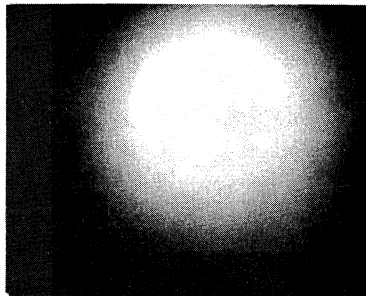
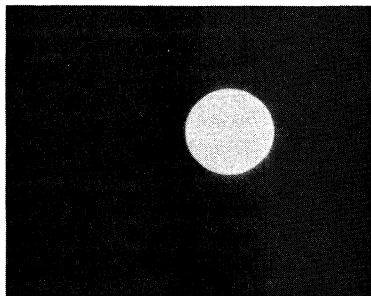


The OBSERVER

A MAGNIFICENT SHADOW IS CAST UPON GREEN BANK



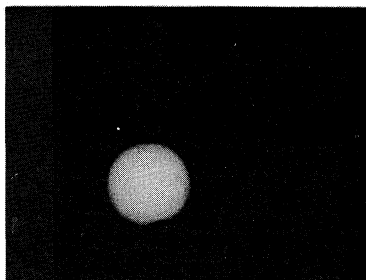
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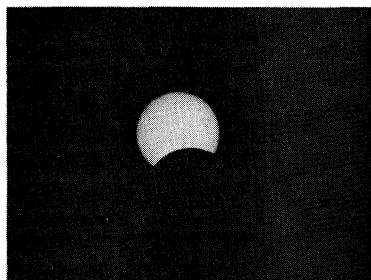
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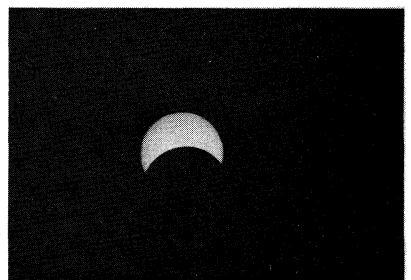
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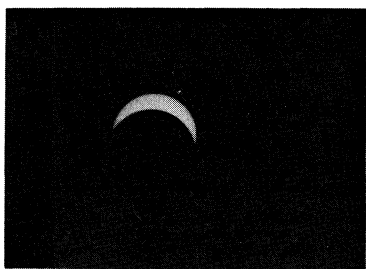
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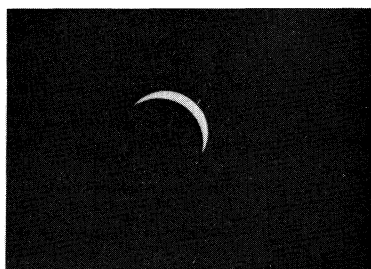
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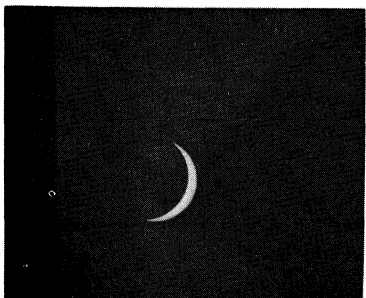
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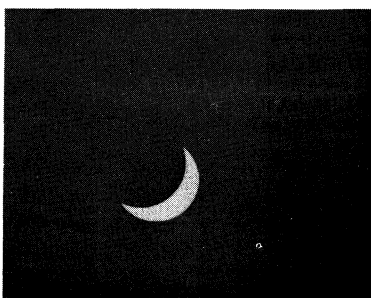
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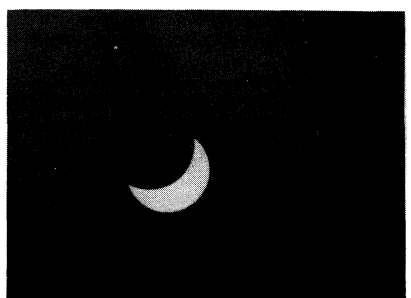
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10



11



12

See story on page 9.

