

The O B S E R V E R

VOL. 17, No. 1

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PAGE 1

*In grateful recognition
for ten years of faithful service*



Left to Right: Wendell Monk, Russell Poling, Sandy Weinreb, Ken Kellermann, Peggy Weems, Charles Cassell, Bob Burns, John Weaver, and Boyd Wright.

Story on Page 2.

TEN-YEAR AWARDS

The ninth annual NRAO Service Awards Banquet was held in the Green Bank cafeteria on January 23, 1976 for employees who completed ten years of continuous service as of December 31, 1975. Dave Hogg, Associate Director, presented certificates and lapel pins to the following twelve employees:

Charles W. Cassell
 Jackie G. Cochran
 John D. Weaver
 Russell B. Poling, Jr.
 Wendell A. Monk
 Boyd H. Wright
 Kenneth I. Kellermann
 Thomas R. Dunbrack
 Sander Weinreb
 Robert E. Mauzy, Jr.
 Margaret B. Weems
 William R. Burns, Jr.

This brings to 124 the number of employees who have completed ten or more years of service. Of this 124, only nineteen have retired, terminated, or are deceased.

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Assistant to the Editor: - Berdeen O'Brien

Editorial Board: - Bill Brundage
 Ed Fomalont
 Wendell Monk

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

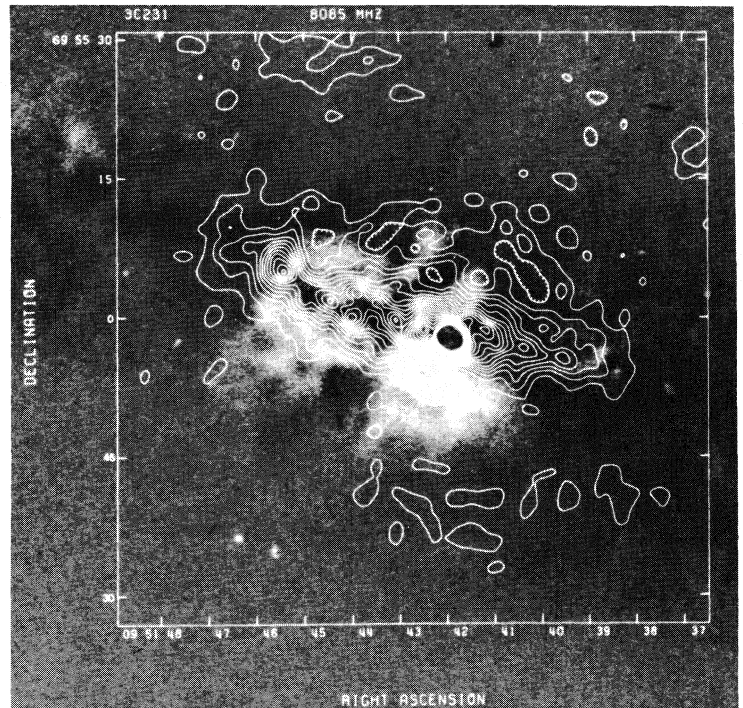
MESSIER 82 - THE CURIOUS GALAXY

Philipp P. Kronberg*

Despite its modest mass of only a few times 10^{10} suns (our galaxy has about 10 times that mass) M82 possesses a collection of interesting objects. A deep photograph in the $H\alpha$ line by Lynds and Sandage in 1973 showed it to have a vast system of extended filaments which reach well above the plane which is seen on a normal photograph. At its distance of 3.2 megaparsecs (roughly 3 x that of the Andromeda Nebula) deep photographs should reveal some individual supergiant stars, but for some reason we don't see them. The plane of M82 has a peculiar, amorphous appearance which is quite unlike that of any other galaxy; it was classified by Holmberg as "Irregular Type II".

The uncertainty in its classification is partly due to the fact that M82, in its celestial modesty, shows us only an edge or profile. While this may be more satisfactory for some smaller members of creation it is most unfortunate for galaxies, whose exotic anatomical details are the most difficult to discern when they show themselves in this way.

What is then the best wavelength to use if we want a high resolution, transparent view of the nucleus of M82? The enormous amount of dust and gas makes it impossible in the optical. Even at the longer radio wavelengths (at which M82, with its non-thermal spectrum, is a strong source) we must beware, since the nucleus of M82 has at least two super-massive HII regions which would probably absorb parts of the radio source at frequencies below ~ 1 GHz. At millimeter wavelengths the resolution and sensitivity for continuum are too poor. This leaves only two regions of the electromagnetic spectrum: the far infrared, say $10 - 400 \mu\text{m}$, and short centimeter wavelengths ($\sim 2 - 10 \text{ cm}$). Since very far infrared ($\sim 50 \mu\text{m}$) detectors don't have enough resolution to map the infrared source in detail, that leaves just two parts of the available E.M. spectrum, $10 \mu\text{m} - 25 \mu\text{m}$ infrared, and the short radio wavelengths. With the former, we should expect to see radiation from the dust, and in radio, the non-thermal synchrotron radiation plus - with luck and good paramps - some thermal radiation from those supergiant HII regions.



The picture above shows the aperture synthesis map of the M82 radio source made at 8 GHz with the NRAO interferometer. It should convince you that the interferometer has as good an angular resolution as the Palomar 200" telescope - which produced the underlying photographs. The sensitivity is also unsurpassed. The map shown is the result of tracking M82 from "interferometer rising" to setting ($\pm 5h40^m$) at 8 different configurations. This gives an r.m.s. noise of ~ 0.5 mJy per beam, which makes it probably the most sensitive radio map made to date at such a high resolution. This sensitivity potentially enables us to map the linear polarization in great detail. Unfortunately M82 didn't cooperate in that respect; it proved to be virtually unpolarized everywhere, and on all size scales down to ~ 20 pc. All we have are upper limits which vary from $\leq 4\%$ to $\leq 0.7\%$ depending upon the total power brightness of the point in question along the radio ridge. Since the polarization vectors show only the noise, I left them off the picture purely for the sake of cleanliness. Speaking of noise, I must insert a caveat here on the noise level of 0.5 mJy/beam mentioned above, and say that this only applies to the polarization map. The

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noise level on the map of total radiation (i.e., the contour map shown) is ~ 3 mJy/beam instead of 0.5 mJy/beam. Reason: At 3.7 cm the atmospheric phase irregularities limit the dynamic range (the ratio of maximum to minimum surface brightness) in our case to $\sim 30/1$ - that means that any emission less than $\sim 1/30$ th of the peak intensity on the map is swamped by "noisy" fluctuations which cannot be removed. To put it another way, the brightest point source (41 S° 9+58"), paradoxically, sets the lowest level of detectability. The sensitivity of the polarization map wasn't affected in this way only because there was no bright polarized source. You will also gather from the radio-optical overlay that there is virtually no correspondence between radio and optical features. This is perhaps not surprising when we realize that the radio source is deeply embedded within the nucleus of M82 where any related optical radiation would be completely absorbed or scattered by dust and gas.

A likely, although unproven explanation for the radio source in M82 is what I shall call a "multi-firecracker" model in which a supernova goes off every few decades. These supernovae heat up the dense interstellar medium near the M82 nucleus (to give the infrared emission) and at the same time contribute enough relativistic electrons to explain the radio emission. If this is so, then the rate of supernova occurring within ~ 300 pc of the M82 nucleus (only $1/30$ th of the sun's distance from our galactic centre) is comparable to that of an entire Sc spiral galaxy. The small peaks on the radio map would be some of the strongest supernovae of the last few hundred, or thousand years. If this is so these must be from 10 to 100 times as powerful as Cassiopea A, the (currently) brightest SNR in our galaxy. We would expect the supernovae to "churn up" the interstellar medium - which is consistent with the absence of evidence for aligned magnetic fields on scales ~ 20 pc as shown by the low polarization limits mentioned above.

Another fascinating feature of the M82 nucleus is the size of the two supergiant HII regions, which Recillas-Cruz and Peimbert found near the nucleus. To show these in isolation from the rest of the murky interior of M82, I have superimposed two 200" photographs, infrared and red, taken by Sidney van

den Bergh and René Racine respectively. By putting the infrared positive on top of a red negative we see a display roughly proportional to (infrared - red). HII regions, which have a large red-infrared difference show black on such a superposition - which is the one shown in the figure. To ionize these 2 regions (each ~ 100 pc in size) by hot stars requires no less than $\sim 18,000$ O6 stars or the equivalent ionizing power (e.g., fewer, but even hotter stars). This is more than the total of such stars in our galaxy. On the other hand, if this many O stars really exist near the M82 nucleus, it would not be unreasonable to expect a supernova say every 10 to 20 years - which would be quite adequate to power the radio source.

You will notice that the left upper HII region (named "M82-I" by Recillas-Cruz and Peimbert) is completely masked by the non-thermal source, and we therefore don't expect to see its relatively weak ($\sim 1-2$ contours) thermal emission. However, part of the other one ("M82-II") peeks out below the main ridge of radio emission (see photo), and we can just see a corresponding "plateau" of radio emission at the 1 - 2 contour level, which is very likely the actual thermal emission. If so, then this is the most distant radio thermally emitting gas cloud yet seen, thanks to the high resolution and sensitivity of the 3-element interferometer.

It is obvious that the radio structure of M82 (3C 231) is quite different from that of the typical extragalactic double source. If the multiple-supernova explanation is correct, then it certainly belongs to a different class of radio source. The next question is: Is it unique as a radio source or are there other extragalactic sources of this type? I don't think it is unique - both the NRAO interferometer and the Westerbork Synthesis Radio Telescope (WSRT) have recently produced maps of similar sources - usually in spiral galaxies with gassy and dusty nuclei. I have just mapped the nucleus of NGC 2146 - a peculiar spiral which has a similar radio structure, and several other galaxies mapped with the WSRT by the Leiden and Groningen groups also show a similar radio structure. The radio extent varies from ~ 0.5 kpc to 3 kpc, and is always centred on the nucleus of the galaxy. Perhaps all such galaxies have anomalously large nuclear

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HII regions similar to M82, and also a very frequent occurrence of supernovae near the nucleus. The very fact of lots of gas and dust also suggests a rich hunting ground for interstellar molecules. In any case it is an interesting astronomical puzzle - whose better understanding may help explain what really does go on in the nuclei of galaxies.

*Visiting von-Humboldt Fellow at MPI

HOMEMADE GRANOLA

Recent articles in *Readers' Digest* and elsewhere have made Americans aware of the need for fiber in their diet, which unfortunately most of us Americans don't get enough of. These articles cite many foods available that can help provide fiber, but one often mentioned is Granola, a good tasting cereal that has been around for a long time but largely forgotten since the introduction and acceptance of ready-made cereals. In case you missed these Granola recipes that appeared in some newspapers and magazines, we are printing below a popular Granola recipe used by the Oref family. This Granola can be made easily at home from ingredients readily obtainable from your local grocery or health food store.

Because many different ingredients can be used in homemade Granola, you can add to or omit ingredients according to your own preference. Whatever combination you use, the basic ingredients remain the same: oatmeal (quick or old fashioned), wheat germ, a sweetener, and oil. The kind of oatmeal you use will determine how chewy the Granola will be. Wheat germ supplies, among other things, vitamins E and B. We use honey because it is a natural sweetener. (There is growing evidence that white sugar is not really good for you.) For the same reason corn oil is preferred to vegetable oil. Fiber content comes from the oatmeal, coconut, nuts, sunflower seeds, sesame seeds, and wheat germ. If you want to add fruit to your Granola, add the fruit after baking. If the fruit is baked with the other ingredients, it hardens and dries out.

Granola made with the amounts and ingred-

ients listed below will make seven pounds of Granola at a cost of 87 cents a pound. This is about the same price you pay for a pound of storebought Granola. While prices may be the same, the homemade Granola contains more different natural ingredients and no refined sugars.

