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The OBSERVER



NIGHT SHOT by JOHN HELBOK (see page 2)

THE 140-FOOT AT NIGHT

Dear Wally,

In the summer of '73, I stopped by with my son on the way to the Cass Railroad, and asked if I could photograph the 140' dish at night. You kindly said yes and allowed us to also view a film that same evening.

I was planning to return to your area and deliver the enclosed photos, but didn't make it. I was looking at a recent "Sky and Telescope" and saw an article on the NRAO and saw your name and address, so I printed these two views of the antenna. It was a hazy night with many mosquitos, but the result is not as fuzzy as I had expected (I had never printed anything but 2" proofs because the negatives didn't appear to be as good as these prints would indicate). I hope you like them. If I do get to visit your way during the next summer or so, I'll bring down an 11 x 14" and a 16 x 20" print of these. In return, I would appreciate a visit to the interior (of the 140'). I would also like to try some nighttime photography of some of the other dishes and possibly a night shot of all of the dishes from one of the adjacent hills.

--John E. Helbok

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SOARING FOR SILVER

Ken Barbier

The third, last, final, concluding installment of an incredibly dull narrative.

Three months ago, in our last episode, we left our hero in his Ford headed from Charlottesville, Virginia to New Mexico and the VLA site. We have shared his disappointing attempts to stay aloft in a glider for five hours in order to earn the Silver Badge for soaring. Attempts in California, Arizona, and Virginia have all resulted in failure and an empty checkbook. Now he is headed for the state selected to hold the national soaring contest for 1975, so you know conditions there must be absolutely inegrevious! Let us join him as he rolls into Soaring Country.

* * *

Sailplane pilots being a gregarious lot, I had a verbal "letter of introduction" to the New Mexico contingent by the time I arrived in the state. I had been advised to contact Al Santilli upon my arrival, as he was flying with the Albuquerque Soaring Club. (Now that I have spelled Albuquerque correctly once, I shall not attempt the feat again, so the club shall be henceforth known as ASC.) It turns out that Al has been around for quite some time. Longer than there were airplanes, for sure; maybe longer than there has been air! He was probably at Kitty Hawk, giving Orville advice. He does a lot of that.

I managed to get a call through to Al the first weekend after arriving in NM. He was just leaving to officiate (and give advice) at the National Soaring Championships at Hobbs, NM. He told me the ASC towplane would be working at Nats, and therefore there would be no club flying for two weeks. Timing is the essence of my existence.

Al gave me some advice. He told me to just show up at the ASC clubhouse on the Moriarty, NM airport two weeks hence and sign up and fly.

During the next two weeks Hobbs experienced the rainiest period in its history. Enthusiasts being what they are, the contest was not rained out, even though the Coast Guard was reportedly patrolling the runways in

cutters a good bit of the time. A good time was not had by all.

So the following weekend I show up at Moriarty like the storm following the darkness and try to cheer up all hands by regaling them with my great soaring accomplishments. They were unimpressed, telling me that the last loud-mouth California type to join the club managed to hang the Schweizer 1-26 in a fence the first time they turned him loose in the friendly booming skies of New Mexico.

Tucking my tail betwixt my legs, I shut up and went through the formality of a check-ride and permission to fly ASC gliders. This out of the way, I was deemed competent to fly the 1-26 all by myself, and wasted no time in jumping in and getting hooked up to the towplane.

Caution is the watchword in a new airplane at a new airport. I was also a new club member, and resolved to make no mistakes -- at least within view of the airport! Right after takeoff, while still climbing on tow straight out from the runway, I experienced the granddaddy of all thermals. It literally (and illiterately) flanged me out of my seat with its violence. Without looking at the altimeter, I instantly pulled the release and cranked into my most professional thermalling turn. After 180° thereof I was able to spot the field I had just been towed off from, way over yonder!



Soaring Country, with beauty in the air....

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....and on the ground.

Now I looked at the altimeter and it said I was at 800 feet above the field, lower than I had ever released before.

The airport at Moriarty is at 6000 feet above sea level. Towplane engines do not produce their best at that altitude. Neither do sea-level brains. As a result I found myself too low, too far from the field, and the bump that produced this situation was just that and not the world champion thermal I had thought.

Nothing to do but hang on right where I was and work the lift I could find until I could get back to the field and the inevitable chewing out we low landers deserved. Starting at 800 feet and maybe 2 miles from the runway, I scratched for every inch I could gain and arrived back over the field at 1500 feet 30 minutes later, wringing wet. From that time on, and holding true for almost every flight that followed in this big country, there was so much up it was hard to get back down.

Nothing to do but load up a barograph, the oxygen tank (we are starting out at 6000 feet, remember), a little lunch, and get that five hour flight. Only one small catch: the club rules limit flights to 90 minutes if someone else is waiting for the plane. This rule is waived if you are trying a badge flight, but then if you don't stay up on your first attempt you fall back to the end of the waiting list for the day. Fair, but it has one devastating effect; it makes you too anxious and forces an earlier start than you might decide to make otherwise, and early starts mean less lift.

After falling out twice, I quit trying to reserve the plane for a badge flight, and decided that the chances were better that some day I would be up and staying up and no one would show up wanting the glider and I'd just go ahead and finish the five hours.

With this plan in mind I started flying just to have fun. Like one weekend when I set myself a task: fly a course with corners at two road intersections and a farm forming a big triangle with the airport at the center. That way I couldn't get in much trouble, and I would be practicing for later Gold and Diamond badge flights (there is no end to this badge chasing).

Dummy, I'd like you to meet the big sky of New Mexico. Everything about it is BIG, from the amount of rain dumped on contests to the size and vertical speed of the thermals. And the corresponding size of the areas of sink. Not to mention the velocity of the wind.

Now, when a hot spot on the ground produces the rising column of hot air known as a thermal, the spot is stationary, but the wind might be blowing. The wind often doesn't break up the thermal, but it will tip it over downwind.

There I were, at about 6,000 feet, having worked the first thermal of the day to it's top. The wind was blowing, and as I rose higher I blew farther and farther downwind. When the thermal was producing no more altitude for me, but still carrying me downwind, I left it and set out for my first practice turnpoint: the freeway intersection upwind from the town of Moriarty. There I were, in my little 1-26, which has about as much wind-penetration power as a concrete duck.

OK, first try I made it halfway to the turnpoint, retreated back to the same thermal, and started climbing again. This time I resolved to increase my airspeed on the upwind run to better my chances of making the turnpoint. That didn't help. Third try was at a lower airspeed. Not from any triumph of logic, but only because Higher didn't make it.

Picture this booming big sky thermal sitting in one spot all day, leaning downwind in a better than 20 mph breeze. Imagine an idiot in a 1-26 climbing up the column, leaving it, flying upwind til he is out of altitude, retreating to the same thermal, and repeating the same exercise five or six times in his

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allotted 90 minutes. Visualize if you can the fact that the farthest point reached upwind was about a mile from that end of the runway, the downwind point not much farther away. It must have been a great comedy show for those on the ground, and was the kind of conditions that would permit a five hour flight, but others were waiting.

* * *

Pete is a glider pilot. Living in the NM wilderness he realized that if he was going to get to fly much he needed to find a tow pilot. Joan happened to be living in his house, since they were married. As she was not an airplane pilot, he bought her flying lessons to insure a ready source of tows. One day Joan was flying an airplane with an engine and Pete into Albuquerque through the mountain pass east of town. ABQ approach control kept giving Joan lower and lower altitudes to insure that the airlines weren't in the least inconvenienced. Down they went, lower and lower into the pass. Rocks to the left. Rocks to the right. Rocks below. And not very far below! Pete was getting nervous.

"What would you do if you had an engine failure down in here," Pete finally had the courage to ask Joan.

"You're the glider pilot," was her solution, "YOU take it!"

* * *

From the end of the sailplane regatta at Soggy Hobbs in July to the end of the soaring activity for the year in October, I made serious and not so serious assaults on the five hour barrier. There were some memorable experiences. Like the time I got on top of Al Santilli in a thermal and he couldn't catch me. His radio was silent for 20 minutes during that climb, a new record. Like the time I was high and happy and the sky was full of lift all around me and I felt great after two hours and even the barograph was working and I could just taste the Silver Badge, when another club member showed up and called me down out of the sky so he could fly. Like the time I was so anxious to get a start on the day that I took an early tow, found what felt like good lift at 1200 feet, right beside the runway, released, and was back on the ground in NINE minutes. Surely a record.

The soaring year ended for me in October, with the five hour flight still the impossible dream, the unreachable goal. When viewed from

this angle, it has more intrinsic, mystical value to me than any achievement of it could provide. Considering that I set out early in the year with the Silver Badge as a definite goal, spent many hours and many dollars in it's pursuit, it doesn't make much sense that not reaching the goal is more satisfying than any possible victory could have been.

That is a part, a small part, of the mysticism of soaring flight.

So what's it all about, anyway? After all the time, money, and energy expended in a fruitless search for a silver badge, shouldn't I be disgusted, disappointed, and sick of flying? NO! Broke, yes, but still enthralled by the beauty of motorless flight. Unlike football, it's how you play the game that counts, not whether you win or lose. At least to me, and a couple of others.

I can remember the really pleasurable times, and they were not the badge chasing flights. Like the day I worked the 1-26 up right under the clouds at Moriarty, and flew back and forth at will for miles in straight lines without losing an inch of altitude. Flying into and out of New Mexico rain showers, listening to the sexy sound of raindrops on a Schweizer's roof. Getting my Blanik 50 feet higher than Mac McKay in his BG-12; sitting up there watching him strain at the control stick trying to catch me. He never did -- that day! Circling in a thermal over Canyon Lake, watching the boaters at play below me and the B-52 aluminum overcasts doing touch-and-goes at March AF Base. Sitting in the grass at sunset sucking up Coors with like-minded friends. There are joys in soaring....if there are any in badge chasing, I never discovered them!

And I am not alone. Rodney Tibbs said it better than I could, writing in the British soaring magazine. "Flying With Their Eyes Shut" describes the "morons who clamber into the air and proceed to turn one of the most beautiful and satisfying of activities into just another set of positions and points...."

"I fly for pleasure," he continues, "I fly for the pure exhilaration of floating through the air and for the adventure of visiting the unknown with my pores wide open."

Sure, there's another side of the coin. The position expounded by Lorette Zirker in "Do You Believe in Magic," where she says:

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"Why should sailplane pilots be allowed to mess around with the word mystic?" Well, Lorette, why not? You put down the mysticism aroused by the silence of soaring with the comment: "I've been experimenting with ear plugs." (In her noisy airplane.) She seems to think the results are identical. "Is it a question of freedom?" she wants to know. "Hardly. They are slaves to temperature, moisture, and the wind systems." She forgot towplanes! And a sailboat can't be as enjoyable as a power boat, for the same reasons, if you reason like Lorette. "The bottoms of mine shafts are as enlightening as altitude," her rantings continue. "Making lasagna is mysti-

cal...." Well, Lorette, to paraphrase a dirty little boy's joke, either I don't know anything about lasagne, or you don't know anything about soaring!

Lucky guess, as her attack on our mysticism concludes with the statement that, money allowing, she'd like to try it some day! I hope you do that, Doll. Meanwhile, I don't hate you. I feel nothing but pity.

Doing it like the birds is mystical. It is beautiful, exhilarating, satisfying, and a hundred other words you have not dreamed of. More so than I could ever describe. A better man, a better pilot, a better poet than I said it when he described:

HIGH FLIGHT

Oh, I have slipped the surly bonds of earth
And danced the skies on laughter silvered wings;
Sunward I've climbed, and joined the tumbling mirth
Of sun-split clouds -- and done a hundred things
You have not dreamed of -- wheeled and soared and swung
High in the sunlit silence. Hov'ring there,
I've chased the shouting wind along, and flung
My eager craft through footless halls of air.
Up, up the long, delirious burning blue
I've topped the windswept heights with easy grace
Where never lark, or even eagle flew.
And, while with silent lifting mind I've trod
The high untrespassed sanctity of space,
Put out my hand, and touched the face of God.