Also see page 10, "Darkness at Noon".

OLD FRIENDS - NEW FACES

Frances Copper

Observers for May and June are as follows:

140-foot

A. H. Barrett, MIT
 R. Batchelor, MIT
 B. F. Burke, MIT
 M. Cohen, CalTech
 M. Ewing, MIT
 C. A. Gottlieb, Smithsonian Ast. Obs.
 D. Jauncey, Cornell U.
 M. Kundu, U. of Maryland
 C. Mayer, Naval Research Laboratory
 L. Meeks, Lincoln Lab, MIT
 J. Moran, Lincoln Lab, MIT
 P. Palmer, U. of Chicago
 R. Rubin, U. of Illinois
 L. Snyder, U. of Virginia
 P. Schwartz, MIT
 P. Solomon, Columbia U.
 D. Staelin, MIT
 P. Thaddeus, Columbia U.
 P. Veron, Meudon Observatory
 A. Witzel, Meudon Observatory
 J. L. Yen, U. of Toronto
 B. Zuckerman, U. of Maryland

300-foot

G. Westerhout, U. of Maryland

Interferometer

Shutdown in May.

Colloquia

None scheduled.

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

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 Ray Hallman
 Troy Henderson
 Marjorie Kanode
 Nigel (Snodgrass) Keen
 Leach Corporation
 L. W. McPherson
 Peter Mezger
 Wally Oref
 Ivan Pauliny-Toth
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 Dewey Ross
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 Virginia Van Brunt
 Bob Vance
 Beverly Weatherholt
 Dave Williams

A special thanks to all of those who help assemble the Observer.

FROM THE DIRECTOR'S OFFICE

Mort Roberts

I recently received letters from two acquaintances who are professors of medicine, one at Harvard and the other at Rochester. I knew that they were involved in training programs related to the newly established medical specialty of "Family Practice", which is the familiar "General Practice" program with the added prestige of a specialty. I had written them about our need for a doctor in Green Bank and the difficulty we had encountered in our recruitment attempts. I want to quote from their letters. One wrote, "Unfortunately, the need [for family practitioners] is critical in many, many areas of the country, so that you are competing with many others for a very small number of people. You should be in a good position to interest one of them with the fine location, but it may take you a good while and a good deal of energy..." The other wrote (in part) "...by no means is there a flood of [students going into family practice] and I am waiting for the American people to rise up in anger and ask for family doctors, family pediatricians, and family internists. Unfortunately, we are a long way from solving the problem."

These quotes give some idea of the difficulties and frustrations involved in our search for a local doctor.

Ted Riffe and I have written hundreds of letters, phoned potential leads all over the country, visited medical schools, advertised in newspapers and medical journals—all to no avail—thus far. I want to stress the "thus far". The search will continue until we locate a physician.

Let me give you some specific examples of our search. We have advertised in more than 10 different newspapers all over the country. We have advertised in 4 different medical journals (several times in each). At the end of last year, we sent letters to every training hospital in the country, over 160, that had an approved residency in general practice. This letter

described the area, the practice, and the support that the Observatory could give to a physician wishing to establish here. Not a single inquiry was received!

We thought of staffing the clinic on a temporary basis by having different doctors come in for at least a month. This is not uncommon in medical practice and such a temporary position is called locum tenens. We included such an announcement with our hospital mailings and received only three inquiries. One wanted to know more. The second, it turned out, had changed his plans after writing. The third might have been available for only a few weeks next summer. We obviously couldn't hope to staff the clinic on an interim basis with such poor response.

What are our prospects? We will get a doctor. The question is when. Our searches have not and will not stop. You can help by talking of our problem to any doctor you meet (or anyone, for that matter). Tell him of Green Bank; mention that a physician can set-up practice here with no financial investment on his part; that a good practice has existed here before. Ask him if he knows of anyone who might be interested. No matter how remote the chance, we will do all we can to follow up any leads that turn up — phone calls, letters, visits. If enough of us start searching together, I am sure success will come that much sooner.