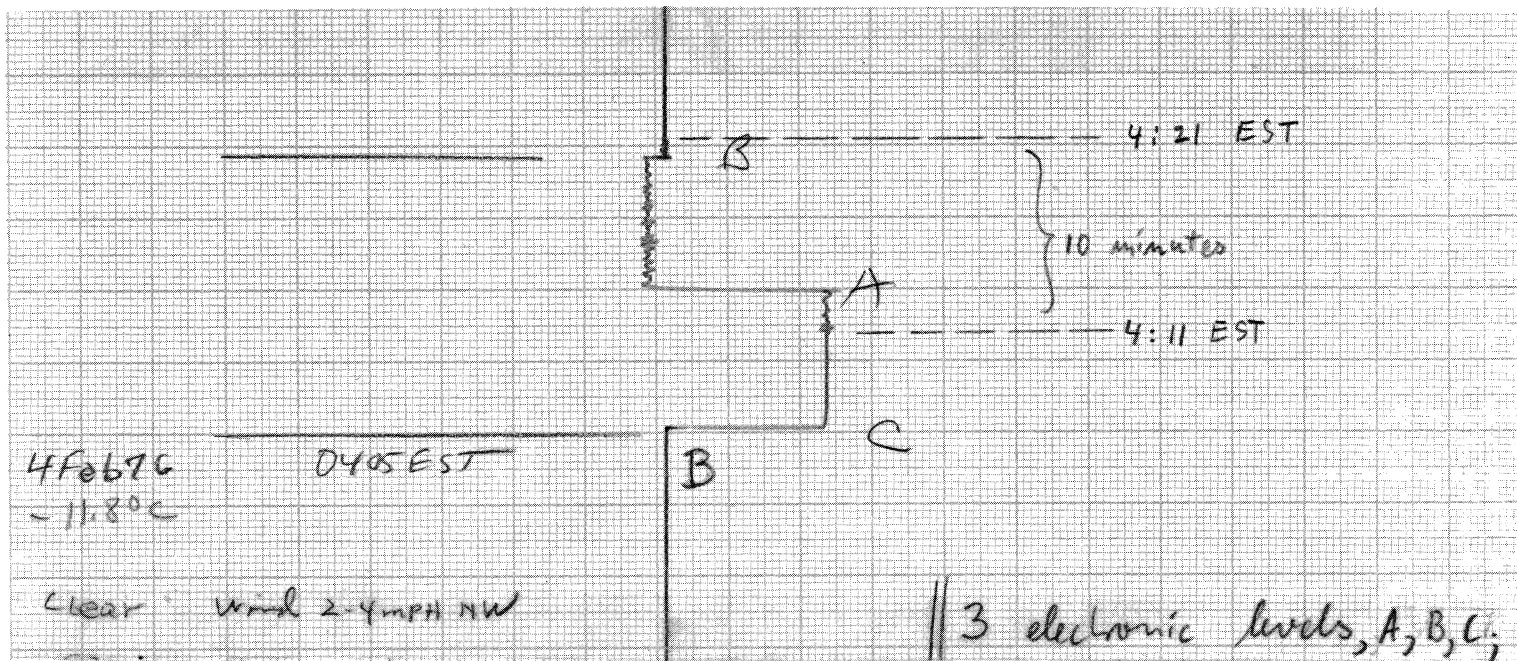
- 10 cups uncooked oatmeal
- 1 jar wheat germ
- 2 cups coconut
- 2 cups coarsely chopped nuts
(English walnut, pecan, black walnut, hickory)
- 1 cup sesame seeds
- ½ teaspoon salt
- 1 cup corn oil
- 2 cups honey
- 2 teaspoons vanilla

Mix dry ingredients thoroughly in a large bowl. Heat together oil, honey, and vanilla - DO NOT BOIL. Pour liquid mixture over dry ingredients and mix well. Spread about ¼ of mixture evenly on an oiled shallow pan (a jelly roll pan is ideal for this). Bake at 325 degrees for 15 minutes. Remove from oven and stir well. Bake for another 8-10 minutes and watch closely so the mixture does not over-brown. It's ready to remove from the oven when a golden brown. Place on a wire rack to cool and stir occasionally to prevent caking. When cool, store Granola in airtight containers. Repeat baking procedure for each panful.

Happy eating. You'll find that a bowl of Granola for breakfast will keep you until lunch. It also makes a good trail food and in-between-meal snack for the kids.



Down-to-Earth Astronomy. Monitoring thermal deformations of the 140-ft concrete building, with three electronic levels (A, B, C, scale 1 arcsec/mm), we observed a jitter from the Guatemala earthquake, just when the 140-ft operator switched through all three levels.
 --Sebastian von Hoerner



Guatemala Quake Toll Estimated Near 2,000

By Vicente Morales

GUATEMALA CITY (AP) — The military chief of staff of the National Emergency Committee said an estimated 2,000 persons were killed in Guatemala on Wednesday by a tremendous earthquake that rumbled over a 2,000-mile stretch through Central American and Mexico.

There were no reports of heavy casualties in the other countries hit by the pre-dawn earthquake, but severe damage and panic were reported in Honduras. Officials in the other country hit, El Salvador, reported some roads and highways cut. Minor damage was reported in Southern Mexico.

Col. Manuel Angel Ponce, the chief of staff, said the figure of 2,000 persons killed was "conservative," adding that "alarming reports" were coming in from the interior of the country 15 hours after the earthquake hit at 3:04 a.m. (4:04 a.m., EST). It was recorded at 7.5 on the Richter Scale, an earthquake of major proportions.

Hundreds of thousands poured into the streets here in panic after it hit. Guatemala City plays host to large numbers of American tourists this time of year, but

Checking the velocity:

$$\left. \begin{array}{l} \text{EST } 4:11 - 4:04 = (7 \pm 1) \text{ min} \\ \text{Guatemala - Green Bank} = 2870 \text{ km} \end{array} \right\} v = (6.8 \pm 1.0) \text{ km/sec}$$

SEISMOLOGICAL AND RELATED DATA

2-117

TABLE 2j-10. VELOCITY V , KM/SEC, OF LONGITUDINAL WAVES AT SELECTED DEPTH INTERVALS h , KM, OBSERVED IN VARIOUS REGIONS, 1950-1958†
 (SE = source of energy, AE = artificial explosions, EQ = earthquake, RB = rock burst. M_0 is the depth of the Mohorovičić discontinuity below sea level in km; V_M, v_M are reported longitudinal and transverse velocities, respectively, just below M_0 . Corresponding values of Poisson's ratio are 0.23 to 0.27)

Region	SE	h	V	h	V	M_0	V_M	v_M
N.W. Germany.....	AE	6-15	5.9 ±	15-28	6.5 ±	28 ±	8.2	?
Black Forest.....	AE	1-21	6.0	21-30	6.55	31	8.2	4.8
Southern Alps.....	EQ	0-35	5.7 ±	35-45	6.6 ±	45 ±	8.0	4.4
Northern Italy.....	EQ	0-15	5.3 ±	15-30	6.5 ±	40 ±	8.2	4.5 ±
South Africa.....	RB	4-36?	6.2	?	6.8	34	8.2	4.7
New York.....	AE	0-35	6.3	?	?	35	8.1	4.7
Eastern U.S.....	AE	0-5	6.0	5-15	6.5 ±	40 ±	8.1	←?
Wisconsin.....	AE	½-3	4.5	3-40 ±	6.0-6.9	42 ±	8.2	?
So. California.....	AE	1 ±	5.8	4-12	6.1-6.7	32 ±	8.2	?
So. California.....	EQ	1-25	6.4	25-35	7.1	35 ±	8.1	4.55
Canadian Shield.....	RB	0-30	6.2	30-35	7.1	37	8.2	4.85
Japan.....	AE	1-23	6.1 ±	23-32	7.4	32 ±	8.2	4.7 ±
N.E. India.....	EQ	1-25	5.6	25-46	6.6	46	7.9	4.5
Central Asia.....	AE	1-20	5.7	20-50	6.2	50	8.0	?
W. Atlantic.....	AE	Water	5-10 ±	6.7	10 ±	8.0	?
Pacific Basin.....	AE	Water	5-11 ±	6.8 ±	11 ±	8.2	?

RAO NUMBERS 1-25

Here's something you've always wanted to know. The names that go with the first 25 RAO numbers. Fret no more because here they are:

<u>NAME</u>	<u>RAO #</u>	<u>DATE OF HIRE</u>
Emberson, Richard M.	1	7-15-51
Coulton, Lillian K.	2	7-08-53
Heeschen, David S.	3	7-01-56
Fennelly, Mary E.	4	9-17-56
Findlay, John W.	5	12-27-56
Westman, Meade L.	6	3-01-57
Taylor, Lewis	7	4-23-57
Doyle, Pinkney E.	8	5-01-57
Taylor, Grover W.	9	5-01-57
Colley, Patricia B.	10	5-13-57
Cole, Fred R.	11	5-20-57
White, Leona P.	12	5-28-57
Beverage, French L.	13	6-10-57
Wooddell, Harry E.	14	6-24-57
Triplett, George R.	15	6-26-57
Wooddell, Warren G.	16	7-01-57
Kelly, Naomi M.	17	7-15-57
Carroll, John J.	18	7-22-57
Hall, Hanson P.	19	8-28-57
Grogg, Edward R.	20	8-28-57
Lusk, Troy C.	21	9-10-57
Arbogast, Nellie S.	22	9-11-57
Sheets, Beatrice B.	23	10-18-57
Taylor, Bedford R.	24	10-25-57
Taylor, Emmet	25	10-25-57

A TRIP TO THE LSD*

Rick Howard

In the summer of 1973 I had the unfortunate honor of being a member of the National Science Foundation Solar Eclipse Expedition. The unfortunate aspect was that of the 100 scientists about 75 went to Kenya while the rest of us went to Mauritania.

Mauritania, a country on the west coast of Africa, is one of those places where even "it's a nice place to visit but I wouldn't want to live there" is over-glorifying the picture. The literature we were given called it a "Land of People" but to us it seemed to barely qualify as a land for camels. The country can be divided into three geographical areas: a small, limited agricultural belt along the Senegal River in the south; a central barren desert with some "vegetation"; and a northern desert containing nothing at all (except sand, seas, and mountains). The area we were in was on the border of the two desert areas.



Camels meet at one of the rare watering holes in the area.

The reason for choosing this area was, of course, purely scientific (nobody in their right mind would want to go there). We had two, millimeter radio astronomy experiments to conduct during the eclipse. Both

required the site to be very close to the central line of the path of totality and in an area of low humidity (in order to reduce atmospheric losses at 3 mm and 8 mm).

In this area the basic industry is raising goats and camels in the desert and dates in the one or two oases in the area. Camels are the second largest export from this region, the first being dates. The recent five year drought has killed about half of the livestock and as a result most of the nomadic people have invaded the few towns in order to survive on United Nations food hand-outs. The local water is undrinkable; you must drink only bottled water (usually imported from France) if you want to avoid the Mauritania version of Montezuma's Revenge. Our typical liquid intake was about 5 liters per day per person, and at \$1.00 per liter even water is expensive. (Our total water bill for the month was about \$150.00 per person. And you think your electric bill is high?!)



One of only two oases in the whole area. A stream rises at one edge of date grove, flows the length of the grove, and disappears into the sand.

Our team consisted of five members of the Pennsylvania State University Astronomy Department and an old WW II radar van that we converted into a portable radio telescope. Our

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van presented several problems for us. First of all, it was too large to drive over the mountain "road" to Chinguetti (the site of the rest of the NSF Mauritania group). The mountain road was so bad that we were told to always take an extra Land Rover along if we were going to Chinguetti to insure we would get there alive. As a result, we had to stick the van out in the middle of nowhere, about 30 miles down the "road" from a small town called Atar where we were staying. The "road" was the main road through this part of Mauritania and after about 30 days of driving it (2 hours each day) we all personally knew every rock and ditch along the way.

Our second problem with the van was that it contained about \$80,000 of delicate equipment and had been driven about 500 miles from the coast to the site (several months before our arrival) by a local "moving company". The problem was that the local Arabs do not know the meaning of the word fragile and thus the van arrived on site with rack-mounted equipment lying on the floor, many cables and wires either loose or broken, and enough repair work to keep us busy for months (although we only had three weeks before the eclipse).

