying photograph)

Dr. Felli expressed skepticism during his first contact with Italy, not really expecting a reliable contact. Since then, however, he conducts the conversation (in Italian of course) not much differently than placing a long distance telephone call. He will be returning to Italy in May temporarily. We hope to continue this schedule with Mauro and Sergio, talking to Marcello from the "other end". (Now if we can just figure out how Marcello can LOGIN into ANTSOL via ham radio...)

Many observatories around the world maintain an amateur radio station on the premises or certainly have a ham

Marcello Felli talking to the Florence, Italy Observatory the inexpensive way! The station here belongs to Bob Mitchell, K5WXR.

or two on the staff. Some of us VLA hams are considering operating an amateur radio station (from the site or Socorro) some weekend for the purpose of contacting hams at the observatories throughout the world. When this activity is planned, the dates, times, frequencies and modes to be used will be promulgated in a future issue of the *Observer*. So contact your local neighborhood ham and if he is interested in participating in such an event, we'd like to hear from you. This would be an opportunity for all to get a first hand introduction to this fascinating hobby of amateur radio. So, as we hams say: 73 (best regards).

P.S. (QRZ? QTX? PSE QSP KA5CNE FER SKED)

* * * * *

FOR THOSE WHO DOUBT

The frozen field
In spring will bloom with clover
The sun stays on ...
The winter clouds blow over!

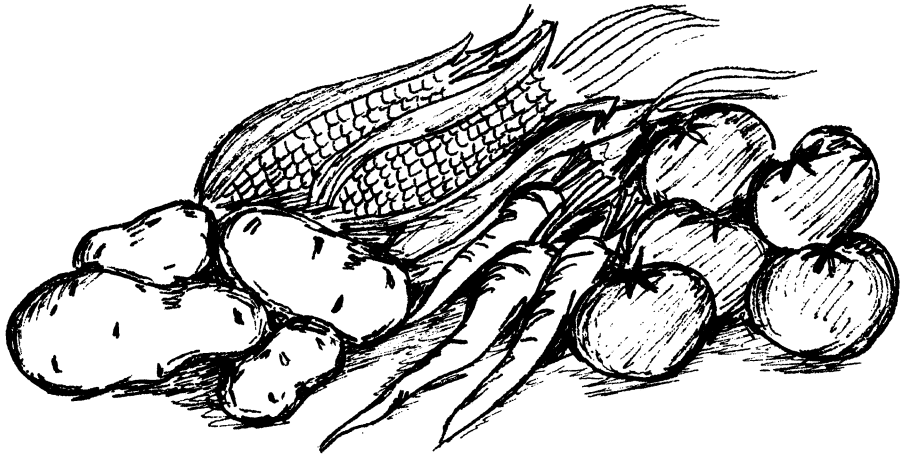
VEGETABLE SURVEY

Wally Oref

Do you know which vegetables are the most popular among American gardeners, which ones appear in over 50 per cent of the gardens of NRAO-Green Bank employees, and which vegetables are preferred by consumers? Answers to these questions come from a Gallup poll of American gardeners, a poll of NRAO-Green Bank gardeners, and a Department of Agriculture survey. For easier comparison, we've put the vegetables in list form.

Gallup Poll		NRAO-GB Poll		U. S. Department of Agriculture Poll	
Tomatoes	In over 50% of gardens. Order of Popularity	Tomatoes	In over 50% of gardens. Order of Popularity	Potatoes	Order of Popularity
Onions		Corn		Tomatoes	
Beans(green)		Beans(green)		Corn	
Cucumbers		Lettuce		Lettuce	
Peppers(green)		Potatoes		Peas	
Lettuce	Less than 50% but in top 10.	Pepper(green)		Cabbage	
Radishes		Cucumbers		Cucumbers	
Carrots		Onions		Onions	
Peas		Cabbage		Carrots	
Corn		Squash		Celery	
		Radishes		Beans(green)	
		Peas			
		Beets			