(MSR, TRR, et al: There is more than one way to skin a cat!)



"By golly, you DO have a different approach!"

Having been asked, by the venerable Editors, to provide an article for the Observer, and lacking inspiration, I discovered in my files this perhaps appropriate composition by an obscure English bard.

Ivan Pauliny-Toth

Paradise Lost

by

John Milton

Of radio interference and the fruit
Of that forbidd'n Science whose mortal taste
Brought radio telescopes and all our woe
With loss of innocence, sing heav'nly Muse
That on the secret top of Palomar
The Ryles and Boltons didst inspire, who taught
In the beginning how the Radio Stars
Rose out of Chaos; or if Arbovale
Delight thee more and Deer Creek that flows
Fast by the mighty instrument, I thence
Invoke thy aid to astronomic song.
And chiefly thou, O Editor, who didst
Ordain me thus to light the vast Abyss
Of both our minds and speak of ancient time
Before our fall from grace, my labours bless.

Eight times our Orb has coursed the fiery Sun
Since when our feet first trod this blessed spot
And festive throngs did greet our journey here
Waved flags and strewed our path with flowerets
That fourth day of the seventh month that still
With touching loyalty they celebrate.
But O how fall'n, how chang'd art thou Green Bank
From that so happy state of innocence.
Like lambs we gambolled in the pastures green
Of fresh-found knowledge that thou didst reveal
When but two telescopes clove unknown skies
And that eternal pedestal, set by
With silent cranes: shelter from holocaust?
Or mushroom cellar? Who could tell until
Great Mammon for Technology did smooth
The way and forg'd the mighty instrument.

(continued)

Yet in that ancient time thou might'st espy
Astronomers steering the dishes' course
Or delicate receivers change. If now
In this presumptuous manner they behave
Thunder and Lightning on their heads descend
And on those who abet them, from on high.

Upon what meat hath NRAO fed
That she is grown so great (the Bard doth ask).
Thy meat may be thy poison, Heav'ns reply,
For on computer output thou hast fed
And tape doth swaddle thee in tangled loops,
Both red and the brown-hued magnetic kind.
So dims the vision that once searched the skies
But now myopic sorts cards, digits, bits and signs,
Burrows in caverns dank of print-outs, plots
To exhume Truth which it once buried there.

Thus to the fresh Old World from troubled New
The Exodus begins to Rhine's cool shore
Where the Black Forest elves and Krupp renown'd
Beat swords into the homologous shape
Of telescope immense. But those who go
Can but recall a little isle of calm
Set in a world of tempests; where the air
Is fit to breathe and water fit to drink,
Where forests and not asphalt reign and grass
Is to be walked on, not to blow one's mind.
Or shall we ask, on Europe's busy scene
If such a place exists, or did we dream?