Our daily routine was to rise about 0400 and drive to the site (commonly called the LSD) arriving around sunrise. Then start the power generators (local power in Mauritania is not at all local) and work till about noon, have lunch and attempt to work for another hour or so. I said attempt because by 1300 the temperature in the shade was 115° F to 120° F and working outside could only last 5 to 10 minutes before the heat got to you. We would then ride back to Atar and all collapse for several hours before dinner. This routine went on every day till Eclipse Day. (Since we couldn't postpone the eclipse, we had to get the equipment ready on time.)

After weeks of effort, Eclipse Day arrived. The weather was cloudy with high humidity (just what we had gone to the LSD to avoid). Just before mid-eclipse the 3 mm klystron power supply blew up and ended that experiment. By the end of the eclipse we were in the middle of a raging sandstorm. To top it all off, out of the 6 minutes of totality (longest in the century) we had only seen about 30 seconds before the clouds had covered up

the sun. We all felt that somehow it just wasn't worth it.

The story, believe it or not, has a happy ending. We got out of the LSD and left Mauritania, all swearing never to return. Despite the heat, sandstorms, and all our other problems, we managed to get good enough data results to make the trip a success.

*lousy, stinking desert

HELLO? HELLO? HELLO?

Gloria Racey

One ringy-dingy, two ringy-dingys.....Is this the party to whom I am speaking???

No, this is not Ernestine. Some days it is tempting...but I am working to help support the husband, Kit-Kat, Kitten and Ben so I must behave.

O.K. Let's talk a little about the switchboard system.

1. There are priorities in handling the calls when more than one line is ringing at the same time. The commercial incoming lines get answered first. Reason for this is these calls are usually from the general public. If they don't get service on the 3rd or 4th call they may think the office is closed or we don't want to answer the phone. We try to give these people the quickest and best service.
2. FTS calls come next in getting answered. If you call in from other locations you may notice sometimes it takes us a while to answer. This is because I may be in the middle of an overseas call, taking a message, or finally got the FTS operator after 30 rings and 4 trys. So just hang on the line. Same is true for the tie line and the operator line. Try me back in a minute or two.
3. If you have me place a call and need it in a hurry, please tell me. I place all calls on the FTS and this takes a long

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time so if you need your call quickly, let me know and I will place it commercially.

4. If possible, tell me when you leave the office to go out of town. This helps me, the people who call here for you, and the people in the office. It's not going to make anyone mad if you don't let me know but it is helpful if you do keep me posted.
5. Page 17 of Special Instructions in the NRAO phone book will make your calling quick and easy. If you put Instructions II and III to use it will save time and save NRAO money. Call me if you need help in using the system.
6. If possible try to make your own calls, especially the direct dial FTS. Call me for the calls you think you will have trouble on or will take a lot of your time. On the direct FTS dialing, often you will be finished talking to the party even before I get the number dialed because of the interruptions I may have. When placing calls I must hang up to answer incoming lines and this delays your call.
7. If the tie lines to Green Bank are busy and you are in a hurry, use the FTS. Dial 5 - 80 - 924 - 6 + Ext.
8. We now have 8 FTS lines. Previously we had only 4. You should have little or no problem in getting out on the FTS.

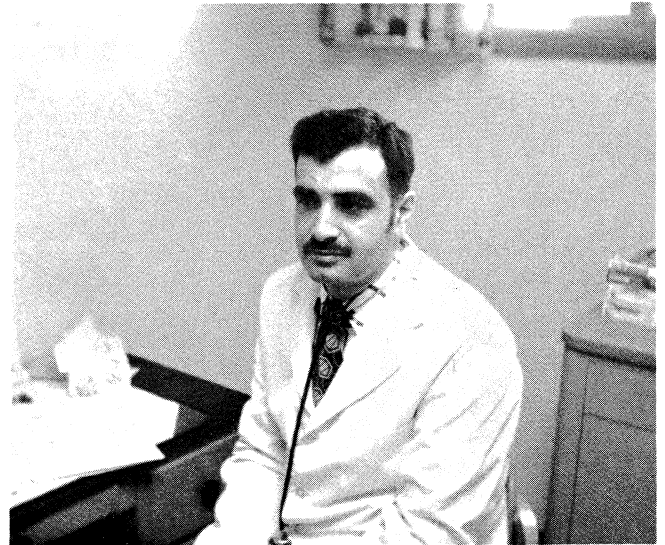
If you need help in your phoning, give me a call. My number is easy to remember. Just dial 0.

GREEN BANK CLINIC

Dr. Odd Aga and his wife, Dr. Angela Aga, have returned to Germany. For over four years, the Agas administered to the sick and wounded of the Green Bank Observatory and surrounding communities. Angela returned to Germany in September 1975 and Odd joined

her on January 30, 1976. Both will be missed as friends and highly respected physicians. We all wish them well in their new endeavors.

Effective February 1, 1976 the Memorial General Hospital Association, Elkins, West Virginia, under an agreement with the Observatory, assumed responsibility for operating the Green Bank Clinic. The Association brings with it a great potential for expanded medical services in the Green Bank area. MGHA has agreed to provide specialized physician services such as pediatrician, obstetrician, and internal medicine to the extent service demands may require. A resident Medical Doctor has been assigned by MGHA to continue the "general" or "family" oriented medical practice which has been conducted by the Doctor's Aga during the past four years. We understand that the Clinic staff (Jane Hamed, Laurel Stone, and Edna Wilfong) will continue with MGHA.



Our new physician,
Dr. Nabil S. Al-Misky.

On February 1, 1976 the MGHA assigned Dr. Nabil S. Al-Misky to be their resident physician at the Green Bank Clinic. Dr. Al-Misky and Mrs. Hiyam Al-Misky and their five daughters, Roufaida, Reem, Ousaima, Iman, and Amal (ages 4 to 10) will occupy the "Wade House" in Green Bank formerly occupied by the Aga family. Dr. Al-Misky comes to Green Bank

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from Jefferson Memorial Hospital in Alexandria, Virginia. Welcome Dr. Al-Misky and your family.

NAVAJOS AND ASTRONOMY

John Stocke*

Most all of you are no doubt familiar with the Navajo people as makers of turquoise jewelry and hand-woven rugs of high artistic quality. What you are probably unaware of is that the Navajo tribe has been and is the most successful Indian group in this country at maintaining their traditional lifestyle surrounded by our modern Western European culture (I hesitate to call our civilization American). This has been possible because the Navajos occupy the largest reservation in this country comprised of most of the northern quarter of the state of Arizona plus smaller bits of Utah, Colorado, and New Mexico. This reservation keeps them relatively isolated from - among other things - the accomplishments of modern science. It was in this isolated setting at Navajo Community College that I taught an elementary astronomy class last summer.

At first thought the prospect of teaching an elementary course in astronomy to fifty college age and older Navajos is somewhat frightening. Getting astronomical ideas across to introductory students in our own culture is sometimes extremely difficult. But without even a common culture base the problem becomes far more acute. Let me give you an example.

One day in class I was explaining the process that forms a rainbow in the sky. Most of the class was either familiar with what I was saying, or I was making reasonable sense to them. However, one older Navajo lady in the front row seemed not to understand at all. After class she told me why she didn't understand rainbows.

"How can rainbows be just water droplets in the sky," she said, "when two twins ran across a rainbow to see their father, the Sun?"

I was familiar with the Navajo tale of these two boys but frankly had not taken it quite as seriously as I should have. Conflicts like this one arose time and time again for both myself and my students. Like the most difficult problems in research, problems like these don't come along very often but when they do they can be very rewarding. I could have yielded to the temptation of replacing the older Navajo tale with some modern scientific dogma, but in the end I left the problem to

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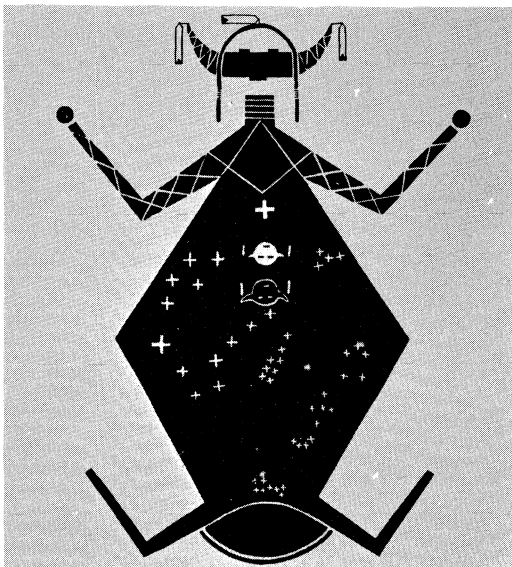


"Navajo Community College at Tsaile Lake, Arizona near the center of the Navajo Nation. Notice the distinctive octagonal architecture derived from traditional Navajo houses called hogans."

my student, merely presenting her with the facts as cogently and in as unbiased a way as I could. Being the teacher I, of course, learned much more than she did from this process as I watched her wrestle with the incompatibility of her own beliefs with what I had told her.

It is easy enough to put down a culture which possesses what we might call backward beliefs, but to do so we would have to overlook the beauty of the Navajo lifestyle, living such creative lives in harmony with Nature under smogless skies filled with more stars than I have ever seen.

Astronomy is a course of special interest to Navajos because of the overwhelming presence of the night sky on the reservation. The "black upper" as it is called is central to many of their current beliefs including a ceremony called "star gazing" in which modern Navajo medicine men stare at the light of a single chosen star in order to help a sick friend. Perhaps because of this ceremony many Navajos are familiar with the different colors of stars. Also, in nearby Canyon de Chelly there are numerous "planetarium sites", overhangs cut naturally in the canyon wall where marks have been carefully painted to represent stars. I believe these sites may be "finding charts" for stars of particular importance to the medicine men. Below is a picture of a sand painting depicting "Father Sky" with the sun and moon faces shown in



the center (with the horns) and the few constellations which are identified by Navajos including the Pleiades (or dilyehé in Navajo) at the bottom. The Navajos still learn to tell time at night and plant their crops in spring by the Pleiades. I later found the same "sun face" design as in the sand painting on a piece of 6000 year old Chinese pottery. If I had any doubts about how ancient the Navajo traditions are, I could doubt no longer.

The lasting impact of my summer on the Navajo reservation has been twofold. First I have learned to respect the simple Navajo semi-nomadic lifestyle as an important option to our material oriented culture in which heart attack victims outnumber astronomers and street lights and people come in equal numbers. Even for the Indians of our country the land reserved for such living is dwindling due to our own culture's need for coal and more land to build on. Only we can save this living option for our descendants.

Secondly the reward of communicating the ancient science of astronomy to students of any culture is always greater for the teacher than the students. Whatever I taught the Navajos they returned to me in countless ways. Astronomy like living with the Navajos re-connects us to Nature and the origin of all things. The Navajos know that they are an integral part of the world, as natural as the red rock lands in which they live. If people in our culture would look at the night sky more often far away from city lights perhaps we could begin to realize this truth as well.