* * * * *

"INVISIBLE UNIVERSE"

The "Invisible Universe" film recently won another award. Excerpts from a letter detailing this award and Diploma of Honor follows:

August 26, 1976

Gentlemen:

It is a great pleasure for me to inform you that the film entitled "The Invisible Universe" received a Diploma of Honor at the XXXth Congress and Festival of the International Scientific Film Association held August 8-14 in Philadelphia.

This Congress of the ISFA, the first time within the United States, was held in conjunction with SCE-COM'76, the biennial meeting of the American Science Film Association, which served as host organization. Nearly 200 films were selected by screening committees in 20 countries providing delegates to the Congress with an extraordinary array of films and video tapes governing many applications in research and education.

Again, congratulations on the success of your film.

Sincerely,

Randall M. Whaley
President, ISFA/ASFA

International Scientific Film Association

XXXth Congress and Festival
1976 Philadelphia


Diploma of Honor

awarded to
The Invisible Universe

directed by
Seth Shostak
United States of America

for its excellence in presentation of scientific concepts to the general public

August 14, 1976


President, ISFA/AICS

* * * * *

RECREATION ASSOCIATION NEWS

Dwayne Schiebel

PICNIC

The Annual NRAORA Summer Picnic was held July 17, 1976 at the Recreation Area. Congratulations are in order to the following contest winners:

Golf Driving	-	Bill Vrable
Crawling Contest	-	<u>1st</u> - Ian Gottesman -- <u>2nd</u> - Gisela Rots
Pick Up Golf Balls (age 1-2)	-	<u>1st</u> - Stephanie Mayor -- <u>2nd</u> - Sarah Kellermann
Pick Up Golf Balls (age 3-4)	-	Kelly Gordon, Adam Mayor, David Kellermann
Crab Race - Girls	-	<u>1st</u> - Nida Hively -- <u>2nd</u> - Jodi Warner
Crab Race - Boys	-	<u>1st</u> - Chris O'Brien -- <u>2nd</u> - John Monk
Three Leg Race - Girls	-	Shannon Barkley, Johnna Ralston
Three Leg Race - Boys	-	Patrick Smith, Brad Fleming
Box Race - Girls	-	Kyleen Snyder
Box Race - Boys	-	Darrell Schiebel
Sack Race - Girls	-	Danieth Patton
Sack Race - Boys	-	Barry Williams
Back to Back Race - Girls	-	Amber Ralston, Beth Liptak
Back to Back Race - Boys	-	Danny Dolan, Ross Jeffries
Egg Race	-	Debbie Smith
Football Passing Accuracy	-	Jerry Parnell
Wheelbarrow Race	-	Peggy Campbell, Russ Poling
Egg Throw	-	Manota Hively, Carroll Warner
Horseshoe Pitching	-	James Carpenter - (Jerry Parnell)*

* Disqualified because he was only 18 years of age. Eligibility age was 19.

Swimming Contest Winners:

10-11 Freestyle (Girls)	-	Jennifer Fleming
10-11 Freestyle (Boys)	-	Mike Liptak
12-14 Freestyle (Girls)	-	Jennifer Howard
12-14 Freestyle (Boys)	-	Bill Howard
15-17 Freestyle (Girls)	-	Mary Jane Oref
15-17 Freestyle (Boys)	-	Conrad Smith
10-13 Underwater Distance (Girls, Boys)	-	Maria Del Giudice
14-17 Underwater Distance (Girls, Boys)	-	Chuck Brockway

The Recreation Association Board of Directors wishes to thank the ladies at the cafeteria, the men at Central Shops and Plant Maintenance, the many volunteers who helped serve food, run carnival games, help with contests, haul and unload food, call bingo, and all the other volunteer help which made this picnic a success.

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COMING EVENTS

Movies - We plan to have movies in November, January, February, and March.

Dances - Watch the Bulletin Board for Notices.

Bluegrass Concert - "Stompin' Crick" - November 6, 1976

Children's Christmas Party and Teen Dance - Work has already begun on these events.

Site Pictures - Your Recreation Association has 11" x 14" Site Pictures for sale at \$5.00 each. Contact Janet Warner to see or buy a site picture.

Election of New Officers - Sometime between October and our General Membership Meeting in November, a nominating committee may ask if you would like to serve on the Board. Before you say "I don't have the time", remember someone has to have the time to make these recreation association functions possible.

* * * * *

HOW IT WAS 50 YEARS AGO
(MORE OR LESS)

Jim Dolan

This is the modern age of jet travel. Propellers are "out"; pressurized cabins, full-course meals, cocktails, soft music, and movies are "in". Everybody knows this. It is even possible to travel thousands of miles, change aircraft two or three times, and never see the outside of the passenger compartment. Comfortable? Yes! Also boring. However, there is an alternative to this mechanized efficiency.

The accompanying photographs are of a flying machine known as a "Tiger Moth". As far as I can determine, the vintage is around 1925. Top speed is about 100 m.p.h. It carries two people and has a range of about 300 miles. If you were fortunate enough to observe this aircraft parked in Hevener's field about 3 miles north of the Observatory, the markings probably appeared a bit strange. The aircraft carries New Zealand registration and belongs to a New Zealander named Ian Benny who presently resides in Los Angeles, California. The story goes this way.

Mr. Benny, aside from restoring antique airplanes, is also a steam railroad enthusiast, and in particular has a thing for Shay engines. He learned of the Cass Railroad



Not a model but a real flying machine called a "Tiger Moth". Vintage about 1925.

through railroad magazines in New Zealand. No, he did not fly the Tiger Moth from New Zealand. It was shipped (broken down) to California (via cargo plane, I think) where Ian reassembled it and then started out from California. He hedge-hopped across the

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southern United States to Florida and up the East Coast. I'm not sure how he managed to find Green Bank with the meager instrumentation aboard; it appears he does most of his flying in the time-honored tradition known as "seat of the pants" (and a prayer). Be that as it may, he found us. He even called ahead for permission to land at the NRAO airstrip, but permission was not granted. However, Ian was not deterred.

On Wednesday, 15 July, the two-winged Moth appeared over the city of Arbovale. A few minutes later Millie Hevener was astonished when she looked out the window and saw this apparition straight out of the World War I era taxi up beside her house while deftly avoiding the groundhog holes. (Planes normally land on the east side of Deer Creek, where strangely there are no chuck holes, not over by the house.) The story continues. You can imagine Millie's surprise when this fellow, goggles, scarf and all, climbs out, and after receiving assurances it was all right to park there, asks directions to Cass ... and then strikes out walking. The plot thickens here. An acquaintance of mine, John Gillispie, a native of Pine Grove, now a school official in California, home for the summer, was tooling along toward Cass and stopped to pick up the pilot turned pedestrian. To make a long story shorter, Ian ended up as a house guest of John and Mrs. Delbert Gillispie (John's mother) until Saturday 18 July.



*"Tiger Moth" sits in Hevener's field.
Plane carries New Zealand pilot at top
speed of 100 m.p.h.*

Ian thoroughly enjoyed his stay in the mountains of West Virginia and was overjoyed with his Cass railroad cap and tape recordings of the Shay whistle. John said he enjoyed Ian's jokes about New Zealand bushmen, something like the fellow going into a restaurant ordering beans. The waiter says, "What kind of beans?" The fellow says, "Human beans!", etc., etc., ad infinitum. (I'm sorry.)

Anyway, if you were at the NRAO picnic about 1 o'clock on Saturday, 18 July, you saw him leave. I was there helping him get underway and told him about the picnic and suggested he "fly over", which he did. He had to put 5 gallons of auto fuel in the plane to get to Elkins, then to Columbus, Ohio; Oshkosh, Wisconsin (air show); up to Canada, and back to Los Angeles.

As I watched the little Tiger Moth disappear over Cheat Mountain, I couldn't suppress a feeling of nostalgia. Remember those daring fellows: Rickenbacker, Brown, von Richthofen, and of course the most intrepid of all, Snoopy and his Sopwith Camel?

BOWLING 1976-77

Richard Hiner

We started the 1976-77 season with a picnic for bowling members and their families, which was held at the picnic shelter on 1 September at 1700 hours. A good time was had by all.

The following members will bowl the first half of the season: Howard Brown, Rufus Chapell, Jim Gibb, Richard Hiner, Bruce McKean, Larry Miller, Wendell Monk, and Bob Vance. The following will bowl as substitutes for the second half of the season: Harold Crist, Don Hovatter, Russ Poling, and Bill Vrable. We will be in the Tuesday night 1830 league.

Any prospective bowler that would like to bowl the second half, contact R. Hiner at extension 309-GB.

Bowlers watch out; Women's Lib might picket us at any time!



INSULATING THE 140-FOOT TELESCOPE

John Ralston

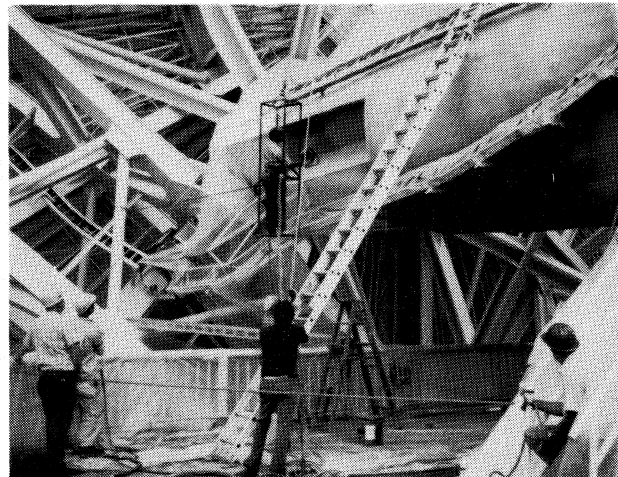
In the period from 1965 through 1968 Ken Kellermann and Ivan Pauliny-Toth initiated the pointing parameters for the 140-foot (point errors which occur over and over whenever the telescope is moved during observing) which had to be corrected by systematic pointing corrections. These pointing corrections are programmed into the observing program and are handled automatically by the computer. Since 1968 other scientists have verified these pointing parameters, refined the errors, and made systematic corrections.

Although pointing parameters are now well-known and are being systematically corrected, the 140-foot can be made even better if these known pointing errors can be reduced further. Recent studies indicate that pointing errors can be made smaller by correcting for refraction and thermal deformation. Refraction occurs when radio waves are bent ever so slightly by the atmosphere (e.g. passing through air). Corrections for refraction can be calculated from measured atmospheric data. Thermal deformation, on the other hand, takes place whenever a structure heats up (expands) and cools down (contracts). The amount of thermal deformation can be determined by using thermal sensors and electronic devices which measure the angular change in the structure (electronic levels).

Pointing errors caused by refraction and thermal deformation can be minimized by insulating the 140-foot telescope. This is now being done and the work may be completed by the time you read this. A spray process using urethane foam was chosen because an effective cover of urethane can be applied relatively easily to unusually shaped structures, it's an excellent insulator, urethane has permanency, and it's cost is competitive with other insulating materials.

Only certain parts of the telescope will be insulated: the two yoke arms, the polar axis shaft, the concrete pedestal above the main deck, and the recessed area inside the top deck walkway. Placing insulation comes after considerable prior preparation by NRAO people. Areas to be insulated must be thoroughly steam cleaned, new deck drains installed, heat pads placed in the recessed area (electric

heat pads on the bottom, followed by 3 inches of insulation capped with 3 inches of concrete), and concrete poured in other places.



Applying urethane foam insulation to the east yoke of the 140-foot.

After the telescope is completed, thermal studies of the structure and foundation will be repeated but in lesser detail than in the first study by Sebastian von Hoerner. If required, data from this monitoring will be used as computer input for further pointing corrections.

The contract has been let to John L. Renshaw, Inc. of Beltsville, Maryland and is to be completed by mid-September 1976.

The six most important words in the English language:
I admit I made a mistake.

The five most important words: You did a good job.

The four most important words: What is your opinion.

The three most important words: If you please.

The two most important words: Thank you.

The one most important word: We.

The least most important word: I.

--Anonymous

MULTI-COUNTY OPERATION
RESCUES THREE FROM CAVE

Bill delGiudice

There are more than 300 known caves and pits in the northern half of Pocahontas County, a feature which attracts a constant stream of cavers or "spelunkers" who explore, and sometimes meet disaster underground. There is an average of one caving accident per year and while some involve no more than leading an inexperienced group out of a cave, others can, and do become relatively large operations involving several groups and agencies from distant counties and neighboring states. The following is an account of an operation which started with four organizations from two counties, and finally had another state and three more counties represented.

azine (p. 825). Three of the men did reach the floor of the Big Room, but their excursion was to last twenty-eight long and hard hours.