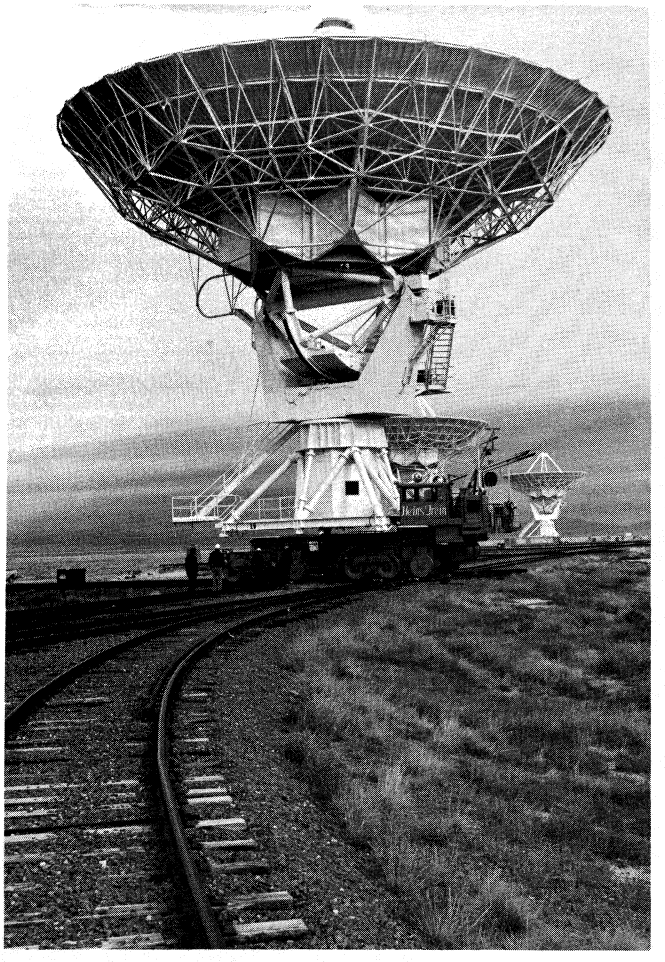
Not surprising, really, we in Green Bank raise about the same vegetables as does the average U. S. gardener which are pretty much the choices of the American consumer. In the Green Bank poll we also asked gardeners to name their favorite variety of their top ten vegetables. However, not enough people responded to this part of the poll to name favorite varieties. HAPPY GARDENING IN 1980!



VLA UPDATE

Jon Spargo

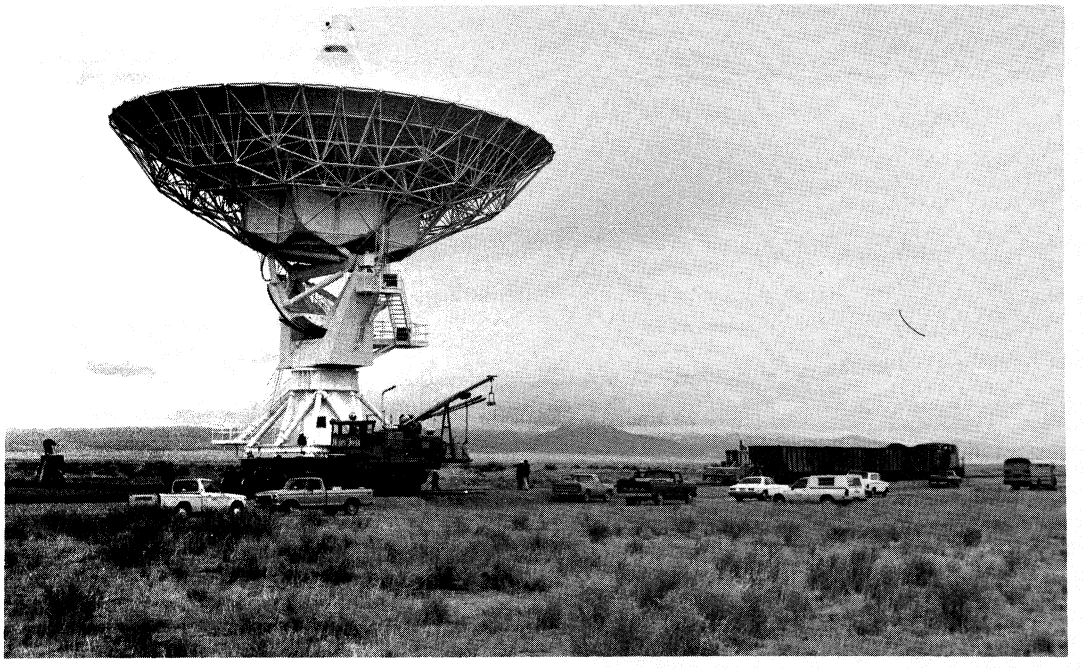
On January 18, 1980, another kilometerstone was passed when VLA crews moved Antenna #19 a distance of 5.2 kilometers out the North arm. In doing so, the antenna has to cross U. S. Route 60 which was sufficient cause for excitement with nearly all hands turning out to witness the event. Onlookers included VLA personnel, news media and State Highway Department personnel who came to measure traffic disruption and check safety procedures as the antenna crossed the highway. The following sequence of photographs, taken by Jack Lancaster, pretty well describe the event.