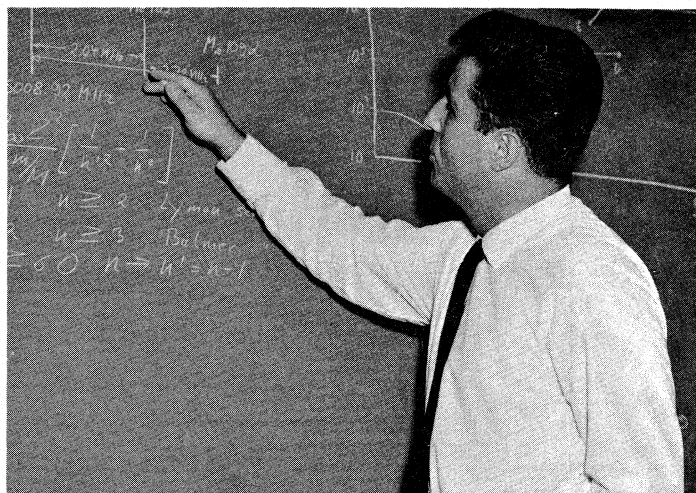


Ivan and Jo Pauliny-Toth

THE STORY OF RADIO RECOMBINATION LINES

Peter G. Mezger

One night on July 9, 1965 Bertil Höglund and I were obviously wasting another night at the 140-foot telescope. We searched for a radio line which had been predicted six years before by the young Russian astrophysicist Kardashev. Bertil and I had started this search about a year before with the Tatel telescope (now known as the 85-1). Sometimes we saw a line; sometimes we did not. Then people came back from the Hamburg IAU meeting where Russian radioastronomers had announced the detection of these lines. We looked at their spectrograms and felt that their results were not in much better shape than ours. We put our last hopes in the 140-foot telescope. Neil Albaugh had checked out the radiometer once more and had found a bad contact in the servo loop of the frequency synthesizer. Katherine Moyd, now a graduate student at Tucson, helped us with the computer program and made coffee. The Omega nebula came above the horizon and the operator peaked up on the continuum source. We started to integrate, on source, off source, etc. After half an hour Katherine and Bertil drove down to the computer and when they came back they had a big grin: On the computer graph the line stood out like a sore thumb — there was no doubt that we finally had found it.



Author Mezger

Radio recombination lines originate in HII regions, which are dense clouds of gas surrounding very massive stars, known as O-stars. They emit sufficient ultraviolet photons to completely ionize a large volume of the interstellar gas. Ionization means that one or more electrons is knocked out of the orbit in which it is bound to its nucleus, leaving behind the ionized nucleus, or ion. Subsequently, it moves around as a free electron, emitting broad-band radiation. Gradually, it is decelerated in the electric field of the ions, until it is captured once more by an ion. It recombines and thus forms a neutral atom. It is this process of recombination which gives rise to the radio lines. For example, the famous H109 α line originates while the electron jumps from the quantum level $n = 110$ to $n = 109$. Physicists just could not believe that such weakly bound electrons could exist.

Anyhow, they do exist and several theories had to be revised. Five Ph.D. theses and hundreds of papers were written. What are these observations good for? Unlike on earth, a fully ionized gas, or plasma, is the most common state in which material is found in the universe. Now radioastronomy had a means to study a particular type of plasma, i. e. , the low-density, low-temperature plasma which constitutes HII regions. It will never be possible to study these plasmas in laboratories.



Continued, next page --

For the physicist these studies are highly interesting; and if you want to break up a peaceful coffee break at the NRAO, just enter and casually mention, "Dr. Silverstein just sent me a preprint where he finds that the electron temperature in Orion varies from 5 to 50 000 °K." However, the layman cannot get terribly excited about such statements. But there are other celestial objects which can be studied through observations of radio recombination lines which are more appealing. Let us take stars, for example. Fortunately, we do know that they exist; since if you ask theorists like von Hoerner or Nakano they can easily prove that stars will never form out of the interstellar matter. Still, there they are, hanging in the sky — huge, tamed H-bombs, gradually burning their hydrogen into helium. That phase of a star where it burns up its hydrogen to helium is probably best known, both observationally and theoretically; it is called the main-sequence state of the star. Now, stars come along in different masses, ranging from $0.08 M_{\odot}$ ($1 M_{\odot} = 1$ solar mass) to $50 M_{\odot}$. After all hydrogen is burned to helium, the helium is burned to carbon, etc., until the chain of nucleosynthesis stops at the element iron. At that point, we shut our eyes and hope for the best, which is probably a supernova explosion, which leaves behind a neutron star and thus a new playground for Sutton, Reifenstein and Company.