1300 hours: The four men had packed the equipment they would need about a half mile from the road to the mouth of the cave. Wives of two of the men accompanied them for a few yards into the cave but soon left to wait outside. The men had climbed down into a fair sized room just inside but this soon shrunk down to a tunnel-like passage which could be walked with occasional stooping. This passage continued for about 800 feet to another climb-down and then became even smaller, in some places less than two feet in diameter. This crawlway continued for 170 feet with a continuous stream of cold water flowing along the bottom making it impossible to remain dry. Later, remember that the victim in a stokes basket had to be removed along this route. At

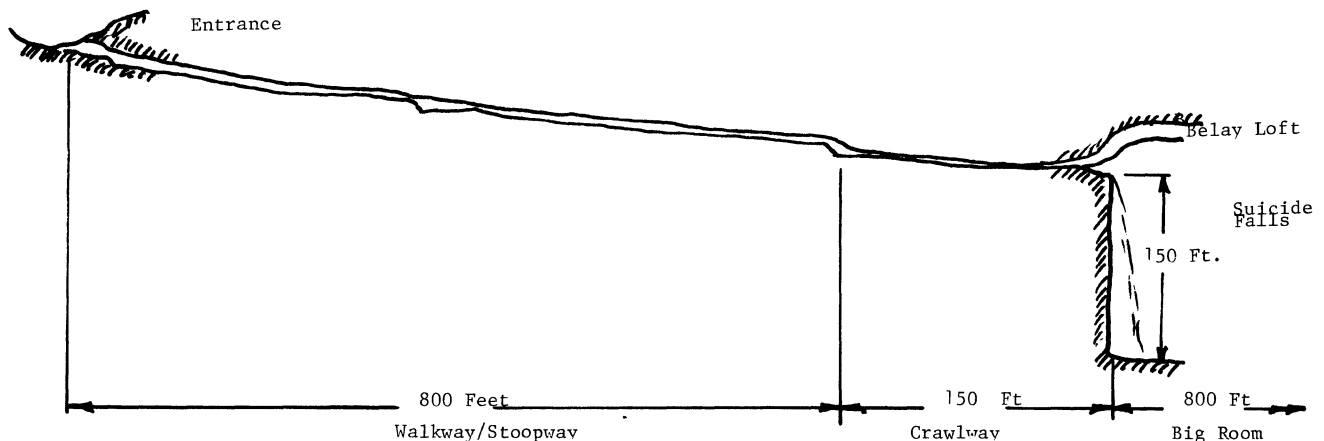


Figure 1. PROFILE - CASS CAVE, CASS, WEST VIRGINIA

Four young men ranging in age from 19 to 29 years came to the small town of Cass, about 9 miles south of the Observatory, on the 29th of August to explore one of the more famous caves in the area. The primary feature of this cave is a 150-foot waterfall which is itself more than 90 feet below the cave entrance (see Figure 1). The waterfall cascades down into the Big Room, which is over 800 feet long, 180 feet high, and 75 feet wide. A spectacular photograph of the waterfall appeared in the June 1964 issue of the National Geographic Mag-

the end of this crawlway they emerged into a small room at the head of the waterfall, ominously named Suicide Falls, and could look down on the Big Room. They climbed thirty feet above and 20 feet out beyond the falls, to a ledge called the Belay Loft 180 feet above the floor. There they rigged a descent rope and rapel brakes to make the drop into the Big Room.

2100 hours: The first two men had descended to the floor and the third man was on

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the rope when his rapel brake malfunctioned and he fell, perhaps as much as 50 feet. He landed on a ledge just above his companions with his legs broken and was in considerable pain. The fourth man, still up on the Belay Loft, recognized the seriousness of the situation and left the cave in search of help. The first dwelling he came to was that of an Observatory employee who called me at my home.

2135 hours: I notified the Observatory security guard, who doubles as our dispatcher, and he activated the rescue squad tone-coded radios. A crew of five responded to the fire house. We maintain a chest of equipment intended for removing an injured worker from a radio telescope if it were ever necessary, and most of this equipment is useful in any rescue from heights, or depths. This was loaded into the ambulance along with lightweight cable ladders, extra lights, and other special equipment. The county disaster officer at the Marlinton Fire Department was notified, and he dispatched two units from Marlinton, 25 miles south. The Bartow, Frank, and Durbin Volunteer Fire Company (BFD) is only 12 miles north but they would be called later to take charge of exterior operations.

2207 hours: We arrived at the scene and questioned the caver who fortunately happened to be an EMT, and we got an unusually objective situation report. The victim's condition was not serious enough to justify an immediate panic descent by an EMT, but we would need expert help to get him out. We called the Greenbrier (County) Grotto of the National Speleological Society, and asked for a vertical cave rescue party. Their estimated time of arrival was 0200 the next morning. Our activity until then was in preparation for them to come in and supervise the lift of the victim.

2215 hours: While we were transporting the hundred or so pounds of rescue equipment to the cave, the Marlinton units arrived and the entry party was organized. There was a local geologist and caver we had asked to help us, the man who had come out of the cave, six EMTs, and three firefighters. Our rescue chief, Bill Brundage, is an experienced caver, and most of the others have cave-rescue experience.

0100 hours: The entry party rigged safety lines and put a man in a parachute harness on a ledge a few feet down the cliff face from

where he lowered a package containing food, blankets, splints, instant heat packets, and carbide for the cavers' lamps. Also included was a note advising the men what to expect, and asking for additional information of the injured man. This note passing is our most reliable method of communications because bad acoustics in caves make shouted messages almost impossible to understand and radios are useless in a cave.

0200 hours: The NSS rescue party, five men and a woman, arrived and took charge of the cliff-top operations. It would be almost impossible, and very dangerous to lift a man in a stokes basket up to the Belay Loft. On the other hand, the only other way out would pass the patient through the waterfall. We chose the wet route as the better of the two choices. Rock bolts were driven into the cave wall from which to hang blocks and rig haul ropes. Three of the NSS men rapel down to the floor to prepare for the lift.

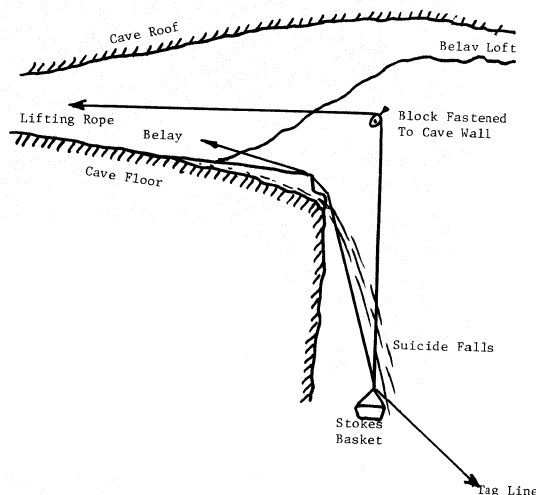


Figure 2. *Suicide Falls and the Belay Loft at the head of the Big Room. Cass Cave, Cass, WV.*

0500 hours: BFD responded with an ambulance to transport the victim when he was brought out. The outside activity, almost nonexistent until now, began to pick up. BFD operated a collecting point and information center, gathering in volunteers needed to pull the men up, and making sure they were properly equipped. Some two dozen men were ready by the

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scheduled lift time of 0700 hours.

0715 hours: The lift started, but almost immediately a huge rock, weighing perhaps 300 pounds, broke loose. A desperate effort by Bill Jones, leader of the NSS party, held it until more people could get a hand on it. When the men below were clear, they let the rock fall to the floor below. Fresh, experienced cavers were on the way from distant parts of West Virginia and Virginia, so there was some deliberation on whether to attempt the lift again, or to wait. The decision was to go ahead.

0900 hours: The ropes were re-rigged and another lift was started, and once more trouble developed. The safety brake on the main lifting rope jammed and had to be replaced.

1100 hours: Once again the ropes were re-rigged and made ready to lift.

1130 hours: The stokes basket reached the top of the falls with the injured man in good condition. He had been splinted and warmly wrapped in blankets with heat packets to prevent hypothermia and wrapped in plastic to protect him from the waterfall. He was nonetheless soaked, and was rewrapped in dry blankets and carried out of the cave by the BFD.

1200 hours: The BFD ambulance took him to the local doctor, 9 miles from the scene, and then to the hospital, another 40 miles. He was reported in good condition.

1630 hours: The last of the five men on the floor of the Big Room reached the top, and came out. The relief party of NSS cavers had arrived too late to help with the injured man, but helped the exhausted men out with rescue equipment.

1730 hours: The last of the men and equipment had come out of the cave and the last unit reported back in service. The operation was concluded.

Most people, perhaps all people who have never been in a vertical cave, ask why such an operation takes so long, 20 hours in this case. This is a very dangerous operation under far from good conditions. It is cold, wet, dark, cramped, slippery, and exhausting. To work under these conditions demands that great care be taken to avoid mistakes, which on the surface may not be serious, but underground can be fatal. No caver who had not already received fatal injuries before the arrival of a Pocahontas County rescue squad, has ever been

lost, and just as important, no rescuer has ever been seriously injured during a cave rescue. That's a good record.

JUNK MAIL THAT HAS BRIGHTENED MY DAY

Sarah Martin

Given that the NRAO has one of the longer names for an institution and that Charlottesville is purported to be the longest one-word place name in the country, along with the ubiquitous computer handling of addresses, it follows logically (or illogically, depending on your point of view) that some strange mail receipts would result. That's why we hardly flinch when things come to us at Charlottesville or Charlotsvl, but we did do a double take when we were addressed as Harlottesville, VA.

However, even that rather interesting designation was soon overshadowed by two unusual personalized advertisements received from Newsweek magazine. The first was a post card type ad that "cordially invited [us] to join Newsweek for 26 weeks at half price..."; addressed to "Mrs. Natl R Observ".

Since that didn't bring a subscription order rushing their way, Newsweek struck again, this time with a full letter, a few portions of which I'd like to share with you. It begins with our address:

Mr. Nat R Obstry
Library
Edgemont Road
Charlottesvl, VA 22901.

Then we are told that "Nat Obstry" is entitled to subscribe at half price for life and that he is entitled to a full refund if he cancels. Nat is then given the opportunity to say "Yes. Please enter the name OBSTRY in your lifetime privilege file." After that exciting introduction, we get to the real sales pitch, aimed directly at this unique individual. "You can be certain, Mr. Obstry ... that this letter is not popping up in everyone's mail in Charlottesville." We are told that the author of the letter is "writing...only to a carefully selected audience. The list upon which I found your name would indicate that you are an involved and informed individual...Although I'm

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sure, Mr. Obstry, you are already acquainted with Newsweek, you may not know how much surprising news it brings you each and every week. [No, but we're learning!] Mr. Obstry, I'll also wager that you didn't know about the fiery plague that has been spreading North from Latin America. It has already infested the lower U.S. and threatens to overrun the entire nation -- even places around Charlottesvl...."

Despite the persuasiveness of this latest ad, old Nat and Natl have still decided not to subscribe. That probably means that any day now, Newsweek will again contact the Obstry family with an even more appealing offer, like a promise to punish their computer for writing to non-existent persons. Now that's an appeal we'd probably answer. "To err is human, but to really foul things up takes a computer."

Mr. Nat R Obstry

Library
Edgemont Road
Charlottesvl, VA 22901

Lifetime Guarantee No. 1

Nat Obstry

Is entitled to subscribe
at half the prevailing
cover price for life.

Lifetime Guarantee No. 2

Nat Obstry

Is entitled to a full refund
on all unmailed copies if
cancelling subscription.

Yes. Please enter the name

OBSTRY

in your LIFETIME PRIVILEGE file!

MRS. NATL R CBSERV
EDGEMONT ROAD
CHARLOTTESVILLE, VA 22901

N RAO
EDGEMONT RD
CHRLTTSVL, VA 22901

22903NATLRP004304
NATL RADIO ASTRONOMY
PO 043279
EDGEWOOD LANE
HARLOTTESVILLE VA 22903

Editor's Note: Poor Sarah sent the labels along so that I wouldn't think she made it all up. I'd believe anything, Sarah, I get enough of my own. I noticed one of the labels addressed: N Rao. Is that Nat Rao?