*University of Arizona

CREF UNIT VALUES JUMP			
1975			
January	\$30.67	February	\$32.80
March	33.77	April	36.12
May	38.07	June	39.88
July	36.81	August	35.86
September	34.31	October	35.89
November	36.61	December	36.34
1976			
January	\$40.31		

1975

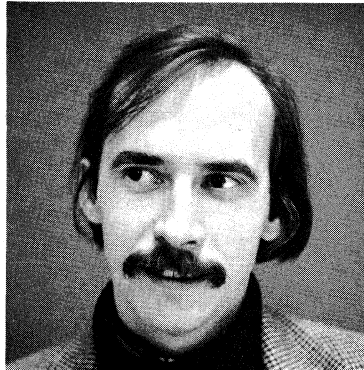
1976

January \$40.31

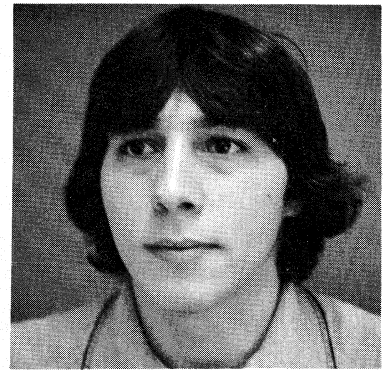
NEW EMPLOYEES

Photo Not Available

Durgadas S. Bagri
Electronics Engineer
VLA - NM



Geoffrey T. Bath
Research Associate
Basic Research - CV



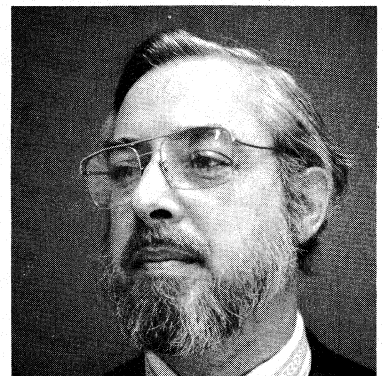
Rick J. Bearfield
Technician
VLA - CV

Photo Not Available

Bobbie L. Cohee
Technician
VLA - NM

Photo Not Available

Frederick C. Dunn
Technician
VLA - NM



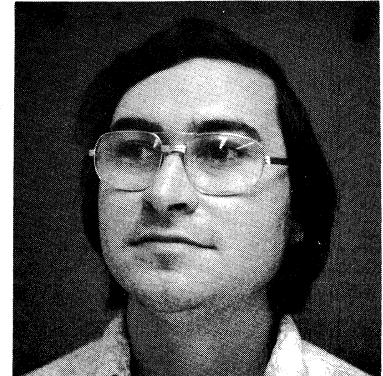
Robert E. Elcox
Electronics Engineer
Electronics - CV



William R. Greene
Supvr., Housing/Food Serv.
Admin. Services - GB



Edward R. Harrison
Visiting Scientist
Basic Research - CV



Alan Jewell
Computer Operator
Computer Div. - CV

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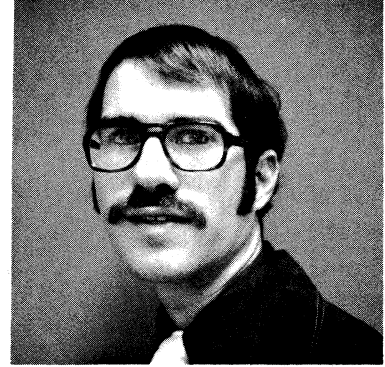
NEW EMPLOYEES (continued)



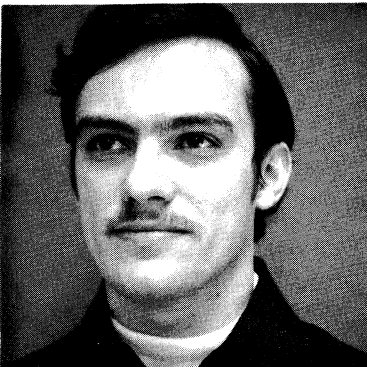
AnnaBelle Lambert
Housekeeper
Admin. Services - GB



Jack Lambert
Driver
Plant Maintenance - GB



Steven S. Lypany
Co-op Student
Scient. Serv. - CV



Michael C. Mayo
Computer Operator
Computer Div. - CV

Photo Not Available

Robert M. Mitchell
Asst. to Project Mgr.
VLA - NM



George Wallerstein
Visiting Scientist
Basic Research - CV

TERMINATIONS

Margie M. Brown
Nash K. Burger
Shirley M. Carpenter
James F. Cope
John D. Earnest
Cleo C. Harper
Philipp E. Hartline
Samuel S. Rouse
William E. Schoknecht
Elke Taylor

Tucson Operations
Computer Division - CV
Fiscal Division - GB
VLA - NM
VLA - CV
Administrative Services - GB
VLA - CV
Electronics Division - CV
Electronics Division - Tucson
Administrative Services - GB

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RETIREES

Russell D. Bussard
Elmo R. Turner

Telescope Operations - GB
Plant Maintenance - GB

LEAVE OF ABSENCE

Robert F. Elliott

Plant Maintenance - GB

We are sorry to report the death of Gene Crist, who died on January 16, 1976. Gene was a Photo Technician at Green Bank. He joined NRAO in March 1958.

SUGGESTED NEW STANDARD WARNING SIGN

Jon Spargo

One of the constant worries of telescope operators is that of someone being on, under, or in the vicinity of a telescope while it is in operation and without his knowledge. At Green Bank and Tucson the operators are within a reasonable proximity of the telescopes, save for the Green Bank Interferometer, and can be on the watch for people who disregard safety rules and go on or near the telescopes while they are in operation. Here at the VLA, however, we face the prospect of having the telescopes spaced out along the 13 mile arms of the wye and also being largely out of the view of the operators.



To help alleviate the problem, Bob Runyon, of the drafting department, has designed the warning sign, pictured at left by itself, and in front of VLA antenna No. 1 on pad CW5 (above). The sign is in place at all times during remote operation to warn people of the danger of climbing on the antenna and to have them contact the telescope operator before proceeding any farther.

I would like to suggest that NRAO adopt this, or a similar version, as a standard sign to be posted at strategic locations around all telescopes as a safety measure to warn people of the danger of climbing on antennas in operation and to help the telescope operators keep track of people on and around the telescopes.



LIBRARY

Sarah Martin

I'll bet most of you thought the NRAO libraries were filled with dull, old astronomy books and a few engineering volumes (to help the engineers get their jobs done). Well, if that's what you thought, you're pretty close to the truth, but a recent project in the CV library turned up some rather unexpected titles. For instance, did you know we had a book entitled Illusions and Delusions of the Supernatural and the Occult? Or that if it hadn't been checked out by Peter Napier back in 1972, it would sit on the shelf next to such titles as The Science of Dreams, Astrology, and The Sleepwalkers?

Two other titles that sparked my interest and curiosity are checked out to Peggy Weems: Anatomy and Layout for Strippers and 57 How-To-Do It Charts. Peg says they are work-related, but one wonders.....

A few books about non-human living creatures have found their way into the collection also. One might wonder why the library bought books entitled Exotic Aquarium Fishes and A Complete Guide to Tropical Fishes unless one knew that until a few years ago, there was a large fish tank in the CV library. Other creatures represented in the collection are ants (Army Ants by T. C. Schneirla) and bats (Echoes of Bats and Men by D. R. Griffin).

Apparently astronomers aren't totally isolated from the concerns of the real world. Titles such as Soviet Marxism and Natural Science, 1917-1939, The Navy in the Space Age, The Promise of World Tensions, and The Draft and You show some evidence of concern closer to earth than their usual reading matter.

Finally, one sees that it isn't all work and no play for NRAO people for we have titles such as The Caverns of West Virginia, Horns, Strings, and Harmony, and Mathematical Fun, Games, and Puzzles to help one while away the hours waiting for data to be reduced or the computer to come back on.



ON TOMATOES

Wally Oref

Last year many people in the Green Bank area were bewildered by what happened to their tomatoes. Spots appeared on leaves, enlarged and turned brown; leaves withered. Similarly large spots appeared on fruit, turned brown, and the fruit became inedible. The disease spread quickly from plant to plant. Most of us watched with anguish as healthy plants withered and fruit spots enlarged. When spots first appeared on leaves, few knew their significance and were totally unprepared for what happened to their tomato plants and fruit. Now we know our tomatoes were the victims of the fungus disease called late blight, that thrives in cool, moist weather. This fungus also causes late blight of potatoes.

Can we prevent this disease from doing in this year's tomato crop? Fortunately, we can. In the case of late blight disease an ounce of prevention is really worth a pound of cure (there has been only limited success in halting the spread of late blight once it takes hold).

Regular spraying or dusting with a fungicide specific for late blight will do the trick. Apply fungicide about 30 days after plants blossom. Repeat treatment every 7 to 10 days.

Recommended fungicides for late blight include Bordeaux Mixture, Zineb, and Copper Dragon. Bordeaux Mixture can be made at home:

- Bluestone (Copper Sulfate)..4 ozs. (7 T.)
- Hydrated Lime.....4 ozs. (12 T.)
- Water.....3 gallons

Dissolve the Bluestone in hot water, using a wooden, earthenware, or glass vessel (Bluestone corrodes metal). Dilute with half the total water specified. Make a paste of the lime in a small quantity of water, and add the rest of the water to it. Pour the diluted Bluestone and lime solution together and mix thoroughly. Strain the mixture through a fine cheesecloth directly into the sprayer before using it. Make a fresh mixture for each treatment. If 3 gallons is too much and 1 gallon is enough, use proportions of 7 tsp. (teaspoons), 12 tsp., and 1 gallon of water.

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Zineb (spray) can be purchased at most garden centers. Copper Dragon (dust) can be purchased locally at Trent's.

Regular applications at 7 to 10 day intervals sound like a lot of work but that's the price you have to pay if you want to prevent late blight. An easier way out would be to plant a late blight resistant tomato. This thought occurred to me so I checked six seed catalogs for a blight resistant variety and found only one listed. Parks say their Super Master Marglobe is resistant to blight. There may be other blight resistant varieties available in catalogs I don't have. It might be worth experimenting with a variety like Super Master Marglobe.

In my research on late blight I came across other information that might be of interest to tomato growers who want to produce better and earlier crops in areas where the nights are cool (like Green Bank):

Tomato sets fruit under limited conditions: you get maximum fruit set when night temperatures are in the 60° - 70° range. When night temperatures fall below 60°, most varieties do not set fruit well.

Growers in cool humid situations have found fruit set can be increased by shaking or vibrating the plant. Best time to shake plants is in midday.

Most of the early maturing varieties (e.g., Early Girl, Burpee Big Early) set fruit at lower temperatures than main season varieties.

Plants pruned to a single stem and suckers removed up to the second flower cluster will produce earlier and larger fruit.

Watering is necessary when natural rainfall is less than 1 inch per week.

A tomato plant has a lot of work to do. For example, an early variety is expected to produce a crop in 60 days and a vigorous main season variety in 70 days and continue production until frost. To help both varieties to produce as expected, they must have adequate nutrients available. The recommended fertilizing program is this:

3 to 4 pounds of 5-10-10 per 100 feet of row worked into the soil two weeks before planting;

when transplanting pour one cupful of 6-18-6 starter solution around each plant. It speeds up early growth and can increase the amount of fruit;

after fruits set, sprinkle about ½ cupful of fertilizer around each plant and water thoroughly. This will be enough for early varieties, but main season should be fed monthly. Keep fertilizer 6-10 inches away from stem.

Gardeners are an ingenious lot and have come up with many tricks to produce earlier fruit, more fruit, and to extend the season. In our area we should use every one that has been proven effective.

O Lord, help my words to be
gracious and tender today,
for tomorrow I may have to
eat them.

JOB APPLICATIONS

As you probably know there are few openings for the young radio astronomers now looking for jobs. This means that they must apply to many universities and observatories in search for their "bread". Unfortunately, this situation places a very time consuming burden on the rest of the astronomers who are required to write lengthy recommendations for these young people rather than drinking coffee with their colleagues.

The problem can be solved by the use of the questionnaire (see following page). The complete profile of any applicant can be covered in nine carefully posed questions. Simply check the appropriate box(es) for each and send it off to the institution who will then have an accurate estimation of the applicant's ability (as well as the author's perverse, immature sense of humor).