The beginning of a star is not much better known. During recent years a lot of observations were made which obviously have some bearing on the early stages of star formation — the so-called protostar stage. Let me just mention the OH and water vapor emission centers, which were first resolved by VLB observations of the MIT group, involving the 140-foot telescope; or the very weak emitters of the carbon recombination line, which are hunted for by various observing groups of the NRAO, Harvard and similar high-browed institutions. Frank Low, formerly of NRAO and now at Tucson, is observing these protostars in a slightly more advanced state, when a stellar nucleus has been formed. This heats the dust which subsequently reradiates in the infrared. Stars — at least the

more massive ones — are rarely formed singly. The rule is rather that they are formed in clusters. Not all the material present in the original protoclusters is transformed into stars; some material is left over and is ionized once the massive O-stars become hot enough. These ionized remnants of protoclusters and protostars were first investigated by Schraml with the 140-foot telescope; later on Webster and Altenhoff took up the thread and investigated these objects with the NRAO interferometer.

If you look at the magnificent pictures of many external galaxies you will very often recognize a clear-cut spiral structure. It was the German astronomer Walter Baade who first pointed out that these spiral arms are made up of dust and HII regions. Dust and ionized hydrogen are the by-products of star formation. Why then do stars form in spiral arms? Only recently C. C. Lin and his collaborators could show that these spiral arms are not material arms, but rather density waves which compress the interstellar matter. The hot interstellar gas (several thousand °K) is compressed and — contrary to what we learned in school — cools down to temperatures below 100 °K. If you don't believe it, ask Hjellming; he has a long computer program where his female slaves have to feed in the new cross-sections every Monday. Anyhow, out of these cold clouds form star clusters which subsequently, as outlined above, form HII regions. And that is the reason why spiral arms can be traced by HII regions. Optical astronomers tried to do this for quite a while but with very limited success, since dust obscures the optical light in the galactic plane. Radio waves, on the other hand, are not obscured. It took the theses of Ted Reifenstein and Tom Wilson, as well as a year of my own time, to come to the conclusion that we need a larger radio telescope to unravel the large-scale structure of the galaxy. In the course of this scientific venture, we aggravated directors of northern and southern radio observatories by pestering them for more observing time. Then we fitted everything together, and found that O-stars are formed only in a certain

Continued, next page --

area of our galaxy (for those who want to know it in more detail, between 4 and 13 Kpc). Then Mort Roberts told us that we could have come to this conclusion cheaper and more quickly had we only read his publications (which we will never do, of course).

Hydrogen is the most abundant constituent of the universe. Next to it — about 10% in number (not in weight) — is helium. Other elements are by orders of magnitude less abundant. That part of astrophysics which deals with the evolution of the universe is called cosmology; that part which deals with the origin of elements is called cosmochemistry (or at least I believe it is called so). Until recently this was a wonderful playground for theorists, since no rock-headed observer could ever dare to prove their wild ideas. The helium abundance is of highest interest, since the burning of hydrogen into helium is the most energetic process known. Its determination by optical methods is extremely difficult and subject to so much criticism that one can come up with nearly any answer. Radio recombination lines of helium, on the other hand, are easily observed and their interpretation is very simple. When Palmer, Zuckermann, the rest of the Harvard Mafia, and I made the first systematic survey we found a constant helium abundance of roughly 8% (in number). This made everybody happy since it fits the "big bang" theory, in which the universe had originally an infinite density and temperature. Within a very short time (of the order of a few minutes according to this theory) the universe expanded and the matter cooled down. Part of the hydrogen was converted into helium and as a by-product there remains a huge amount of radiation, which has been rediscovered only recently by Penzias and Wilson from Bell Telephone as the famous 3 °K black body background radiation.

Theorists were happy that our helium value fitted their predictions nicely. They patted themselves on their shoulders (or wherever they could reach) and invited us to free drinks during cocktail parties. The first blow came when Tom Wilson, I and our friends from CSIRO found a He-abundance about twice as high in the Large Magellanic Cloud. But this was only a minor

disturbance. "There was receiver trouble, those guys were drinking too much Australian wine and beer, and who cares for 30 Doradus anyhow since it can't be observed from the northern hemisphere" were some of the more friendly comments.