* * * * *

A PATIENT'S BILL OF RIGHTS*

contributed by Bill Brundage

The American Hospital Association presents a Patient's Bill of Rights with the expectation that observance of these rights will contribute to more effective patient care and greater satisfaction for the patient, his physician, and the hospital organization. Further, the Association presents these rights in the expectation that they will be supported by the hospital on behalf of its patients, as an integral part of the healing process. It is recognized that a personal relationship between the physician and the patient is essential for the provision of proper medical care.

The traditional physician-patient relationship takes on a new dimension when care is rendered within an organizational structure. Legal precedent has established that the institution itself also has a responsibility to the patient. It is in recognition of these factors that these rights are affirmed.

1. The patient has the right to considerate and respectful care.
2. The patient has the right to obtain from his physician complete current information concerning his diagnosis, treatment, and prognosis in terms the patient can be reasonably expected to understand. When it is not medically advisable to give such information to the patient, the information should be made available to an appropriate person in his behalf. He has the right to know by name, the physician responsible for coordinating his care.
3. The patient has the right to receive from his physician information necessary to give informed consent prior to the start of any procedure and/or treatment. Except in emergencies, such information for informed consent, should include but not necessarily be limited to the specific procedure and/or treatment, the medically significant risks involved, and the probable duration of incapacitation. Where medically significant alternatives

for care or treatment exist, or when the patient requests information concerning medical alternatives, the patient has the right to such information. The patient also has the right to know the name of the person responsible for the procedures and/or treatment.

4. The patient has the right to refuse treatment to the extent permitted by law, and to be informed of the medical consequences of his action.
5. The patient has the right to every consideration of his privacy concerning his own medical care program. Case discussion, consultation, examination, and treatment are confidential and should be conducted discreetly. Those not directly involved in his care must have the permission of the patient to be present.
6. The patient has the right to expect that all communications and records pertaining to his care should be treated as confidential.
7. The patient has the right to expect that within its capacity a hospital must make reasonable response to the request of a patient for services. The hospital must provide evaluation, service, and/or referral as indicated by the urgency of the case. When medically permissible a patient may be transferred to another facility only after he has received complete information and explanation concerning the needs for and alternatives to such a transfer. The institution to which the patient is to be transferred must first have accepted the patient for transfer.
8. The patient has the right to obtain information as to any relationship of his hospital to other health care and educational institutions insofar as his care is concerned. The patient has the right to obtain information as to the existence of any professional relationships among individuals, by name, who are treating him.
9. The patient has the right to be advised if the hospital proposes to engage in or perform human experimentation affecting

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his care or treatment. The patient has the right to refuse to participate in such research projects.

10. The patient has the right to expect reasonable continuity of care. He has the right to know in advance what appointment times and physicians are available and where. The patient has the right to expect that the hospital will provide a mechanism whereby he is informed by his physician or a delegate of the physician of the patient's continuing health care requirements following discharge.
11. The patient has the right to examine and receive an explanation of his bill regardless of source of payment.
12. The patient has the right to know what hospital rules and regulations apply to his conduct as a patient.

No catalogue of rights can guarantee for the patient the kind of treatment he has a right to expect. A hospital has many functions to perform, including the prevention and treatment of disease, the education of both health professionals and patients, and the conduct of clinical research. All these activities must be conducted with an overriding concern for the patient, and, above all, the recognition of his dignity as a human being. Success in achieving this recognition assures success in the defense of the rights of the patient.

* Approved by the House of Delegates of the American Hospital Association February 6, 1973.

NEW MEXICO, ONE YEAR LATER

Jon Spargo

Having now resided in "the Land of Enchantment" for a little over a year, I thought that it might be fun to relate to you, through a series of personal observations made on a wide range of subjects, my impressions about living here.

I must be honest and confess that I did not come here totally unprepared. My sister, who spent 4 years studying archaeology at the University of New Mexico, provided me with quite a lot of information about this state. That's not to say, however, that I didn't receive any surprises! I don't think any native "Easterner", unless he spends his life watching western movies, can adequately prepare himself for the experience of living here.

People: Oddly enough, once the novelty of hearing a different language used daily wears off the people become very familiar. True, names such as Baca, Romero, Armijo, etc. would at first glance seem to conjure up a different picture in your mind as compared to, say, Sheets, Taylor, Ervine, etc. But not really! In fact my biggest surprise, perhaps, came when I realized that one and all were "just plain good old folks".

Food: Now here you can expect a difference, and the difference can usually be summed up by one word. HOT! The trick is to know what produces the most HOT! and then gradually work up to it. Out here interstate rivalries involve, among other things, who can grow the hottest green chili peppers. I myself am not prone to volunteer to be a judge for such contests. One observation I have made though, is that while hot, Mexican food can also be extremely tasty. I've found, as a rule of thumb, that when an eatery advertises super hot food they're usually trying to cover up the fact that their food isn't very well prepared. Thankfully, there are enough good places around so that if you enjoy good Mexican food, a bit on the hot side, you can usually get your fill at surprisingly reasonable prices. One word of caution though. Given a choice, always order the red chili as opposed to the green. Unless of course you want to cure in a single bite, any sinus condition, dental problem, tonsillitis, respiratory disease, or remove a layer of skin from the inside of your oral cavity.

I had one amusing experience concerning food, however, that bears retelling. One night last summer (1975) I had to work late at the site getting a piece of equipment wired up to go onto antenna #1 the next morning. About 6:00 p.m. I took a dinner break and, since my overtime was unexpected, had to drive to Datil to get something to eat at the

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by now famous "Eagle Café", where I discovered that the evening cook doesn't get drunk. Anyway, I sat at the counter and ordered a roast beef dinner (\$1.79) which was excellent except for a lump of soggy spinach which I had managed to avoid throughout most of the meal. As I sat there contemplating whether or not I should at least try it, I noticed the owner of the cafe walking around behind the counter happily devouring, one after another, jalapeño peppers out of a large jar. When he had finished the last one he stood there for a moment trying to figure out what to do with a jar half full of pepper juice. The next thing I heard was, "Here!, can't stand to eat that damned stuff (spinach) unless I pour this damned stuff (pepper juice) on it." Which he did before I could so much as utter one syllable of protest. He then stood there with an expectant look on his face which left me with only one course of action if I didn't want to offend him. "So O.K. dummy, that'll teach you to play with your food! Well, take one quick bite and then if you have to, dream up some flimsy excuse, like you just remembered that your doctor ordered you not to eat spinach drenched with pepper juice on Tuesdays, pay your bill and leave." About six bites later, I firmly resolved never to eat this damned stuff again without pouring some of that damned stuff on it. The transformation has to be tasted to be believed!

Weather: Put aside all the time honored clichés you've ever heard about a hot dry climate. Agreed, most of the time they do apply here, however, it can really get interesting during the times that they don't. New Mexico has the good or bad fortune, depending on how you look at it, of being located in a place where, at certain times of the year, some interesting weather patterns converge with spectacular results. Two of the major weather producing areas that spawn systems which affect most of the U.S., during one season or another, are relatively nearby. They are the Gulf of Mexico and the Pacific Ocean. The fun starts when these areas both produce a major system of one sort or another and they both decide to meet for a western style showdown over New Mexico and have it out. Add to that the fact that the Continental Divide area (30 miles west of the VLA) is, save for Florida, the most prolific spawner of electrical

storms in the continental U.S. It's a weather watchers' paradise! Consider the following recipe as an example. Take one wedge of warm moist air pushing up across Texas from the Gulf, and one wedge of cool dry air pushing down from the Northwest, add to that some very dry dusty earth that hasn't been rained on in several months, mix thoroughly and presto the following is likely to send you running for shelter. First the sky darkens. Then ungodly amounts of lightning start hitting the earth everywhere. Then the downpour begins. During the first few moments of rain, the raindrops hitting the ground raise a cloud of dust aided by the gusts of wind. The dust then combines with the raindrops to form tiny mudballs and it rains mudballs until the ground has been wet enough to calm the dust. Violent storms like this usually occur during our rainy season which lasts from mid-June to the 1st of September. When you come out from hiding after several such storms, three things become apparent. Your lawn is much greener, your water bill goes down, and the surrounding countryside has exploded with the most dazzling display of wildflowers that you've ever seen.

At this point I've realized that I have rambled on at considerable length and not touched on half the subjects that I had intended on including here. So for now I'll retreat to taking and making more notes for future *OBSERVER* issues. Some subjects to be examined later on include: rodeos, the VLA bus, gardening, more about weather, and anything else that comes to mind. See you then.

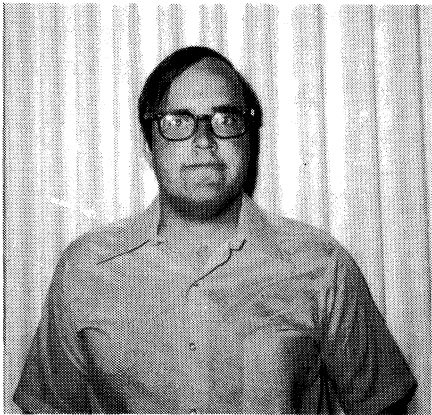
Talent is God-given; be grateful.
Fame is man-given; be thankful.
Conceit is self-given; be careful.

--Thomas LaMance

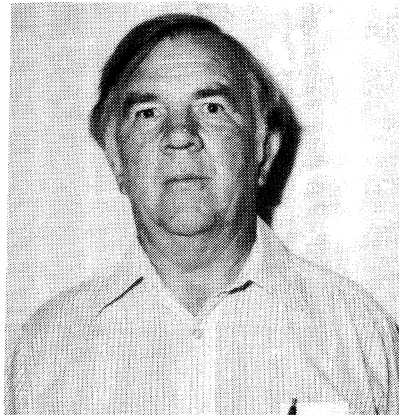
"Democracy means not 'I am as good as you are',
but 'You are as good as I am.'".

--Rev. Theodore Parker

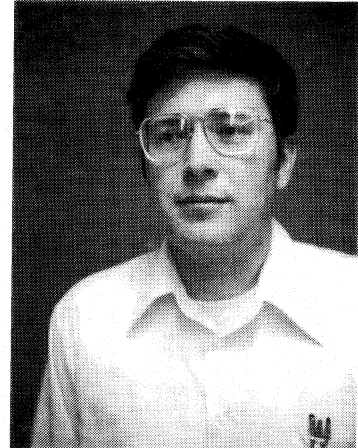
NEW EMPLOYEES



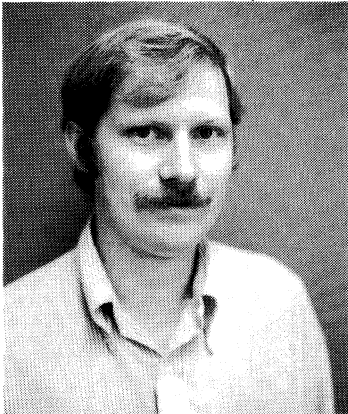
Edward W. Burke, III
Technical Specialist
Tel. Operations - GB



Rufus D. Chappell
Housing/Food Serv. Supvr.
Admin. Services - GB



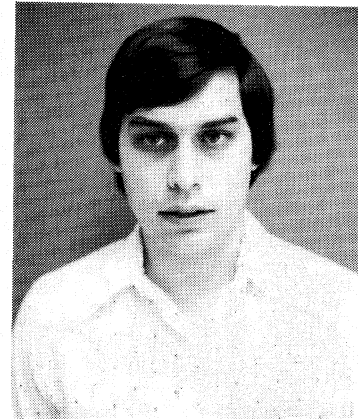
D. Richard Decker
Electronics Engineer
Electronics - CV



Philip E. Hardee
Research Associate
Basic Research - CV



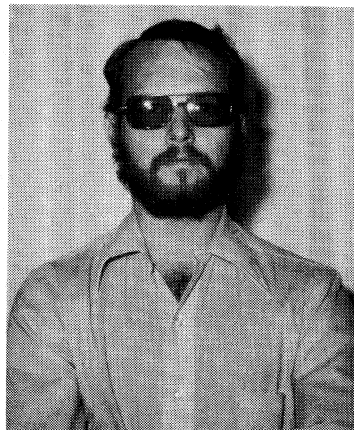
Kathy L. Harper
Scientific Programmer
Computer Div. - GB