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CONFIDENTIAL STATEMENT

Qualifications of _____ Date _____

1. Applicant is smarter than (in order of grey matter)

<input type="checkbox"/> Me <input type="checkbox"/> My Dad <input type="checkbox"/> You		<input type="checkbox"/> Barry Clark on a bad day <input type="checkbox"/> Barry Clark on a good day <input type="checkbox"/> God (may be out of order)
--	--	---

2. Applicant's Aggressive Index (in order of Chutzpah)

<input type="checkbox"/> Charlie Brown talking to red-headed girl <input type="checkbox"/> Charlie Brown normally <input type="checkbox"/> Me taking out garbage		<input type="checkbox"/> Hjellming on a good day <input type="checkbox"/> Hjellming on a bad day <input type="checkbox"/> God (definitely out of order)
--	--	---

3. Applicant's capacity for challenge (in order of hopelessness)

<input type="checkbox"/> Getting out of bed in morning <input type="checkbox"/> Tying his shoes (both) <input type="checkbox"/> Finishing thesis		<input type="checkbox"/> Solving 140-ft pointing problem <input type="checkbox"/> Solution to mysteries of universe <input type="checkbox"/> Development of VLA software
--	--	--

4. Applicant's ability to complete a task (in decreasing order of epoch)

<input type="checkbox"/> Responds faster than Radar O'Reilly <input type="checkbox"/> Completed thesis in one year <input type="checkbox"/> Completed thesis in seven years		<input type="checkbox"/> Never <input type="checkbox"/> Comparable to NRAO hardware development <input type="checkbox"/> Comparable to NRAO software development
---	--	--

5. Applicant's flair for recognizing important problems (in order of flair)

<input type="checkbox"/> Astronomy is important <input type="checkbox"/> Astronomy is unimportant but fun <input type="checkbox"/> Astronomy is unimportant but a living		<input type="checkbox"/> The Flyers will make it three-in-a-row <input type="checkbox"/> Why on earth is he applying for this job?
--	--	---

6. Applicant's teaching ability (in decreasing order of a meaningful dialogue)

<input type="checkbox"/> Never speaks unless spoken to <input type="checkbox"/> Understands most of Sesame Street <input type="checkbox"/> Experience in Gut-course theory		<input type="checkbox"/> Willing to overlook cheating <input type="checkbox"/> Expert at marking on the curve <input type="checkbox"/> Valuable experience at NRAO
--	--	--

7. Does the applicant have the maturity and natural intuitiveness to function coherently in an intellectual environment requiring adaptive interplay of complex physical interrelationships?

Huh?

Question rephrased: Does the applicant know what the hell he is doing?

8. Does the applicant work well with others? (in order of companionship)

<input type="checkbox"/> Last colleague buried at Forest Lawn <input type="checkbox"/> Visits previous advisor in hospital <input type="checkbox"/> Has part-time job as mercenary		<input type="checkbox"/> Not applicable. He doesn't use SURE <input type="checkbox"/> Extremely easy to get along with - reminds me of my pet turtle
--	--	---

9. Applicant's overall standing (in random order)

<input type="checkbox"/> How should I know! <input type="checkbox"/> Worth \$10,000 a year but not \$15,000 <input type="checkbox"/> If it's \$20,000, I'm available		<input type="checkbox"/> Oh well, his wife is cute <input type="checkbox"/> He has the sharpest mind I've seen - and I hate his guts <input type="checkbox"/> Disregard this application
--	--	--

Signed _____

Official Position _____

Address _____

Since it is possible that even this application will not secure our struggling young astronomer a position, a copy of the book Making a Killing in Astrology with a Ph.D. in Astronomy by Erich VonDanika (with a forward written by Bart Bok) will be sent to each applicant if desired.

SPRING FIRE SEASON BEGINS MARCH 1

Natural Resources Director Iras S. Lati-mer Jr. reminds West Virginians that statutory spring forest fire season begins March 1 and lasts through May 31.

West Virginia forest fire laws state:

"No person shall during any fire season, except between the hours of 5 p.m. EST and 5 a.m. EST, set on fire or cause to be set on fire any forest land, or any grass, grain, stubble, slash, debris, or other inflammable materials. Such prohibitions of fires between 5 a.m. EST and 5 p.m. EST shall not be construed to include small fires set for the purpose of food preparation, or providing light or warmth around which all grass, brush, stubble, or other debris has been removed for a distance of ten feet; and burning which may be conducted at anytime when the ground surrounding the burning site is covered by one inch or more of snow.

"Before leaving any fire for any period of time, it must be totally extinguished.

"Permits to burn during the prohibited periods may be issued by the Director of the Department of Natural Resources or his authorized representative. However, this permit does not cover air pollution regulations.

"Escape of fire at any time to the lands of another shall be in violation of the law.

"All sawmills, power shovels, or an engine or machine capable of throwing sparks must be provided with an adequate spark arrestor if operating in forest land or within one-eighth mile.

"All inflammable waste disposal areas on any land must annually have removed all grass, brush, debris and other inflammable material adjacent to such disposal areas to provide adequate protection to prevent the

escape of fire to adjacent lands.

"The state shall recover from the persons, firms or corporations whose negligence or whose violations of any provisions of this article cause any fire at any time on any grass or forest land the amount expended by the state.

"A landowner must take all practicable means to suppress any fire on his property. If he fails to do so, the state shall collect from him the amounts expended by the state for such purposes."

In addition to the foregoing, the director advises that all individuals who need to burn anything should check for compliance with air pollution regulations and local municipal ordinances.

PROJECT CHRISTMAS

D. L. Swann

The VLA Project personnel in New Mexico have initiated a program which we plan to make an annual affair. Rather than exchange Christmas cards with fellow employees, whom we see daily, contributions are made to the Project Christmas Committee and the funds collected are sent to a local charity to help make the holiday season a little brighter for someone less fortunate.

Funds collected this year were forwarded to Carrie Tingley Crippled Childrens Hospital in Truth or Consequences, New Mexico. These contributions will be used for the direct benefit of the children in the hospital.



REMINISCING WITH (AND ABOUT)
GROTE REBER

Bill Meredith

On November 19, 1975 the 10th annual Karl G. Jansky lecture was given by Grote Reber at the University of Virginia's Gilmer Hall. I enjoyed it immensely. Grote, as I hope most NRAO people know, was a pioneer in the field that keeps us all employed. Following Karl Jansky's initial discovery of extraterrestrial radio waves in the early 30's, Grote constructed the "Reber Dish" in his backyard in Wheaton, Illinois and began making radio maps of the universe.

It was a bit difficult to purchase "off the shelf" radiometers in those days so Grote had to design, develop, and manufacture all his own equipment. His presentation at the Jansky lecture was replete with slides of many of his original receivers. I think most people who attended were as fascinated as I with the slides and his discussion.



Grote Reber, with Pat Smiley of Graphic Arts, selecting slides for the 10th annual Karl G. Jansky lecture.

I met Grote in the fall of 1958 when I was first employed at the NRAO. Grote, Fred Crews, and I lived for several weeks at a lodge in Minnehaha Springs, WV while the Hill House was being refurbished. Several Blaw Knox engineers stayed there also. Fred,

Grote, and I usually rode to Green Bank and back together, since everyone was on day shift then, there being no operational telescopes at NRAO at that time.

We all found Grote a delight to be around. There was scarcely a dull moment. Grote was a confirmed bachelor and somewhat set in his ways. He liked to retire early, never later than 9 PM, and would set the thermostat to 50 degrees just before going to bed. The lodge soon cooled down so the rest of us could freeze, go to bed ourselves, or turn the thermostat back up, which would arouse Grote when he became too warm. I can't remember which we did the most.

Another thing that disturbed Grote's slumber was light. The smallest amount shining under his door would bother him, so if we elected to freeze, we had to do it in the dark. Grote was somewhat hard of hearing, so with his hearing aid off, we could freeze in the dark, but make as much noise as we wanted.

Grote had the only key to the lodge and once he was there alone when Fred and I returned. This was during the day and Grote was reading with his hearing aid off and the doors locked. We pounded on the doors and windows in vain, trying to get his attention. I still can't remember how we got in.

Since Grote didn't have a car, Fred and I took turns driving ours. Grote was an inveterate back seat driver, so we never had to worry about forgetting to turn on our headlights or windshield wipers, or drive too fast. Grote always reminded us of these negligencies, and we usually accepted it good-naturedly.

Dewey Ross likes to tell about certain people mouthing words to each other in the presence of Grote. Grote would then peck on his hearing aid, believing it to be out of order. This story, as all Dewey's stories, must be taken with a grain of salt, since Dewey's mind has become a bit addled by living in Tucson for so long.

The Hill House became available to us after living for a few weeks in the lodge. Fred and I had become used to Grote's idiosyncrasies by now, especially his eating habits. Grote liked to more or less mix everything together, including soups. If I recall correctly, we continued to cook for ourselves at the Hill House for awhile, until NRAO hired a cook for lunch and dinner.

Shortly after moving to the Hill House,

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Grote bought some raw chestnuts and proceeded to roast them in the oven. As the moisture in the chestnuts became steam, the pressure caused the nuts to literally explode. It sounded as if he had thrown a handful of Cal .22 cartridges into a fire. Grote frantically turned the oven off, and we all waited for the explosions to subside. After it had been quiet for several seconds, Grote opened the oven door and peeked inside. Just then the granddaddy of all chestnuts decided to explode. Chestnut meat went all over the kitchen and Grote nearly had a heart attack. Fred and I almost died laughing.

Several people were living in the Hill House by now, and we had a habit of raiding the pantry at night. Once while I was working evenings, the rest of the group obtained a large steak from the Hill House larder and cooked it. They considerately left a piece for me but I went on to bed without finding it. It was discovered the next morning by the cook, and thereafter the freezer was locked at night.

I chatted with Grote for maybe an hour during his recent visit here to deliver the Jansky lecture. He related some of his experiences in Tasmania, where he is currently living, and discussed his work there. I reminded him of a tale he told concerning himself. It seems Grote had delivered a colloquium to a group of radio engineers regarding his early experiences in radio astronomy. At the conclusion of his talk he asked if there were any questions. Apparently his lecture was over the heads of the audience. After an embarrassing silence, one individual in the back of the auditorium raised his hand and asked Grote what kind of tubes he used in his power supply. I told Grote I was going to ask him that same question after he finished the Jansky lecture, but I didn't have the nerve.

There are many, many Grote Reber stories and probably a lot of other people who were at NRAO in the early days can remember better ones. These are a few which have stuck in my mind. The NRAO has been blessed with an overabundant supply of interesting people. I think Grote Reber is the most interesting of them all.

WHAT AM I DOING IN GREEN BANK?

John Dickel*

John Dickel is in Green Bank again - it's time for Wally to ask for another *OBSERVER* article. How come nobody ever bugs me for such when I go to Tucson? The usual comment goes like "You know, just tell people what you're doing here.". Since my co-observer, Eric Greisen, is, so-to-speak, "in house" and also back in Charlottesville at the moment, I guess I can't palm the job off on anyone else as I've done several times in the recent past -- so here goes.

Other than admiring the hills and seeing old friends, what am I doing here anyway? Would you believe I'm observing Cassiopeia A? The immediate reaction ought to be: The strongest source in the sky! Hasn't that already been done to death - John Findlay and others have been monitoring it regularly for over 15 years now - so what am I really doing here? The answer is that we're looking at it with the interferometer to synthesize a high resolution map. The next reaction should be: But Dave Hogg, Cam Wade and two other fellows long since departed from NRAO, Robin Conway and Geoff MacDonald, did that back in 1967. So we ask again: Am I really doing anything here besides enjoying the budding of spring in Green Bank? The answer is yes for anyone still willing to be convinced.

A number of years ago, Dave Heeschen and Bill Meredith - as well as others - found that the flux density of Cas A was decreasing with time - someday it won't be the strongest source. The careful monitoring by Findlay, and also by Bill Dent and others, has shown that this decrease is about 1% per year and may vary with frequency.

The decrease has been attributed to an expansion of this supernova remnant - a star which exploded a few hundred years ago and spewed a large fraction of its mass out into its surroundings. The outward flow of this matter has been slowed down by bumping into its surroundings but the shell is still moving outward. As it expands to fill a large volume the density of material in the remnant of this supernova will have to decrease. Thus, the strength of the magnetic

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field imbedded in the material will be diluted and because the strength of the synchrotron radiation depends upon the strength of the magnet we find the synchrotron radiation getting fainter. Such an explanation has some support from optical observations. Some very faint filaments comprise the visible shell of this remnant and they have been seen to have noticeably expanded over a 17 year baseline in time.

The effect is not a simple dilution, however, as the synchrotron radiation also depends upon the number of super energetic electrons present in the shell and their relative energies. There is also some evidence that as a supernova remnant this young expands, there is a lot of turbulence present which can twist and distort the magnet making it stronger in some places and weaker in others and similarly push around the particles. Therefore, in order to understand the aging process in such objects we really need to know how all the individual parts of the supernova remnant are changing with time. From the optical data we can predict that "typical" expansion has been about $\frac{1}{2}$ second of arc per year, so over the nine years since Hogg's, et al's map, things should have moved an average of $4\frac{1}{2}$ seconds or about $\frac{1}{2}$ the beamwidth of the interferometer. This is readily measurable and so the time has come. We are now repeating the original observations in order to qualify the motions of various features. Further, the decrease in total flux density of about 10% in the intervening period should be readily detectable too. We hope to confirm our prediction that the knots which have expanded the most will have decreased more than the average, and the more stable regions have decreased less. But who knows what we'll actually find? One colleague who shall remain nameless (but his initials are E. F. and he works a lot with the interferometer) asked what happens if we find it's really contracting. I'll wait and see on that one.