Here, "Hein's Trein" removes Antenna 19 from pad N6 (DN6) and positions at the transition of the pad spur and main line in preparation for "turning".
Note: The track curving into the main line is the access track from the East arm main line. To get to the North arm the transporter must travel from the West to the East arm and then use this "switchback" to gain access to the North arm.

The turn has been completed and now off we go at the breakneck speed of 5 miles per hour approaching the Route 60 crossing.

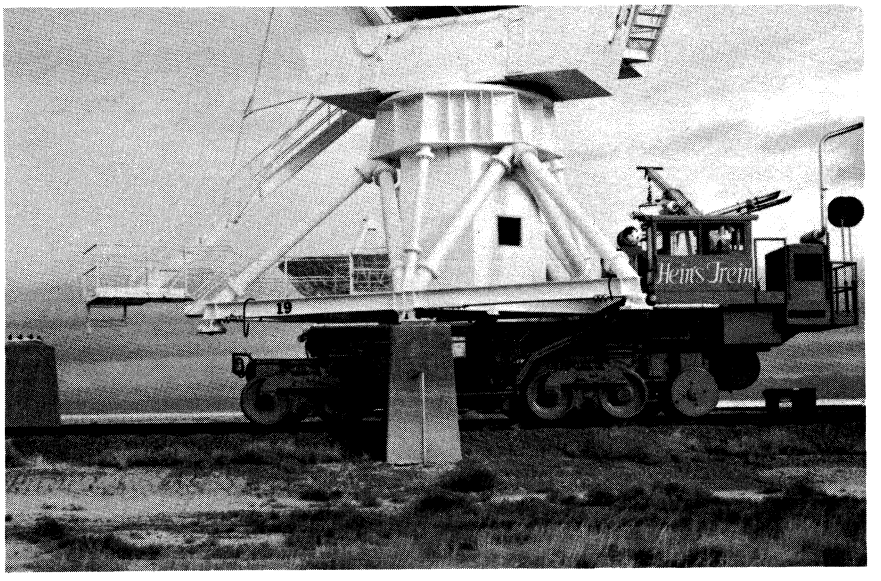
Caution! Antenna crossing! Rubberneckers rubberneck, gawkers gawk and we all cheer as Route 60 is crossed with little or no effort. Photos were taken from the West side of the crossing looking East.



End of the line! But more to come as engine and ballast cars belonging to Wm. A. Smith Company are hard at work preparing more North arm track.

A close up view of how "Hein's Trein" turns. As transporter operator Nick Montaya lowers the rotated wheel truck, antenna mechanic Ramon Molina installs rail inserts. When this procedure has been completed in sequence for all four trucks, stabilizing jacks (between the trucks) are raised and the transporter slowly moves toward the pad and gently lowers the antenna onto the foundation piers. The auxiliary controls allow Nick to have a first hand view of the delicate turning maneuver and for positioning the antenna over the piers before lowering.

CONTEST!



This is Transporter #1 - "Hein's Trein"

Transporter #2 is under construction and due for delivery and final assembly at the VLA site in late March and early April this year. And SO!, we proudly announce the "Name the Transporter Contest". Simply fill out the entry blank below and send it to Jon Spargo at the VLA site. All entries must be received by May 30, 1980. Entry must easily fit onto an approximately 3' x 6' panel on the transporter cab and be readable from at least 100 ft.

Contest judges are Les Temple, Bill del Giudice and Jon Spargo. The judges decision is final and the winning entry will be announced shortly after May 30 (as soon as we stop laughing). Photo's will appear in the next *Observer*.

1st Prize: 8 x 10 glossy of winning entry emblazoned on the cab of transporter #2.

2nd Prize: All expense paid, one week vacation in Datil, New Mexico.*

3rd Prize: All expense paid, two week vacation in Datil, New Mexico.*

*Subject to management approval!

HURRY! HURRY! HURRY! Get your entry in NOW!

Official "Name the Transporter" entry blank

My winning entry is: _____

My name: _____ Phone: _____

Address: (Circle one) CV, GB, Tucson, VLA Send completed entry to Jon Spargo at the VLA.