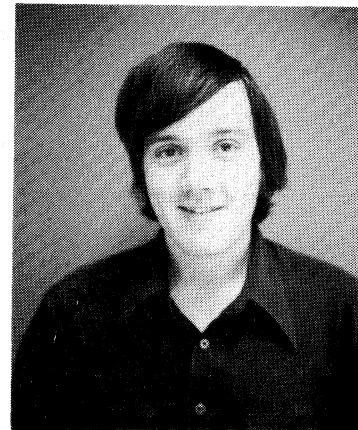
Alan P. Marscher
Jr. Research Associate
Scient. Services - CV



Larry A. Miller
Technician
Electronics - GB

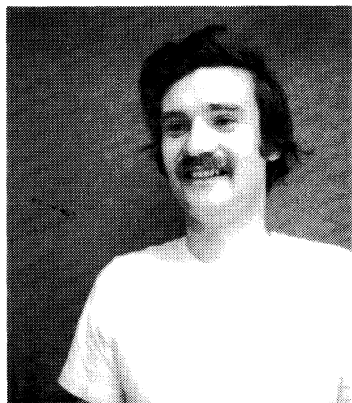


Teddy S. McClung
Technical Specialist
Tel. Operations - GB



Steven R. Spangler
Research Associate
Basic Research - CV

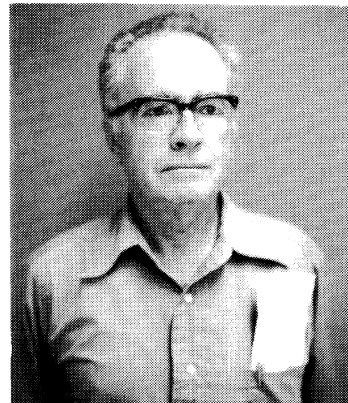
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NEW EMPLOYEES (continued)

Ralph E. Spencer
Vis. Assoc. Scientist
Basic Research - CV



Betty L. Warner
Accounting Clerk
Fiscal Division - GB



Robert N. Whitehurst
Visiting Scientist
Basic Research - CV

OTHER NEW EMPLOYEES - PHOTOS NOT AVAILABLE

Rosalina G. Armijo	Cook	New Mexico
Martin G. Chavez	Maintenance Trainee	New Mexico
Thomas J. Cote	Draftsman	New Mexico
Michael E. Fusco	Technician	New Mexico
Doris R. Gill	Clerk	New Mexico
Adrian Herzog	Technical Specialist	New Mexico
Jerry W. Kaber	Antenna Mechanic	New Mexico
Judith A. Myers	Program Librarian	New Mexico
Elaine I. McKee	Maintenance Trainee	New Mexico
Elsie E. Rivera	Food Handler	New Mexico
Robert A. Hamilton	Janitor	Tucson
Michael T. Routt	Technician	Tucson

REHIRES

Judith F. Moore	Accounting Clerk	Fiscal Div. - GB
Robert S. Pariseau	Scientific Programmer	VLA - New Mexico

TRANSFERS

Edward B. Fomalont	VLA - New Mexico
Eric W. Greisen	Computer Division - CV
Richard J. Howard	Tucson (Electronics)
George H. Patton	VLA - New Mexico
John D. Weaver	Tucson (36-foot)

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LEAVE OF ABSENCE

On Leave: Sander Weinreb

Returned From: Mike Balister

TERMINATIONS

Mark T. Adams
 Harry A. Atwater
 Ted M. Baca
 Geoffrey Bath
 Daniel E. Beeker
 Rick A. Beverage
 Michael S. Bielas
 Ronald J. Buta
 Luis Casiano
 Oscar B. Cate
 Wayne A. Christiansen
 Alfred M. Collins
 Frank F. Donivan, Jr.
 David Doro
 Robert A. Eskanazy
 Robert K. Froelich
 Stephen L. Galhouse
 Samuel J. Goldstein
 Basil Gum

Raymond B. Guthrie
 James C. Hall
 Sven-Olov Hansen
 Edward R. Harrison
 Robert W. Harrison
 James Huntley
 Ann S. Jackson
 David R. Jonese
 Billie Jo Kinnison
 Mark A. Kovalon
 Paul D. Kuhlken
 John Liebenrood
 Elaine Litman
 F. Jay Lockman
 James V. Morgan, Jr.
 Melissa A. McGrath
 Daniel McGuire
 Susan G. Neff
 Mary Jane Oref

James J. Osborne
 Andrzej Pacholczyk
 Bradley M. Peterson
 Roger E. Picklum
 Ernst Raimond
 Eric C. Rehm
 Dawn Reiche
 Frank A. Reid
 June Riley
 Anthony R. Rothman
 William M. Rumble
 Gregory A. Shoemaker
 Gary Steigman
 William J. Tobin
 Claudia M. Urry
 Mauri J. Valtonen
 Nancy J. Wallis
 Stewart K. Wilson
 James F. Wooddell

We are sorry to report the death of a former employee,
 Robert A. Aldridge, who died on August 24, 1976.

* * * * *

LANCASTER HONORED BY NSF*

John H. Lancaster, Assistant Director of Brookhaven's sister lab, the National Radio Astronomy Observatory, has received the National Science Foundation's "Meritorious Service Award." This is the first time in the history of the NSF that this award has been presented to anyone outside the staff of the Foundation.

Lancaster, a staff member at Brookhaven for nearly 20 years, was Deputy Division Head in the Accelerator Department when he transferred to NRAO in October 1972 to oversee the construction of the Very Large Array in New Mexico.

Dr. H. Guyford Stever, Director of the National Science Foundation, presented the award last month in recognition of Lancaster's

"dedicated and efficient service to the Foundation as Project Manager for the Very Large Array Project." He pointed out that Lancaster has ably and successfully directed the procurement and installation of major equipment and facilities and has been notably successful in acquiring quality equipment at lowest cost, with great savings to the government.

* from BROOKHAVEN BULLETIN.



PLANETARIUM PLEASURES

Gerrit Verschuur

Your editor wanted a story. I originally started it with the words "It is February in Boulder and the days are beautiful and warm." Then the pressure of work became so enormous that it was months before I could rewrite this description of what it is like being the director of Fiske Planetarium at the University of Colorado in this, its first year of operation. This job has led me into experiences and contacts with people that have made life very varied indeed. It is a long way from exclusively observing and reducing data. Now my work includes dealing with a promoter of a series of concerts or being a promoter for a concert myself, running planetarium shows, operating the lights while a marriage is performed under the artificial stars, writing scripts, selling tickets when the regular ticket seller doesn't show, teaching classes, etc, etc.

The basic functions of our planetarium are its use as a teaching tool and as a place where the public can go to learn a little astronomy while being entertained. The first step in the latter process is to think about a script. We then discuss it amongst the staff (6 permanent). We then have a meeting to decide what technical effects have to be built and what artwork has to be done for it. At this time the script should be in some workable form, although that isn't always so. It takes about 3 months to produce a new show. As we progress we might get together again to make sure everything is on course and then as opening day draws nearer everyone starts working longer and longer hours.

Artwork has to be produced and photographed and the special effects projectors are tested. Then, after the old show is closed down and the projection shelves are cleared of projectors, the new ones get put in. We allow four days for that. Ultimately we have to run through the new show several times as the various special effects projectors are activated manually at the desired time and the correct rates. All these manipulations of the controls are recorded on an eight-channel tape recorder. Four of these channels already have the sound track with music and commentary on

it. That would have been completed a week or so before. The other four channels contain tone signals which will operate relays, activating whatever it is we need in the script. Later, when the tape is played back, the show will hopefully run automatically. Everything except for the operation of our Zeiss star projector is automatic.

We typically use about 200 projectors in a starshow. Maybe 15 to 20 of these are carousels, the rest include 120 individual single slide projectors for showing up to 10 complete panoramic views around the dome. Others are special projectors that display moving images or zooming pictures.

When the new show opens we hold our breath, hoping that nothing will break down at the critical moments. Some of the technical staff will not be there because they were up for the previous 36 hours! After the show someone might write a review or we get letters of praise or criticism during the next weeks. You quickly discover that you will never please everybody all of the time. Someone will always take offense to this or that, or someone doesn't like the way we do such or such. In the first show we discussed the formation of the elements in supernovae explosions and one man complained to me afterward because I had not mentioned that it was in fact God who made the elements.

Our planetarium is available for other uses besides starshows and classes which brings me into contact with a lot of interesting people. Local musicians, whom I have got to know, have put on several special concerts. We program our special effects during their playing of jazz, rock or funk (the latest word). Some groups use dancers located throughout the theater or behind the projection dome. This dome can be made to appear transparent by the simple process of placing a light behind it and shining it on someone located on the catwalk behind the dome. The dome, or screen, is made of aluminum with holes punched in it. They are too small to see from one's seat, but the screen is 18% transparent, thus allowing us to generate a rather spooky, but dramatic effect when a dancer suddenly appears out of the stars.

On a typical day someone might come to me and want to do a special event, a concert or a multimedia show. We then negotiate the terms

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of the contract (as time goes on, we learn how to do this more efficiently, avoiding pitfalls and making it more efficient). Then they come in to rehearse or record the show, and we spend time helping them, as well as running the shows. This leads to many 60-hour weeks, one after the other, but as the planetarium grows older we will have more students trained to operate the shows and do the star talks afterward. There is always advertising to worry about, and additional publicity in the form of stories.

All this makes for a very varied and interesting job, but it can become very wearing. Our planetarium can also be rented by outsiders wanting to have their own private showing or a party. Before Christmas, one local company rented the theater and brought in a string quartet to play in the lobby while their guests sipped champagne. I ran the show for them. What an appreciative audience that was, mostly smashed on champagne. Afterward I and my helpers joined in the party and then some of us went back into the theater and did an impromptu show including dancing for those few who wandered back in. Such enjoyable evenings are a bonus to the job.

In December one of the students got married in the planetarium. It was a Catholic ceremony. An altar was set up on the stage and we had the stars up while the ceremony took place. It was all very beautiful and moving.

This job is clearly a long way from radio astronomy on a day to day basis, but when we are rolling smoothly, with more routine in our operations, then I will be able to take time off to take a closer look at the universe again.

All in all the life of a planetarium director here is the life of an astronomer who has to be an entrepreneur, promoter, public relations manager, showman, and organizer. Fortunately I have the assistance of a truly excellent staff, otherwise none of this would have been possible. We have 6 full-time and 10 part-time people working here.

In doing talks about the stars after our planetarium shows, one quickly learns a lot about audiences and their reactions. Our main shows are taped and we therefore have an identical show every time. But one night we will have an audience that laughs at all the jokes, another night they only laugh at one. This doesn't depend on the size of the audience

either. It just depends on who is there and what their combined feelings are like. It is fascinating to learn to interact with them when we do the live talk about the current sky. When it is a good audience I find it much easier to give them a good talk. When it is a serious audience it is so much harder. Actors must have this problem all the time.

Today there was a nice example of things that happen here that wouldn't happen at the NRAO. Just outside my office we have a display case which acts like a fairly good mirror when viewed in the right way. Dancers practising their moves like to watch themselves in the mirrors. Today, while working on the next script, I looked up and there was this beautiful dancer, dressed in leotards practising her moves. Such a pleasant break! Eat your hearts out Turner, Burton, et al.

Let me stress that we in Boulder are trying a totally unique thing, and that is to operate a planetarium this big in a town this small. It might not work quite the way we would like it to, but we are optimistic that it will. Not only that, but we are doing a great variety of things compared to most other planetariums, and when I think of the size of our staff I am amazed that we are still going. In 8 months of operation we had 650 hours of classes, over 1000 hours of shows, including rehearsals, 350 hours of special shows (non-rehearsals), 45 hours of school shows and over 100 hours of non-income producing activities, such as experimental film programs.