So that's what I'm doing in Green Bank, and one of the nice things about an aperture synthesis project with the interferometer is that it requires 9 moves of the telescopes, so I'll get several more visits here during the coming spring and summer.

*Visiting astronomer, University of Illinois

BUSSARD GOES HOME TO ROOST

Bill Hunter

On 31 December 1975 Russell Bussard retired from service at the National Radio Astronomy Observatory. Russ has been active in different phases of NRAO development since its beginning. He worked for both E. W. Bliss, and Pacific Crane and Rigging during the construction of the 140-foot telescope. After the 140-foot went into operation, he remained there working for NRAO until his retirement.

I think all of us here who have known Russ are, without exception, "pleased as punch" to have been associated with the man. Our lives have been greatly enriched by his good humor and many colorful, historic stories about life in this locality.



Above is a photograph of Russ at a little gathering with some of his friends. As you can see, he leaves us with a big smile, not sour and disgruntled. A host of friends at NRAO wish him a rewarding future in his golden years.

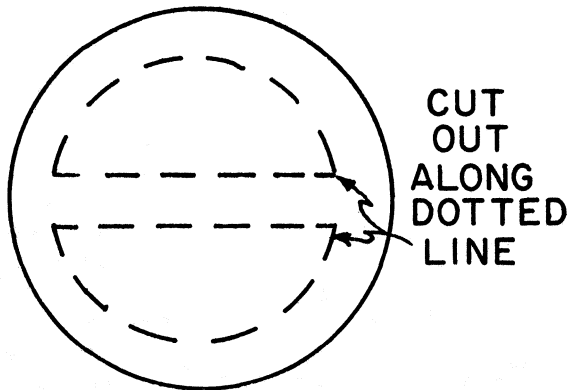


WALLY'S HAND WASHER

You could call this a "how to" article because it tells you how to make a simple device to wash your hands outdoors. Not only is it simple, but it costs nothing to make since it is made from throw-away materials. Furthermore, it takes very little time or effort. The reason I made one in the first place was because I was often catching it for dirtying the sink bowl and hand towels. I really got the idea from my wife who once made one for Girl Scouts.

My hand washer is made from a gallon-and-a-half plastic Clorox bottle (any gallon plastic bottle with a cap will work equally well), a piece of rope, a plastic net bag like oranges come in, and a few pieces of soap too small to use in the bathroom.

Here's how to make the bottle washer and assemble the soaper: First, cut out the bottom as indicated by the dotted lines in Figure 1. (I start the cut with a knife and



BOTTOM OF PLASTIC BOTTLE

finish with tin snips. Next, pass the rope under the strip left in the top and tie in a closed loop. After you snug up the cap, the washer is ready to fill with water (fill bottle through cutouts in bottom) and hang in a convenient place. You now have a water reservoir and an adjustable water dispenser. All you have to do now is make the soaper and hand scrubber.

The soaper and hand scrubber is easier to make than the bottle washer. In fact you don't have to make it. All you have to do is drop a few pieces of soap in the net bag and tie it alongside the bottle. You will be pleasantly surprised how well it soaps and

takes dirt and grime off the hands. It works a lot like your wife's plastic pan scrubber. The photo below shows my wash bottle and soaper hanging from a pine tree near our house. I have a similar setup near the garden during the garden season.



Polly Oref tries out her dad's soaper and hand washer.

The rate of water coming out of the bottle can be easily adjusted by loosening or tightening the cap. I usually allow a dribble to flow while I lather up and scrub with the plastic net. When I'm ready to rinse I loosen up on the cap and let her run. Add an old towel to the setup and you'll be going first class. Not only will this simple hand washing device help keep sinks and towels clean, but it will make you something of a conservationist. It saves water, soap, and recycles throw-aways.

I'm sure that some of you will find other uses for it. I did. I made several bottles and use them to water and feed garden plants during dry spells. Out camping they are really handy even if you have a wash basin in your camper or trailer. Kids, especially, like to wash with one because of the novelty.



GREEN BANK RECREATION NEWS

Dwayne Schiebel

During this year, your Recreation Association hopes to sponsor activities that will be enjoyed by everyone. Any suggestions you might have should be passed on to any Board member. Some of the activities that we have sponsored or will be sponsoring are:

MOVIES:

Nov. - Trinity Is Still My Name
 Jan. - Run Wild, Run Free
 Feb. - All Hands On Deck
 March - One and Only Genuine Original Family Band

BINGO:

March 27

DANCES:

April 3 - April Fool's Dance	"DJ Ray"
May 29 - Spring Dance	"Country Heartbeats"
Sept. 4 - Labor Day Dance	"Journey"
Oct. - Halloween Dance	
Dec. 31 - New Year's Dance	"Destiny"

We also plan to have a square dance sometime this year.

JULY PICNIC:

We received several suggestions for the picnic as a result of our survey.

TEEN ACTIVITIES:

We will probably have a teen party in August and a teen dance in December.

The results of our survey concerning dances is listed below:

Questionnaires returned - 38

New Year's Dance (Band)

Average price per couple - \$11.00

All Other Dances

Average price per couple:

Records - \$5.00

Band - \$6.00

I want to thank everyone who returned the questionnaire as this was one way to find out how Recreation Association members felt concerning dance prices and what type of music to have for dances.

Anyone who doesn't have a current Membership Card should contact Janet Warner.

LIBRARY ROOF

Sarah Martin

The staff of the NRAO library - Charlottesville announces with joy, glee, and a certain amount of trepidation and anxiety, the repair of the library roof and the subsequent removal to parts unknown of the library Wishing Well (see the *OBSERVER*, February 1975). This unexpected, but heartily welcomed repair took place in early December. The job turned out to be adequate this time and hopes soared as the next rain brought no water into the library. These hopes quickly diminished however when the day after Christmas brought a new leak, even bigger and more dramatic than before, for this one took eight trash cans lined up in a row to catch the flow. Notes on the trash cans like "See what happens when you let reindeer prance on your roof" and "NRAO ark", along with sundry of the scientific staff playing Evil Knevil, jumping over the trash cans, failed to brighten the dismal prospect of another half dozen years of trying to get the roof fixed. However, within two weeks time (a record in these parts) this new leak was also stopped and shortly thereafter even the ceiling tiles were replaced, which we feel shows a certain faith in the quality of the repair jobs. The library has now returned to being a serene and peaceful place wherein the pursuit of knowledge and the Post comics can now take place without the annoying drippity, drip from the ceiling.

Coward - one who in a perilous emergency thinks with his legs. --Bierce

AIRCRAFT LOST NEAR GREEN BANKBill del Giudice

Early in the evening on 21 January the Observatory Emergency Organization learned of an aircraft reported missing in blizzard conditions about 13 miles southwest of the Observatory. Aboard the twin engine, six passenger aircraft were three men enroute to Pittsburgh after a refueling stop in Roanoke. Near Clover Lick they reported severe icing conditions and were diverted to the airport at Lewisburg. Before they could complete a turn to the new heading they broadcast a Mayday. Air traffic control gave them a heading to the Observatory airstrip but it was never acknowledged. It was 1633 hours.

This aircraft had a radio beacon which should have automatically activated when the plane crashed. Knowing this, the Marlinton Volunteer Fire Department asked the Observatory Emergency Organization to provide a receiver to pick up these signals and locate the crash site. Search parties were out until after 0300, 22 January. There was no radio signal and no sign of the aircraft.

Weather conditions were still so bad on the 22nd that only ground parties could search although an Air Force C-130 flew over listening for the radio beacon. State Police, Civil Air Patrol, County Sheriff officers, and other volunteers began arriving in Marlinton. Manpower was a problem because just four hours before this crash a Department of Natural Resources aircraft had crashed near Canaan Valley, northwest of Green Bank and had not been found yet. State Police and CAP personnel were still working at that site. The Observatory was asked to make the airstrip available for the air operations which were to start as soon as weather permitted. Sis Michael's office became a control tower and a direct communications link was established with the auditorium, which was used as a control center and air crew briefing room. Here radio receivers were set up to monitor State Police, sheriff, fire department, and aircraft calls. A coffee pot was sent from the cafeteria and the walls were covered with maps of the area.

The weather was clear on the 23rd, the third day. Five helicopters and seven fixed wing aircraft used the field that day. The

entire area between Green Bank and Marlinton was searched, with emphasis on the Clover Lick Mountain area. Dozens of reports from citizens who had heard an airplane flying low had come into the control centers in Green Bank and Marlinton. Every one was checked by air or by foot patrols, or both.

On the 24th the search shifted south due to a misinterpretation of information from Eastern Air Rescue Command at Scott Air Force Base. There were three helicopters and five fixed wing aircraft searching south of Clover Lick to Marlinton and east into Virginia. The State Police and National Guard helicopters were now being fueled from a tanker on the airstrip and the CAP fixed wing aircraft were going to Elkins and Lewisburg for fuel. The three helicopters alone used 800 gallons of JP4 fuel and the air crews fueled on 160 cups of coffee on the 24th. No sign of the aircraft.

Rain, fog, and snow did not permit flight operations on the 25th, 26th, and 27th, but ground crews were out on all three days. The Marlinton Fire Department had men out in freezing rain until 2200 hours on the 26th checking out a malicious false report, the only malicious act in the more than eight days of the total operation.

The mixup which had searchers too far south on the 24th had been cleared up and the State Police and two National Guard helicopters were back in the air on the 28th. The ground was covered with snow and the downed aircraft was white so hopes were not high. Air search continued until dark with no sightings. The helicopters flew to Marlinton and put down next to the Marlinton Motor Inn where the tanker met and refueled them. They were ready for an early start on Thursday, the 29th of January.

At 0915 on the 29th, the State Police helicopter was enroute to check broken trees sighted by Roy Pennington and while passing the north face of Clover Lick Mountain in an area previously searched twice, the laconic message came over the radio into the control center, "We have found the aircraft!". The pilot had seen the outline of the white tail assembly against the white snow just as snow was once again starting to fall. The Marlinton Fire Department dispatched an Army 2½ ton all-wheel drive truck, a rescue truck, and an

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ambulance to the scene while the Observatory ambulance and a four-wheel drive wagon responded from the Observatory. Only the all-wheel



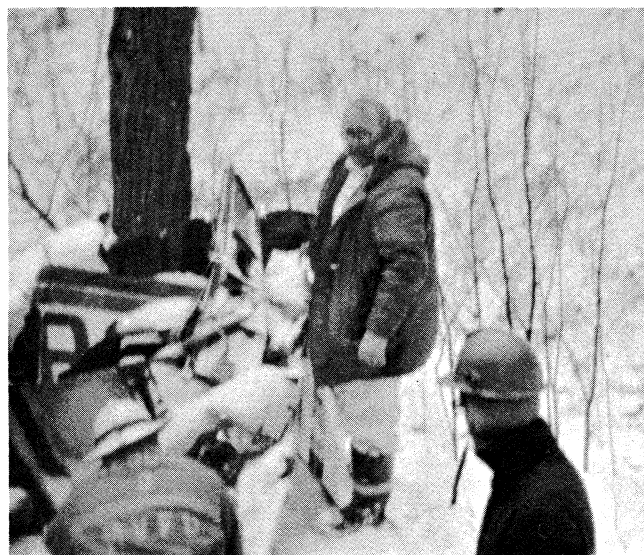
Aircraft as discovered on
Clover Lick Mountain.

drive vehicles could get close to the crash site which was on a hillside near the head of Clover Lick Creek in dense hardwood forest. All three occupants of the aircraft had been killed immediately on impact and after the police had concluded the initial investigation the Marlinton and Observatory rescue squadmen and fire fighters extricated the bodies from the wreckage and carried them down to the waiting vehicles. This operation was concluded by 1230 but wrapping up loose ends took until 1920 hours.