As you know, science is mainly advanced by graduate students. So it came as no surprise that a young graduate, Ed Churchwell, continued to make more blunder of the big bang by not finding helium in the galactic center region. He asked me not to mention any of his conclusions since he does not want to aggravate the establishment before he gets his Ph.D. But let me just mention another fact. Optical astronomers found about ten times less helium in some Quasars than one would expect (i. e. , a helium abundance of 1% rather than 10%). They obviously had the same sneaking suspicions concerning their observations as Ed and I had concerning the helium deficiency in the center of our own galaxy. However, evidence is piling up that there are strong similarities in the physical processes of galactic centers and Quasars and the helium deficiency may be the key to the most relevant process since it pertains to the primary physics of these beauties, unlike, for example, synchrontron radioemission, which is always a secondary event. But then, beware, you poor guys who try to explain Quasars by VLB experiments. Your travel agency will soon run out of business.

Please turn page for figures showing the sequence of recombination line spectra.



Dr. Mezger has terminated employment with the NRAO and at present is on vacation. He will soon begin work at the Max-Planck-Institut für Radioastronomie.

"You came a long way, baby!" — that is obvious in viewing this sequence of recombination line spectra:

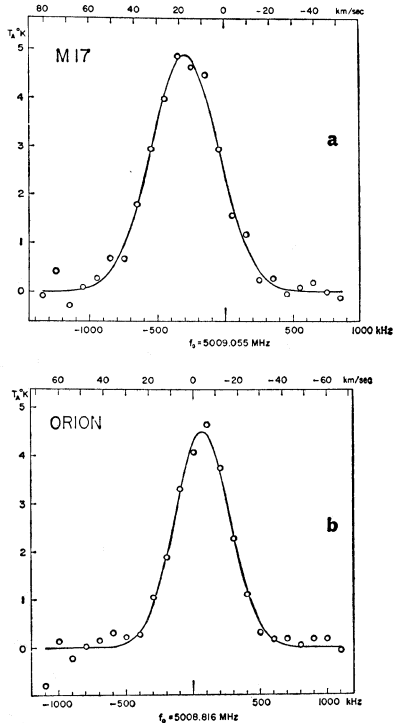


Figure 1 — The first H109 α recombination lines observed by Höglund and the author in M17 and Orion A, using old NRAO 20-channel spectrometer.

Figure 2 — A broadband spectrogram observed by Churchwell and the author using the NRAO 400-channel autocorrelation receiver. The various hydrogen (H), helium (He) and carbon (C) lines are indicated.

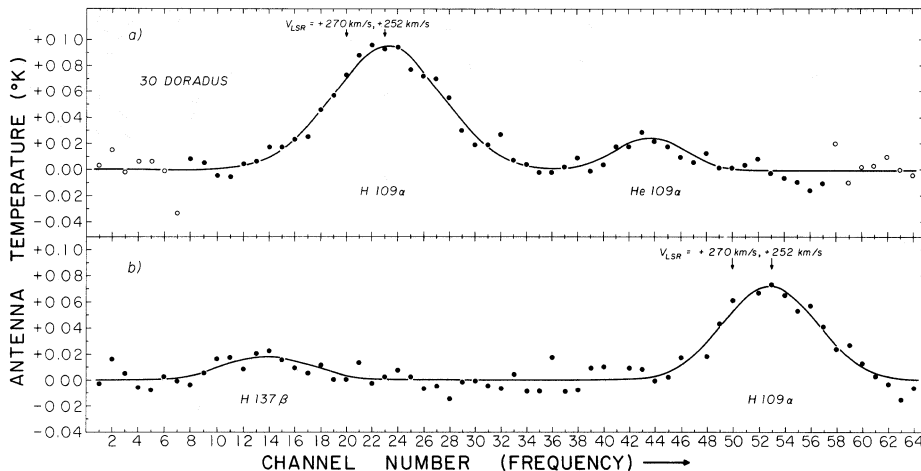
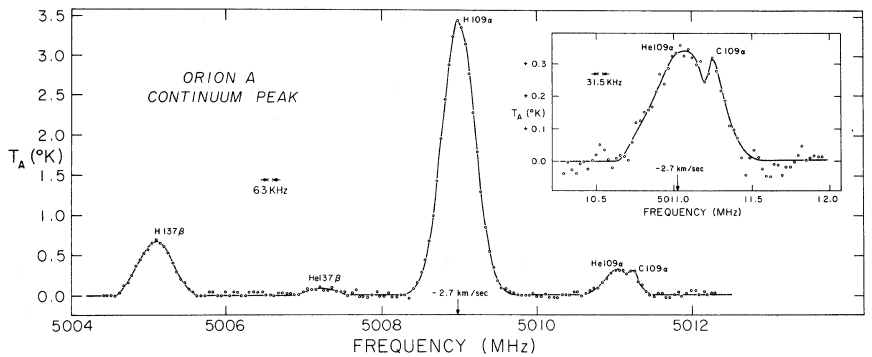