In the future there will, no doubt, be other research oriented astronomers who want to try their hands at getting into the planetarium field. My advice to them is that while it is worthwhile, choose a good place to work. There are many planetariums where you cannot do what we are doing. We are fairly unique. Boulder is unique in being a melting pot for lots of talent and interesting people. There are many artists and musicians here, there is always a lot going on and the climate is great. I suspect that in ten years Boulder may no longer be like this, since many movements go in waves. On the other hand it might well become one of the big centers for creativity in the USA. Only time will tell. In the mean time, I find a spirit here that is bringing more creative people to town and it is a thrill to be in amongst it all and we hope that the planetarium becomes more and more successful.

MATHEMATICS OF COOKING

Rufus Chappel

Some of us, at one time or another, after having dined in a good restaurant have requested a recipe for a particular dish on the menu. Usually chefs guard recipes carefully, but occasionally one will consent. Probably you were requesting the recipe for use at home. If so, your joy will probably be short lived when you discover that the recipe he gave you is for fifty, one hundred, or more portions. It need not be if you use a simple formula to adjust the chef's recipe.

The following formula will usually enable you to reduce the number of portions to a more reasonable level:

Divide the number of servings you want by the number called for in the original recipe. Multiply this answer times each original ingredient to give you the required amount of each ingredient in the adjusted recipe.

Servings (portions)		amount of each	adjusted
<u>you want</u>		ingredient in	amount
Servings (portions)	x	original recipe	of each
in original recipe			ingredient

EXAMPLE: 50 portions recipe given to you by chef

Rice (raw)	1-3/4 lb. or 28 oz.
Ham (cooked)	8 lb.
Cheese sauce	5 qt.

To change the recipe to 30 portions (round figures):

$$\frac{30}{50} = .60$$

.60 x 28 oz.	= 16.80 oz. or 17 oz. or 1 lb.-1 oz.
.60 x 8 lb.	= 4.80 lb. or 4 lb.-13 oz.
.60 x 5 qt.	= 3.00 qt. or 3 qt.

New recipe -- 30 Servings:

Rice (raw)	1 lb.- 1 oz.
Ham (cooked)	4 lb.-13 oz.
Cheese sauce	3 qt.

ANTENNAS 4 - ASTRONOMERS 0

Kathy Clayton

Antenna One and Antenna Two collaborated one night (when the astronomers were through). They thought up a plan to fool "homo-sapien", and made up their own signal, we took to be alien. The headlines next day proclaimed "Contact From Space". You should have seen all the dignitaries at that VLA place! Recordings were studied, all new charts were made, But the antennas that night laughed at the joke they'd played. The best scientists and astronomers came from nations around, To see if they could figure where that signal was from. One month later (to the woe of the antennas) the astronomers Came up with their final conclusions; That signal from space was due to antenna confusion.

And to this very day,
out on the San Augustin Plains
You can still gaze on those
two antenna remains.
And on a quiet night
Way, way out there,
You can still hear their
laughter in the air.

CREF UNIT VALUES - 1976

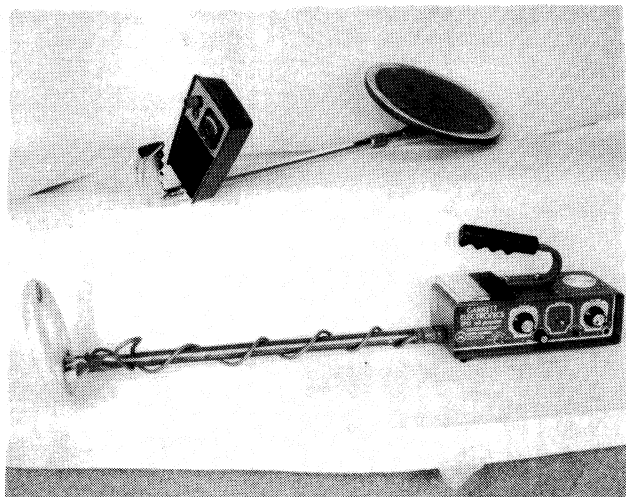
January	\$40.31
February	39.76
March	40.75
April	40.10
May	39.69
June	41.60
July	41.21
August	40.94

DETECTORS AND DETECTING

Carl Chestnut

Modern prospectors hunt for coins, bottles, and relics electronically - they use electronic metal detectors. What looks like a pie plate attached to a handle and buzzes is really a sophisticated piece of electronics that is sensitive enough to detect coins eight inches below the surface, or pinpoint old dumps buried under several feet or more of dirt and sod where old bottles and relics lay hidden.

Several years ago the metal detecting bug hit me and I modestly "started in" by building a Heath Model GD-48, T-R type detector from a kit. This detector cost me \$75.00 plus assembly and testing time. Last year I moved up several notches and bought a Garrett BFO-type "Relic Hunter" with discriminator. I also moved up in price. The "Relic Hunter" cost \$245.00.



*The Chestnut's metal detectors.
Top: the Heath Model GD-48.
Bottom: the Garrett BFO "Relic
Hunter"*

Two major kinds of metal detectors dominate the market today: (1) the BFO, or Beat Frequency Oscillator and (2) the Induction Balance, or Transmit-Receive (TR). There are, of course, other types but since these two are bought most frequently, I will limit my

discussion to them.

The BFO: This type has two oscillators; each oscillator produces a radio frequency. One of the two oscillators utilizes a coil which not only produces a beat frequency but is used as a search loop. If these oscillators are adjusted so their frequencies are very nearly the same, the difference between them becomes an audible beat note which will indicate the presence of metal.

Whenever current is applied to a coil it radiates a magnetic field around itself. This magnetic field stays uniform as long as no metal is brought into the field. However, if a piece of magnetic material (e.g. piece of iron) is brought into the field, the field becomes concentrated, and lowers the coil's oscillating radio frequency causing it to produce an audible difference. On the other hand, when some current conducting material, such as a coin, enters the field, it reduces the coil's field, but raises its oscillating radio frequency and creates an audible difference in the opposite direction.

The Induction Balance: This type uses one set of coils to produce a field, and a separate coil to detect its presence. Because of this interaction between coils, this type is also called a "Transmit-Receive" detector. Generally the two "transmit" coils are placed on the same axis and are separated by a "receive" coil. These transmit coils are connected so their fields oppose each other, and if the receive coil is carefully positioned it will not detect any field in the absence of interfering substance. In the vicinity of the receive coil the two transmit fields are balanced, which is why this is called an "Induction Balance". The receive coil detects nothing until the field is disturbed.

The induction balance works this way: when either a piece of magnetic or current conducting material is brought into the field of one coil, it disturbs the coil's field, much in the same way as it did in the BFO. The BFO detects a magnetic or current conducting material because of a change in frequency. However, this type detects the material because the field is disturbed, putting the fields out of balance. After this happens the receive coil "hears" a tone.

Both types of detectors can save a lot of useless digging for worthless materials (like

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pop and beer can tabs) if they have discriminators. The BFO discriminates between magnetic and non-magnetic material by tuning the instrument in such a way that objects you want to find increase the frequency difference, while objects you don't want to find decrease it.

The Induction Balance type can be similarly tuned. However, in this type the frequency is not changed. Instead the residual coupling between the transmit and receive coils is adjusted so that the objects you want to find increase the coupling and the objects you don't want reduce it.

Unfortunately, there is no one particular detector on the market that will do all kinds of detecting (maximum depth, small objects, etc.). However, I will try to explain the qualities to look for when selecting a detector for bottle and relic hunting as contrasted with one for coin hunting.

Bottle and Relic Hunting: The best way to find old bottles and old relics is to look in old, buried trash dumps. Trash dumps are easily found with a metal detector that picks up large, deeply buried metals that are common to trash dumps. The detector for this kind of hunting should have a search frequency of 100 KHz or lower for depth penetration.



Some of the old coins, bottles, and relics found with the Heath and Garrett metal detectors.

The large pieces of metal found in trash dumps usually cause enough change in frequency to be easily detected. The Heath, Model GD-48 is good for this type of hunting. It is a T-R type detector and will locate a buried two-inch pipe eighteen inches deep.

Coin Detecting: A detector with a discriminator is the only way to go if you want to increase your chances of finding many coins. Usually most places where there might be coins, there are generally many, many pieces of magnetic and non-magnetic "junk". In the name of time, labor and interest, the ability to discriminate between magnetic and non-magnetic objects is essential. One of the best detectors for this purpose is the Garrett "Relic Hunter" or "Coin Hunter".

The Garrett's frequency is in the order of 1 MHz or larger so that it can detect small objects. Its depth of penetration in soil is usually limited to 3 or 4 inches. However, I have found a few coins at 7 or 8 inches deep with this detector, but the average coins are generally at a depth of 2 or 3 inches.

I've found one of the best places to search is around old homesteads. In particular around a front porch area, under shade trees, and under clothes lines. If the building is no longer there, it is a good practice to search around the cornerstones - it was an old practice to place a coin on top of the cornerstone with the date the building was constructed. Some bricklayers had a similar practice except they placed a coin on the top course of a chimney.

The best digging tool I've come across is a small garden hand trowel. Especially in sod where you will be digging most of the time. With care you can dig in sod and no one will be the wiser. I recommend this procedure: over the detected object cut a 3 inch circle through the sod down into the dirt a couple of inches. Lift out sod and dirt carefully so sod and dirt come out intact. Dirt removed when digging for your treasure should be piled to one side of the hole. After you've found your treasure, refill the hole with dirt and tamp lightly. Lastly, reinsert the sod, step on it and walk away. I've checked back on places I've dug and I've found it hard to tell where I had dug before.

You probably won't be satisfied with the first metal detector you buy. Maybe you will be
--continued, next page--

at first, but later you'll want something better. Someone said that buying a metal detector is like buying a boat or house: you generally have to own about three before you get what you want. It will help when buying that first metal detector to know this: most manufacturers' specifications are very misleading. I would caution anyone interested in buying one to look for good balance, sensitivity, ground effects, waterproofing, and oscillator stability. Right now I'm looking for the third one.

I know of two others in the lab who have metal detectors. They are Tom Dunbrack and Roy Pennington. Tom has a Garrett TR model and Roy a Heath GD-348. Their primary interest is searching for relics in Civil War battlefields. Roy is presently looking for a better model, but I don't know how satisfied Tom is with his. It may well be his third.

CPR
(CARDIO-PULMONARY RESUSCITATION)

Bill delGiudice

A few weeks ago in a West Virginia city, a car pulled up in front of the fire house, the driver frantically blowing the horn. A man lay slumped in the passenger seat. Firefighters rushed out to find the 77 year old man wasn't breathing and had no heart beat. Two firefighters began treatment immediately while others brought out an oxygen unit and called an ambulance. The man, a heart attack victim, survived.

He was lucky because he was stricken a block away from the fire house where trained emergency medical technicians were available. What would you do if someone suffered a similar attack and you were the only help immediately available? Almost any person can save the life of a non-breathing, heart-arrested victim with no other tools or equipment than his mouth and hands. The process is called cardio-pulmonary resuscitation.

This fall the Green Bank EMTs will offer a short course to teach cardio-pulmonary resuscitation and other basic first aid to any interested persons. We hope that you never

find yourself in a life or death situation, but if you do this training can give "life" an edge. Please watch the bulletin boards for our announcement.

VLAPRA

Larry Carlisle

VLAPRA is now a reality. That, amigos, is the Very Large Array Project Recreation Association.

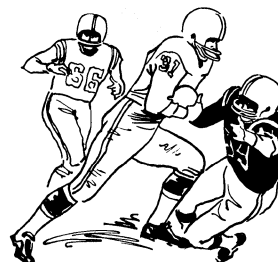
The Land of Enchantment offers much for the nature lover, the history buff, rock hounds, and even opera patrons. However, to insure a semblance of social life there have been some very busy NRAO employees this summer.

On June 9 an ad-hoc committee of Don Swann, Jon Spargo, and Larry Carlisle set the wheels in motion and by July 15 a Board of Directors was elected. Named to two year terms were Larry Carlisle, Skip Lagoyda, Peter Napier, Dave Archuleta; and, to one year terms, Judy Kampf, Gareth Hunt, and Rey Serna. From that Gareth Hunt was elected President; Rey Serna, Vice-President; Larry Carlisle, Secretary; and Peter Napier, Treasurer.

The first VLAPRA activity was a picnic at Sedillio Park in Socorro held on August 22. That successful event will be reported on fully, with photographs, in the next issue.

On August 27, during a general membership meeting, the Constitution and By-Laws was adopted.