A lot of effort by a lot of people went into this operation and it is impossible to properly recognize them all. There were individuals from agencies which were there because it was their job to be there, but they did more than just their jobs: the State Police; Civil Air Patrol; National Guard; Marlinton, Durbin, and Cass Fire Departments; the Department of Natural Resources; the Forest Service; the Air Force; Navy; and probably a few that didn't come to my attention at the air operations control center.

Many individual employees deserve special attention: Richard Fleming for a fantastic job of handling an unusual volume of air traffic (getting 8 aircraft on or off in ten minutes

more than once). George Patton, Bill Brundage, and Ron Weimer who helped to set up the control center and spent as much time as their regular work would allow and just about all of their own time. Ron was also up all night the day the aircraft went down, searching for the radio beacon signal. The men who made up the recovery team had a particularly difficult and demanding job. Len Howell, Duane Sizemore, Clifford Barkley, Neil Horner, and Ron Weimer assisted the Marlinton team in recovering the bodies.



Ron Weimer and Len Howell
at the crash site.

Two non-employees, Winfred and Jacob Sheets, spent just about every minute of the 8 days helping at the control center, searching in all kinds of weather, and finally helping in the recovery. There were so many offers to help, we couldn't use them all. Many people went out on their own, some were guides for CAP foot patrols, and others brought in snacks and sandwiches. To all of those named and unnamed, THANKS.

Bore - a person who talks when you wish him to listen. --Bierce

SOARING FOR SILVER
or
COAST TO COAST IN PURSUIT OF A
SILLY TIN BADGE

Ken Barbier

Author's Note:

I was happily starving, employed as a professional pilot giving glider rides and clearing almost enough to cover my \$30 a month rent, when a call from Dr. Dick Thompson lured me away to the VLA project, with the incentive of a real paycheck. As a side benefit, I was able to travel from California to Virginia and back to New Mexico, taking time off wherever possible to pursue my one true love: flying without an engine. For those of you who have never enjoyed this sport, I hope this narrative will arouse enough interest that you will at least give it a try as a passenger. Doing it like the birds is one of life's greatest joys.

Disclaimer:

The events recorded herein are unfortunately all too true. No names have been changed to protect the innocent, as I don't know anyone with that affliction. If there is any resemblance between characters living or dead, and unnamed persons in this story, they sure are characters!

The Federation Aeronautique International administers an international program of awarding badges for achievements in motorless flight. The lowest of these awards for which any great deal of piloting skill is required is the Silver Badge. To gain this award a soaring pilot must make an altitude gain of 1,000 meters, a cross country flight of at least 50 kilometers, and a duration flight of five hours.

With the equipment in common use and the conditions extant in this country, the first two of these accomplishments are trivial. This is the account of assaults made on the five hour barrier during 1975 by one pilot.

* * *

Sleep was rudely interrupted by an insistent pounding on the door of my little travel trailer. I cautiously edged my nose out of my sleeping bag into the cold air and grouchyly yelled "It's open!" at the intruder.

"Look at this!" yelled Rolf, barging into my tiny home beside the runway at Skylark Gliderport, Lake Elsinore, California. "You won't believe it!"

My watch, which was too damn cold to put on my wrist, said it wasn't even noon yet, but I struggled out of the warm sack anyway and looked out the door of the trailer. Capping the ridge to the southwest of the field was a line of puffy white cumulus clouds stretching northwest all the way to 4,000 foot Santiago Peak. There was no noticeable wind on the surface, but some must have been blowing against the ridge to produce such a beautiful cloud street. Under such conditions a sailplane can drive straight ahead at a good speed and not lose an inch of altitude.

"I'll get out the LP, then help you with the 1-34. Come on!" Rolf insisted. Rolf was half owner in a Laister LP-46, while I usually rented the Schweizer 1-34, because it cost more than anything else on the field, I guess.



SCHWEIZER 1-34, shown including ballast.

Both were medium performance sailplanes; ten years earlier they would have been world beaters. Such has been the progress in soaring flight.

Still mostly asleep, but too impressed by the conditions to refuse, I started pulling on cold, damp clothes. Later in the year the field would be a mass of hot dry air with sand blowing upwards in strong thermals, but this was still winter!

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I splashed some cold water on my face and staggered down to the gliderport office. Like an angel, Arleen had already made a pot of coffee. It didn't taste like an angel's coffee, but at that hour who cares? I poured some in a dirty cup and gulped.

"Fixmeabarograph. WhattimeisRolf'sfirst-student? Writeustwotowtickets. I'lltake69S. Where'sthatdamntowpilot!" It didn't help any that Arleen didn't seem the least excited. Good old Hans, our tow pilot-mechanic was probably over in the hanger, doing whatever it was he did to the tow planes to make them fall apart sooner. I finished burning my throat and ran over to the hanger to see if I could get things MOVING!

Across the field, Rolf was struggling mightily to push his five hundred pound LP to the flight line, poor 6'2" baby.

"You have a student at 11:00," I broke the bad news. Who needs money anyway. "I guess you get the first tow. Arleen is fixing me a barograph. Don't forget to seal it before you take off."

A barograph makes a record of flight altitude vs. flight time, when you remember to turn it on, and would be used to verify my claim if I were to make either the 1,000 meter climb or the five hour endurance flight. Rolf would be my official FAI observer, so he had to seal the device before I installed it in the 1-34, just in case I had hidden away in my pocket a pre-recorded trace from a previous flight of sufficient height or duration, which I could then, in the cramped quarters of the 1-34, swap for the blank trace, thus defrauding the FAI of a piece of tin worth about 50¢. Make sense? All sport flying makes sense! To the man collecting the rent! Rolf needed a 31 mile flight to complete his Silver Badge. I had no legs on the badge. I guess Rolf was in such a hurry so he could find the lift for me, since he had to stay around the field to give lessons. It was a workday, for him anyway. He soon had the LP ready on the flight line.

"Hans! Get your imported --- in that ----ing Cub and LET'S GO!" Rolf and Hans were great pals. I separated them, then helped stuff Rolf into his tiny bird, hooked up the tow rope, and sent him on his way.

While the tow plane and glider were struggling up to the ridge, I had time to pre-flight the 1-34, burn some more skin out of my

throat, and collect the baro. Boy, what a great day for a five hour flight. Not yet 10:00 a.m. and look at all those...oops! Well, there were still a few puffs left up on the ridge, and it still looked good up near the peak. Twenty five miles away, up-wind. But the wind was obviously dying.

I was ready to go when the tow plane landed. No one around to help me, as usual. I ran up to the Cub and asked where Rolf had released.

"Right up at the tower."

"Take me up just below him." I planned to use Rolf's greater experience to spot the lift. I had to hook up the tow line myself, climb into the cramped cockpit, climb back out, reach behind the seat to turn on the barograph, climb back in, climb back out, fish the seatbelts out from under the cushion, climb back in, buckle up, mumble "Altimeter set, belts on, canopy closed and latched, controls free, trim set, release checked" to appease the Gods of Preflight, and wag my rudder at Hans, in the hope that he hadn't fallen asleep or gone out to lunch by now. What luck! The tailpipe of the towplane belched a cloud of smoke from the oil accumulated by the long idling, and we were off! Me dragging one wingtip that no one was around to lift for me.

Over to the low point of the ridge we flew, then followed the crest upwind, climbing as the ridge climbed, and thus staying only a few hundred feet above the rocks. We passed over the Beehives, so named for the field full of beehives, where the first thermal lift on windless days was usually found. On up the ridge to the microwave tower. All the way, only a few bumps to indicate that the air was anything but deadly stable. There was something happening in the atmosphere when we got to the tower, however, and I pulled the release, even though I hadn't spotted Rolf.

"Probably too high to spot by now," I thought. The lift felt pretty good between the tower and the rim of the ridge, a hundred or so yards away. But my first task on this flight was to fly away from the lift, so that the barograph would record a loss of altitude to verify the point of release. As I crossed the rim of the ridge I could feel that there was still some wind blowing up the

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slope. So I shoved the stick all the way forward and dove into the valley to put a notch on the barograph trace that even John Hancock would be proud of.

The Schweizer 1-34 is a sleek little sailplane, and, aided by all my weight, we were diving at 120 mph in an instant. Three hundred feet of altitude gone and I pulled up into a climbing turn back to the ridge. No sweat. The wind blew me back over the rim and I found a patch of lift that the theoreticians of motorless flight could argue about forever. The wind blowing up the slope would produce ridge lift, which won't carry you much higher than the top of the ridge. The sun shining on the flat vegetation-covered field on top of the ridge would produce thermal lift, which any amount of wind would destroy. But this patch of lift was a combination of the two. Up I went, gaining 2,500 feet in a few minutes.

At which point an inversion layer (the same one that traps the smog) put a cap on things, just short of a Silver altitude gain. I wasn't concerned, as it was going to be a long day. I rolled out of my climbing turn when there was no more climb to it and headed northwest, following the line of the ridge. I flew and flew and sank and sank in a sky that by now was completely clear of clouds, and totally devoid of lift.

Under me was 2500 feet of altitude above the ridge, and 5500 feet above the valley floor. In my search for rising air I could have continued my cruise away from the field until half of that 5500 was gone, and still have made it back home. But even my limited experience told me there would be nothing to be found over the valley this early in the day. When I was down to 1000 feet above the ridge, I turned back the way I came. The book says never fly through the same bad air twice, but I had only one other choice: walk home. I made a fast run back to the tower and started a wide sweeping turn to find all that booming lift I had so recently deserted. Nothing! Slow up now to minimum sink airspeed and float down the ridge toward lower ground. Nothing! Over the Beehives, nothing! Running out of air now, turn back toward the field and float home in beautiful, clear, smooth, stable, stupid, calm air.

When things are busy on hot summer weekends at Elsinore, the only way to maintain

control of the crowds on the flight line is with the gliderport office PA system, which must put out at least a megaWatt of pure audio. As I touched down and rolled to a stop, Arleen used that PA system to announce to the world that I lacked only four hours twenty minutes for my five hour goal.

"So, old buddy and instructor," I cornered Rolf, "where were you who was going to spot the lift for me?"

"Over the dairy," (just on the edge of the field) Rolf said, "hanging on by my teeth to a tiny thermal. I never got over 1500 feet!"

Later that very same day, with the wind calm, Rolf busy trying to teach students how to land without bending any aluminum (at least as long as he was in the plane), and a bright sun shining down on the hills and fields, I loaded up my pockets with candy bars, put a fresh chart in the barograph, took a tow over to Bundy Peak, on the other side of the valley from the unlucky ridge, and released in what felt like a real boomer of a thermal. I was back on the ground in twenty five minutes this time.

* * *

As the sun returns from its winter hibernation, and shines down more directly upon the landscape, the heating of the lower layers of the atmosphere occurs at a greater rate, and the percentage of soaring time to time on tow increases. At least for glider pilots with some degree of ability. For some of us, our only claim to fame is the uncanny instinctive ability to accurately center ourselves in the only parcel of air within miles which is descending, instead of rising. As spring turns into summer these parcels become more difficult to find, until sooner or later even those of us who have really developed this talent to the maximum find ourselves almost inadvertently staying up.

As the eternal optimist, and avid collector of worthless barograph recordings, I had to make another try at the five hours before leaving Southern California for points east. This time I was really prepared, with a jug of ice water, four rolls of Lifesavers, two candy bars, and weeks of training in how-not-to-have-to-go-for-over-five-hours-at-a-time-after-too-much-beer-the-night-before. All athletes must train!

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Once again the early departure, and the ominous finding of lift over the microwave tower. This time I repeated my probe up the ridge, and the retreat to the tower. This time the thermal over the tower was not only still there, but strengthened. A climb followed by a probe in another direction resulted in another retreat. By now the tower thermal was really working! Better stay with what is usable, I thought, and spent another hour circling over the same patch of ground.

Although it doesn't seem to take so long, over half a minute passes for each 360° a sailplane circles in a thermal. Can you imagine the excitement that is created by sitting in one position in the cramped confines of a tiny cockpit, going around and around in a never varying circle, hanging on to the only lift to be found, just because it is the only way you're going to have enough time in the air to complete a five hour flight in one day? Well over a hundred circles in the same place. Next time, I resolved, I'd at least bring a radio to listen to. Or a book to read.

One and one half hours into the flight, still guarding the tower, and my watch crept slowly past noon. Sure enough, as I looked around, the sky began filling with other gliders, in other thermals. Finally I can leave this prison. I spot someone far across the valley, at least five hundred feet higher than I am! The relief in being confident that I can leave this thermal for another after so long without blowing the accumulated time is beyond measure. Gleefully I roll out on an easterly heading and push the airspeed up to the century mark.

In the quick trip across the valley I sense not a sign of lift. But as soon as I reach the hills on the other side I drive into a wall of ascending air that shoves me down into the seat and rattles my teeth! Wow! I look up and above me is the beautiful outline of a fiberglass superbird against the blue sky. I wind my 1-34 into a tight turn and plan to catch up with him.

Let us temporarily leave our hero in his exuberance for a short lesson in the ecology of Southern California.

From the grass-covered coastal hills and well out into the burning desert lives a hearty creature with whose Latin nomenclature I am not the least bit familiar. But having once met him, you would not forget him. Being of

the beetle family, he creeps around on six spindly legs, nose to the ground, as if looking for something he lost. He is about an inch long, and doesn't inspire irrational fear as a tarantula or a scorpion might, but that doesn't mean he is without formidable weaponry. Just get too close to this sad looking fellow, and he will put his nose even lower, raise his tail even higher, and let loose a cloud of gas which you cannot describe as being pungent, or nauseating. No. You can't describe it in these terms because it defines pungent. It is the soul and meaning of nausea! It protects our ugly little buddy so well that he is found everywhere, crawling into every interesting crevice he can locate. He is a peacable chap, not prone to attacking the defenseless, unless provoked. He can feel endangered if his poor little eyes spot an approaching large object, or he can feel in danger if suddenly awakened out of his morning's nap by a violent onslaught of turbulence, like when the sailplane he inadvertently crawled into drives into a huge thermal and executes a snappy pull up into a tight turn. He doesn't appreciate the beauty of such endeavors. Not at all. He just feels threatened. Down goes the nose. Up with the tail.

Meanwhile our hero, finally finding himself in no immediate danger of falling out of the sky, begins to relax, and starts thinking seriously of those nice candy bars in his pocket. Suddenly, he gets the message. He is not alone on this flight.

No pilot would ever admit to making himself airsick. But with a little help from his friends? Being airsick can make you a laughingstock, and I have known a couple of student pilots who fell victim while sitting idle while their instructor demonstrated his expertise, and had enough sense to laugh about it. Later. But for the pilot alone, strapped in a reclining position in a high performance sailplane, it can be, and has in the past proved to be, a fatal matter. The nature of the machine in which you are strapped prevents you from leaning over; you are strapped down, practically lying on your back. If you fight against your retching, you can inhale at the wrong time and suffocate. It has happened. In these circumstances it is not funny, and a pilot can be--
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come very nervous until he reaches the ground.

Then it's funny. My green face was good for a couple of laughs. Everyone had a good time kidding me. Who knows, I might have cracked a smile myself. But then I have a hysterical personality.

* * *

There are those who claim that every man has a price. Some pure souls can deny it, and claim higher principles. Not me! Just as things at Elsinore were beginning to look up, and fifteen year old girl students were completing their five hour flights before me, I was forced by the lure of a paycheck to leave this little paradise and journey to (ugh!) Virginia, wherever that is! The lack of money being the root of all evil, I responded to the call and headed east.

Somehow, after a day of travel, I ended up stopping along the road at Estrella Sailport in Arizona. I was minding my own business when a cute little blond simply insisted that I take a checkride with the duty instructor, so that I could rent one of their overpriced, overaged machines. I could have resisted, being anxious to be on my way to report to my new job, but when it turned out that she was the duty instructor that day...

Away we went in the trainer, giggling gleefully. She because she was getting paid to fly, me because blonds do that to me. Oh, we soared on laughter silvered wings, until it dawned on me that what should have been a quick trip around the pattern to see if I could find the airport had turned into an hour's flight. I won't accuse her of intentionally distracting me in order to run up a long flight, but neither will I absolve her of it! Besides, it's the longest checkride in history.

So we finally landed, and it was lunch time. Not wanting to fly on an empty stomach, I sat around gazing at the planes circling lazily, and leering at the instructor. At last I got up enough ambition to jump into a tired old single place clunker and be hauled into the sky.

The lift was so good it was a while before I noticed that the variometer, which tells you whether you are going up or down, was not even working! After having been on the road for a day, and having been checked out for an hour, and having flown for an hour without a vario, I was pretty tired, and had to force my way down to the airport through incredible lift.

What a waste. It didn't dawn upon me until later just what a waste it was. From the time of the takeoff of the checkride until I landed from my solo flight, over five hours had passed and plenty of lift was left in the Arizona sky. I could have made the badge flight that day without even trying!

* * *

In the Shenandoah Valley of Virginia, high atop an all but inaccessible ridge, there may or may not live a Southern Gentleman who could possibly be named Colonel Linford Bachtell. If such a person were real, he might have been smart enough to beat the government at the soil bank game by raising, in his backyard, a field full of airplanes and gliders. He might also, by chance, not have noticed that his backyard is too damn small to use for a runway. But considering his heredity, he may have noticed that fact, but stubbornly refused to let it deter him from his goal.

In desperation at finding myself on the soggy East Coast, I laboriously sought out this ridge-top Shangri-La (named for the aircraft carrier of the same name, which had a longer and wider runway), in hopes that I could find something with wings and no smelly engine, to fly. Like all West Coasters, I knew quite well that there could never be any decent sailplane flying east of Dallas. The existence of a world record out-and-return flight of over 700 miles without an engine, set on the East Coast, didn't affect my thinking. When my mind is made up, don't try to confuse me with mere facts!

When I first sighted LB Gliderport, I was sorry I had. There was a glider lined up, with its nose pointed up a grassy knoll. After checking carefully for hidden assassins, I peeked over the knoll to find a tow plane pointing downhill on the other side. At the bottom of the hill, in line with this pair, was a gully. On the other side of the gully was a tree covered hill, dead ahead of the two aircraft.

Not knowing that such an operation was totally impossible, the tow pilot firewalled the Super Cub and hauled the glider over the top of the hill. With the ground dropping out from below them, the glider was almost instantly airborne. The tow plane was flying just before reaching the gully. They now faced a tree covered hill dead ahead. It was

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hard to believe that this had ever been attempted before, but the tow pilot seemed to know that by turning hard left, practically scraping his wingtip, he could find a route between the hill and the next one to the left, and so out over the valley to safety.

Due to the virtual impossibility of landing a light aircraft down such a steep hill, both tow plane and glider had to return to this pea patch airport by reversing this course. "Big deal," I thought, after my shaking had subsided, "but what happens when two gliders have to land at the same time?" I survived my indoctrination to East Coast flying in plenty of time to witness not two, but ten powerless aircraft heading for this same postage stamp runway at the same time. And I was one of them.

(to be continued)

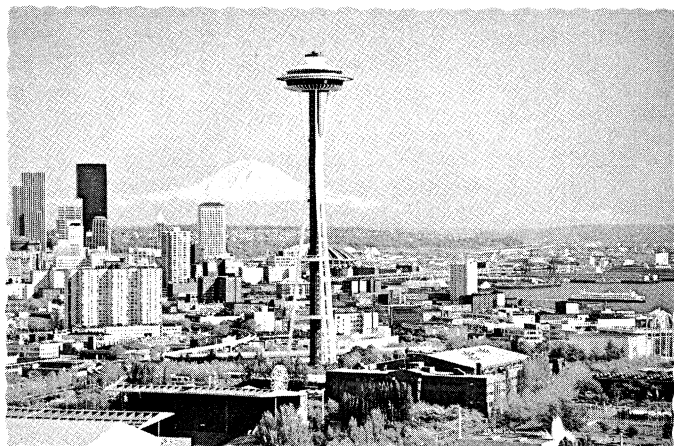
THE PACIFIC NORTHWEST

Bruce Balick

Greetings from the Pacific Northwest! It has now been two months since we arrived here, and a very pleasant two months it has been. Mother Nature has been rather active in this corner of the country and has created an array of majestic scenery for us to enjoy. It is difficult for me to describe the area without sounding like a travel agent. In any case, we really do like it here.

It's sunny now, and writing this letter is difficult because of the splendors outside my office window just a glance away. To the east are the rugged Cascade Mountains with a coat of fresh snow. Mt. Rainier rises 14,000 feet from just about sea level and can be seen 70 miles away rising over some spruce trees nearby. Across Puget Sound lie the range of Olympic Mountains where as much as 200 inches of rain can fall in a year.

Speaking of weather, do we have it here! Never a plain old rainstorm - generally our precipitation comes as a series of dramatic rainshowers separated by periods of sunny skies. Last weekend it got cool, and we had some wild thunder flurries that really shook things up. An hour later the sky was an innocent "what-me-rain?" deep blue.



Seattle city skyline including the Space Needle (height 600 feet) and Mt. Rainier (height 14,408 feet). To the right is the Elliot Bay of Puget Sound where active fishing and shipping industries are located. In the foreground is the Seattle Center which now includes several large museums, a sports arena, an opera house and concert hall, and a pavillion where 20 international restaurants are set in an indoor garden. The name Seattle comes from an Indian chief who was paid off by the early settlers if he would stop raiding the city. He died fairly rich.

Our winters are warm. It rarely freezes, and then only at night. The summers are cool and quite dry (about three inches of rain fall during the 4 summer months). Seattle lies in the rain shadow of the Olympics, and we get about ½ the annual rainfall of Washington, D. C. and about as much as San Francisco.

Seattle itself is a spacious, clean city, abundant in trees and vegetation, and relaxed in atmosphere. The well-known highlights include the Seattle Center (site of the '64 Fair, including the Space Needle), the Puget Sound Ferries, and the Boeing factories. Of lesser fame but greater interest to me are the displays of unusual artifacts of the Northwest Indians, the Pike Place Market (a large outdoor farmers' and crafts market open all year in the city center), and the many interesting and reasonably priced restaurants. The trip here for seafood is worth the price

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alone. There are fresh oysters, crabs, clams, salmon (four varieties), red snapper, etc., and perhaps even more once the summer fishing season begins. We all look forward to a bountiful berry season (especially the kids) including blue-, black-, rasp-, boysen-, and strawberries.



Mount Rainier is one of several volcanoes in the Cascade range which stretches from Mt. Baker in northern Washington to Mt. Lassen in northern California. Mt. Rainier is thought to be extinct. Recent years have seen total snowfalls of 1000 inches or more, and the glaciers are no longer receding. Mt. Baker has recently begun smoking, and Mt. Lassen erupted strongly in the 1920's.

The astronomy program here is modest in size and strong on activity. There are seven faculty and twenty students. Little observing is actually done here; most people head for Kitt Peak, CTIO, Europe, and NRAO. There is a 30" telescope on a beautiful site to the east of the Cascades where the summer air is very dry (parts of eastern Washington are the driest areas in the U. S.). I've still not been to the observatory, and probably I won't go till access to the site improves.

Until then, I'll be seeing you in Green Bank.

He who waits to do a great deal of good at once, will never do anything.

--Samuel Johnson

NEW CAMERA AT GREEN BANK

Bill del Giudice

You have read the title and said to yourself, "So what?" because the purchase of a new camera is no big deal. Well, this one is a somewhat larger than most. It stands well over 7 feet tall, takes up more than 20 feet of floor space and weighs a couple of tons. It will handle film more than 2½ feet square and will copy drawings or art work almost 5 feet square. In order to install the camera it was necessary to completely rebuild the graphics workroom area dividing it into a gallery which houses one end of the camera, a film processing room housing the other end of the camera, and a third room which contains miscellaneous smaller cameras, light tables, and work areas. The new camera replaces a much smaller, antiquated model and considerably improves the capacity of the graphics department.