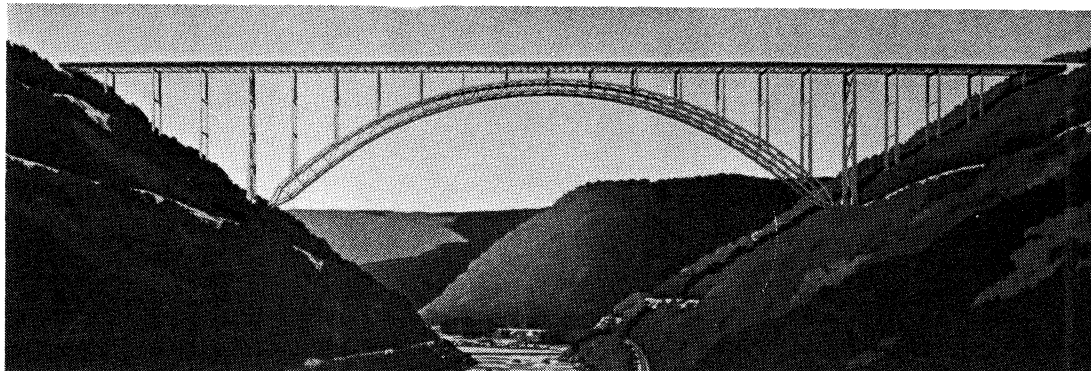
The Board of Directors is busy canvassing employees for ideas, acquainting themselves with internal functions, and making plans for the future. Assuredly, there will be more good news from VLAPRA.



NEW RIVER GORGE BRIDGE

contributed by Dick Hiner

Take US 19 out of Summersville, West Virginia and you are on the road to one of the construction wonders of our age: the New River Gorge Bridge. Dick Hiner visited the bridge in mid-August and brought back data and information about the bridge thinking it might be of interest to readers of the *OBSERVER*. Good thinking. The *OBSERVER* is happy to print herein the data and information Dick brought back.



NEW RIVER GORGE BRIDGE¹; FAYETTE COUNTY, WEST VIRGINIA

Owner - West Virginia Department of Highways

Design Engineer - Michael Baker, Jr., Inc.

Contractor - American Bridge Division, United States Steel Corporation

Longest Steel Arch in the World - 1,700' Span - 370' Rise

Second Highest Bridge in the United States - 876 Feet

(325' Higher than the Washington Monument)

Bid Price - \$33,984,000

Total Weight of Structural Steel - 42,775,000 Pounds

Maximum Reaction on Arch Casting - 19,600,000 Pounds

Weight of One Arch Bearing Casting - 54,000 Pounds

Weight of One Arch Bearing Pin - 18,000 Pounds

Diameter of Pin - 27 inches - Length - 12'-0"

Weight of Heaviest Piece to Erect - 172,000 Pounds

Maximum Design Load in Arch Chord - 14,120,000 Pounds

(Area Equivalent to 28½" Solid Steel Square Bar)

Number of Bolts in Largest Joint - 2,300

Longest 1 1/8" Diameter Bolt - 14" Grip

Largest Truss Chord Plate - 7¼" x 3¼" x 70'-0"

Largest Gusset Plate - 14.5' x 11.5'

Ratio: $\frac{\text{Dead Load}}{\text{Design Total Load}} = .73$ $\frac{\text{Live Load}}{\text{Dead Load}} = .08$

NOTE: Design Total Load includes wind and impact loads.

Maximum Live Load Deflection - 5 3/4" at ¼ Point

Maximum Lowering of Bridge Due to Drop in Temperature -

From +60° to -10° = 10½" at Crown

Depth of Arch Truss - Varies from 34' to 53'

--continued, next page--

Deck Width - 69'-4" (4 Traffic Lanes with Concrete Divisor)
Total Length of Bridge - 3.030 Feet
Erection Highline - (4'-3" Round Cables - 3,500 Foot Span - Largest Ever Used)
North Arch Footings and Thrust Blocks - 6,072 Cubic Yards of Concrete
(Enough Concrete to Build 1 3/4 Miles of 2-lane Concrete Highway)
Total Number of Record Calculation Sheets - 4,759
Manhours for Design Calculations and Drawings - Equivalent to One Man Working
40 Hours per Week for 15 Years

- - - - -

HISTORY OF A HISTORY-MAKING BRIDGE

Deep in the mountains of West Virginia, construction crews are busy building the longest steel arch bridge in the world.

Being constructed across the New River Gorge in Fayette County, this history-making bridge is the single most expensive project ever undertaken by the West Virginia Department of Highways. At 873 feet above the river, the span will also be the second highest in the United States and the highest east of the Mississippi.

The span should also make economic history. Governor Moore has indicated that the construction and completion of the bridge will contribute greatly to the economy of the state in general and the Fayetteville area in particular.

Contractor on the 3030-foot bridge is the American Bridge Division of U. S. Steel Corporation, awarded the contract in June, 1973. U. S. Steel's low bid of \$33,984,102 was about \$11 million less than the engineers' estimate cost. Of the four bids received on the project, the highest was \$52,496,017. Thanks to the efforts of Governor Moore, the Appalachian Regional Commission is funding 70 per cent of the expense of the project rather than the standard 50 per cent.

The bridge itself was first envisioned as a suspension-type structure. However, the consulting firm Michael Baker, Jr., Inc. determined the steel arch design would be more economical and would better adapt to the construction area. The four-lane bridge will be supported by 9 land piers and 13 bents on the span itself.

Expected to be open to traffic in the fall of 1976, the bridge will include 21,000 tons of structural steel, 1700 tons of reinforcing steel, 17,000 cubic yards of sub-structure concrete, and 6000 linear feet of aluminum railing. The span is being built of unpainted weathering steel, which cut original construction costs by \$300,000. The weathering steel will also eliminate subsequent paint jobs running approximately \$1 million each time.

In late 1973, U. S. Steel erected two cableways consisting of four main steel cables suspended over the gorge from 330-foot towers on either side of the canyon. The ironworkers are using the cableway system to erect the structural steel, the first of which was put in place in June, 1974.

Corridor "L", of which the bridge is one segment, will run for 70 miles between I-64 and I-77 in the Beckley area and I-79 at Sutton. Over 46 miles of the Appalachian Development Highway are currently open to traffic.

* * * * *

¹ Literature distributed at the bridge site by Lacy Wriston, Scarbro, West Virginia.

WHAT'S COOKING?

Cherry Cheese Pie

*from the kitchen of
Berdeen O'Brien*

Crust:

In a pan or baking dish 8" x 13", make a graham cracker crust.

- 1 1/3 C. Graham Cracker Crumbs
- 3 T. Confectioner's Sugar
- 1 stick oleo (melted)

Blend these ingredients well, then press in the bottom of the pan. Place in the refrigerator to cool while preparing the Dream Whip mixture.

Dream Whip and Cheese mixture:

- 1 C. milk (cold)
- 1 tsp. vanilla
- 1-8 oz. pkg. Cream Cheese
- 2 envelopes Dream Whip
- 1/2 tsp. almond extract

Make Dream Whip according to package directions. Add flavorings to the milk. Let the cheese warm (room temperature), then blend in granulated sugar. Add to the Dream Whip a little at a time, then beat until smooth.

Spread about half of the Dream Whip-Cheese mixture over the crust. Cover with 1 can cherry pie filling. Top with the remaining Dream Whip-Cheese mixture.

Let stand in refrigerator for several hours before serving.

Zucchini Relish

*from the kitchen of
Ellen Bouton*

- Combine:** 10 cups chopped zucchini
2 cups chopped onions
5 tablespoons salt.

Let stand six to eight hours.

Drain and rinse well. Combine with:

- 1 chopped sweet red pepper
- 1 chopped sweet green pepper
- 2 cups vinegar
- 2 cups sugar (or 1 1/3 cups honey)
- 1 tablespoon dry mustard
- 1 tablespoon turmeric
- 1 tablespoon nutmeg
- 1 teaspoon celery seed
- 1/4 teaspoon cayenne
- 2 tablespoons cornstarch.

Simmer until thickened. Can add more cornstarch if necessary. Pack in hot sterilized jars and process in boiling water bath: 5 minutes for pints; 10 minutes for quarts.

Use this on hamburgers, hot dogs, etc. Also good with cottage cheese, in egg salad, with macaroni and cheese, in cheese sandwiches, and open-faced broiled cheese sandwiches.

Seven Layer Cookies

*from the kitchen of
Isabelle Michael*

Melt 1 stick of oleo in 9" x 13" x 2" pan. Sprinkle 1 cup graham cracker crumbs over oleo. Sprinkle 1 small pkg. butterscotch chips and 1 small pkg. chocolate chips, and 1 can coconut over crumbs. Pour 1 can sweetened condensed milk over coconut. Sprinkle 1 cup chopped pecans over top. Bake at 325° for 40 minutes.

TOURIST OPERATIONS

Wally Oref

When I wrote this article, daily public tours had ended and the second weekend of tours was over. After the last tour on September 19, the tally sheet showed 21,312 visitors had taken our regular public tours. Actually, more people visited the Observatory than that.

Before the tour season started on June 12, 1,580 students toured the Observatory in special school groups. On Memorial Day weekend, when we ran only the buses, we toured 875 more. By June 12, when public tours started, 2,455 people had already visited the Observatory. For the rest of the weekends we expect around 3,000 visitors, and another 500 or so from special tours. An estimate of between 27,000 and 28,000 visitors for 1976 should be about right.

The tour center keeps other statistical data. For example, if you wanted to know how many cars, on the average, come and go on a single tour day we could tell you that. And we could also tell you that in each car there would be, again on the average, either three or four people.

We record visitors by state and this far along in the season we can tell where the majority of our visitors come from. You would probably guess West Virginia is represented most often but which states do you think are the second and third most represented? It's a fact that number two is Ohio, and Virginia is number three.

Similarly, most people would pick Sunday as the most popular tour day, but few, I think, would have guessed Thursday was almost as popular. The least popular tour day (you're right) is Monday.

For Linda Snyder and Bill Young in the tour center, and for tour bus drivers Paul Kesler, Nathan Fertig, and Jerry Matheny, I invite you to take a tour before the season ends in October. What happened to June Riley? June, who worked ten years part-time in the tour program, reached sixty-five at the end of June. Since then he is actively raising sheep in two counties.

A.U.I. SCHOLARSHIP PROGRAM REVISED

Monroe Petty

The A.U.I. Board of Trustees has approved two major revisions in the A.U.I. Scholarship Program which will take effect in the fall of 1977.

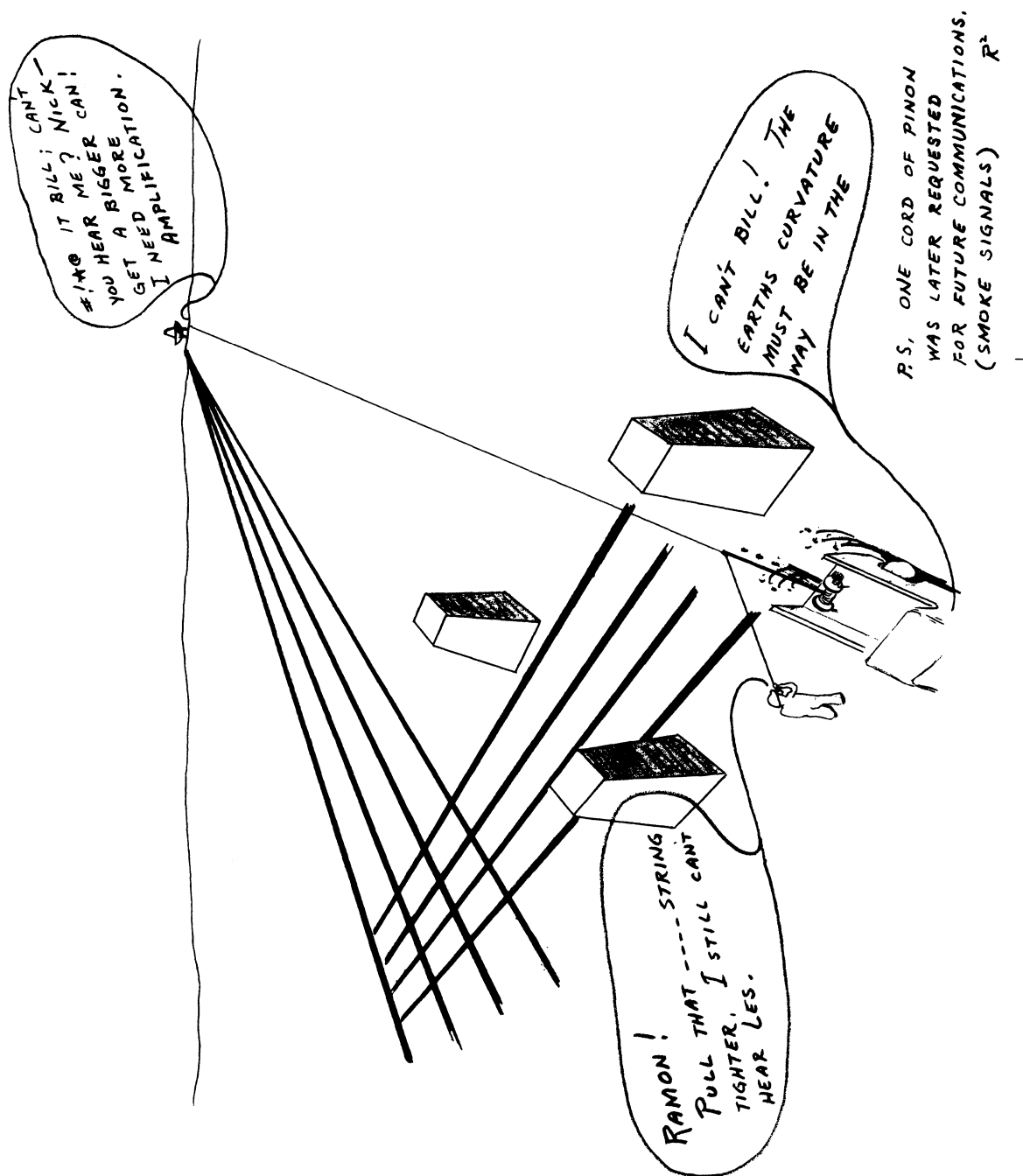
The first revision increases the annual scholarship amount from the current level of \$900 to \$1250. This increase will apply to all 1977 scholarship winners as well as previous winners who will be continuing their studies during and after September 1977.

The second revision permits scholarship winners to undertake a course of study leading to an associate degree, which normally requires only two years of study. Previously the scholarship applied only to four-year baccalaureate programs. As in the past, scholarship winners must enroll at an accredited institution of higher learning.

Complete information on this year's A.U.I. Scholarship competition was distributed to all employees on September 15. Further details may be obtained by contacting D. E. Hogg, extension 223 in Charlottesville.

NOW IS THE TIME TO:

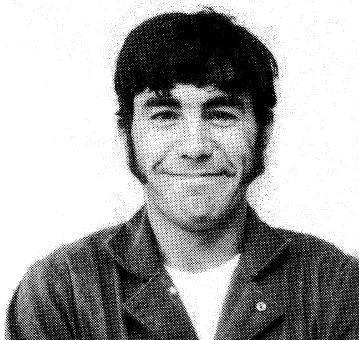
Reflect
Dry Corn
Go hunting
Dig potatoes
Cook kale greens
Plant crocus bulbs
Look for hazelnuts
Carve pumpkin faces
Watch ducks fly South
Treasure each falling leaf
Finish seeding winter wheat
Haul apples to the cider mill
Set up a corn shock, just for fun
Roast marshmallows over a bonfire
Keep a fire extinguisher on the corn picker
Stand content before a barn filled with hay



VLA - NEW MEXICO-BASED EMPLOYEES



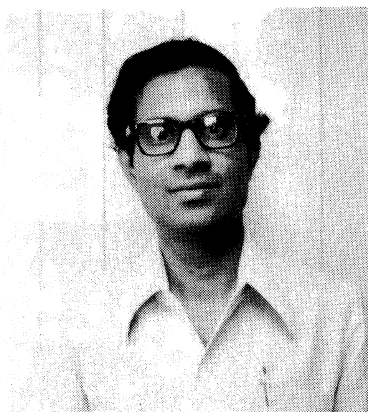
Kathleen Clayton
Technician



Ramon Molina
Telescope Mechanic



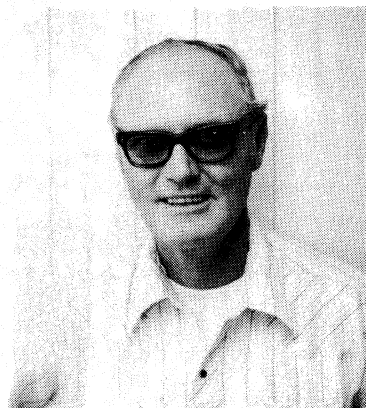
Judith B. Martin
Secretary



Durgadas S. Bagri
Electronic Engineer



David B. Archuleta
Special Serv. Asst.



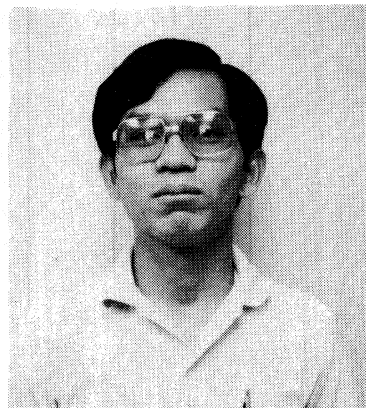
Donald L. Krieger
Trans. Equip. Operator



Bobbie L. Cohee
Technician



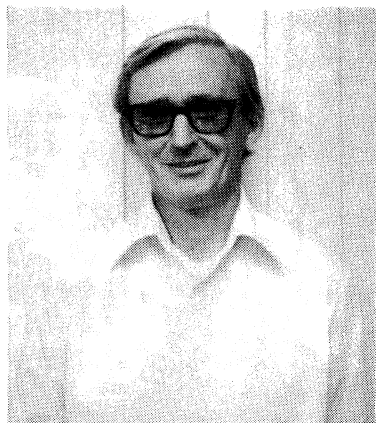
Isidro Lopez, Jr.
Bldg./Ground/Util. Worker



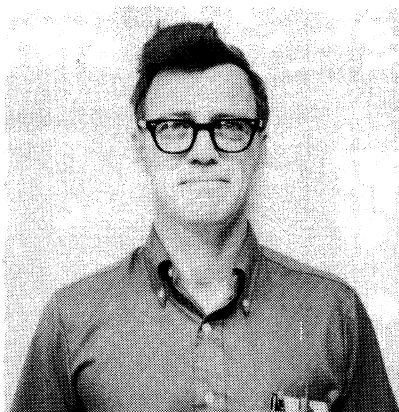
Mikio Ogai
Electronic Engineer

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VLA - NEW MEXICO-BASED EMPLOYEES (continued)



Robert S. Runyon
Draftsman



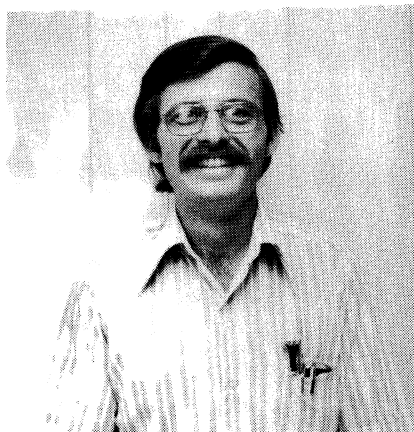
James L. Oty
Tec. Specialist



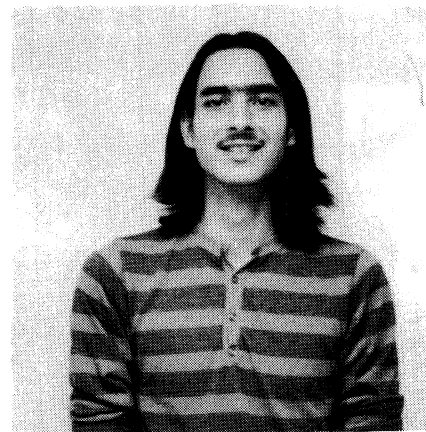
Theodore E. Neubauer
Staff Shop Technician



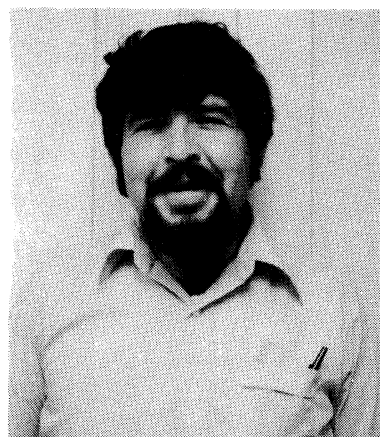
Rudy Latasa
Technician



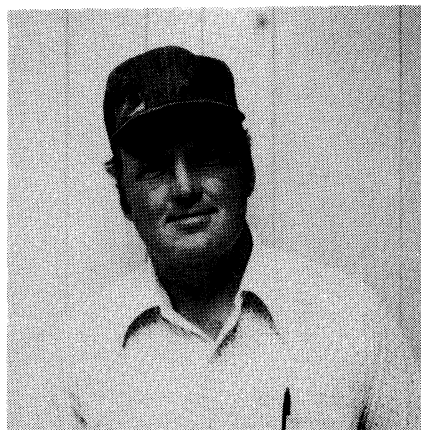
Stephen W. Troy
A/C Heat/Plumb. Engineer



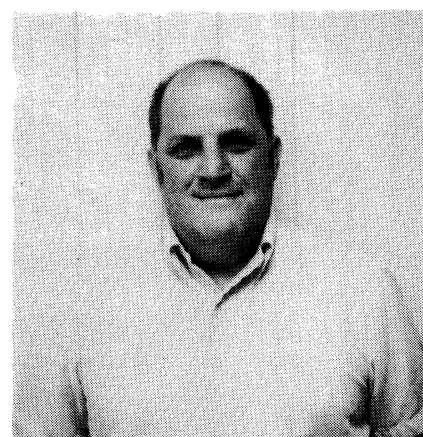
Patrick A. Temple
Technician



Rey Serna
Technician

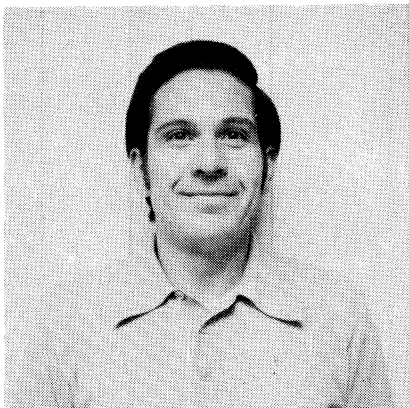


C. Keith Cottom
Waveguide Foreman



Ernest M. Caloccia
Electronic Engineer

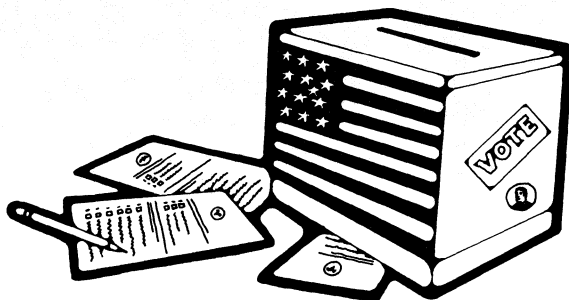
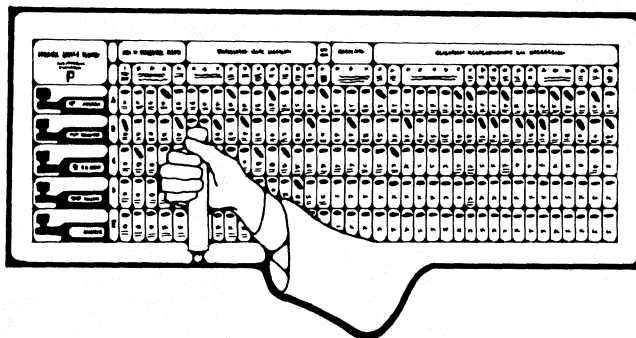
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VIA - NEW MEXICO-BASED EMPLOYEES (continued)

Frederick C. Dunn
Technician

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