Figure 3 — This spectrogram taken with the CSIRO 64-channel spectrometer is of intermediate quality between the spectrograms Figures 1 and 2. It is a remarkable spectrogram insofar as it shows the first radio recombination line observation of an extragalactic HII region, 30 Doradus in the Large Magellanic Cloud.

NEXT BIG ACT 2024

Ray Hallman

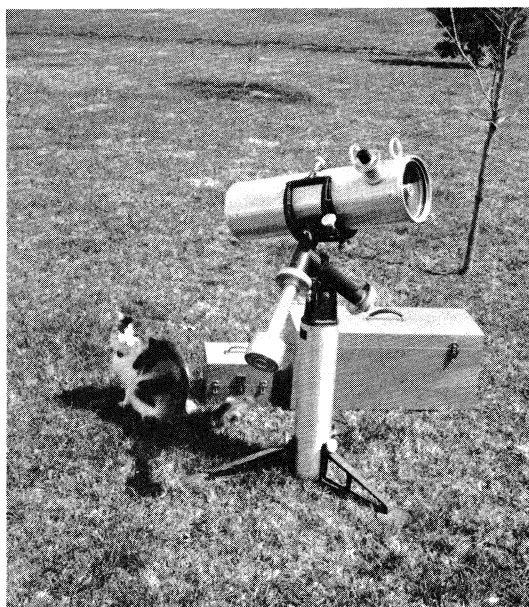
Darkness fell on Green Bank at mid-day Saturday, March 7, 1970, as the solar system and the elements cooperated to give astronomers and amateurs here a near perfect look at a rare solar eclipse.

The cover photos, local views of the eclipse, were made using the Observatory's six inch optical telescope. The pictures are arranged in consecutive time order with number nine at the peak of the event. The moon begins passing in front of the sun in the lower right corner of picture four, moving diagonally, and leaving in the upper left corner in picture 12.

The famous trial and error method was used to make the pictures. Having no idea what exposure setting to use, the polaroid-type camera was selected to allow instant picture viewing. But two basic problems had to be solved; namely, exposure and focusing the camera. A special battery operated lamp circuit was constructed to clip over the electric eye, thus defeating it and allowing variable exposure. The focusing problem was solved by looking into the ground glass back of a second camera focused to infinity. Proper focus was obtained by adjusting the telescope eyepiece until the image was clear in the ground glass, then substituting the polaroid, also focused to infinity, and taking the picture directly through the eyepiece.

The telescope is the property of NRAO and is available to any Observatory person who desires using it. One piece is missing; namely, the finder scope. This is a small telescope, about 2 power magnification, that is used to sight the main telescope to a source. It is probably silver aluminum in color and about seven or eight inches long, making it similar in appearance to a rifle type scope sight. If anyone can find the finder scope, please step forward.

Many beautiful sights are waiting for the interested person to see.— the moon, rings of Saturn, moons of Jupiter, the Great Nebula in Orion M-42, and others too numerous to mention. A chart is available that tells you when the sources are visible.



The Observatory's Six Inch Optical Telescope

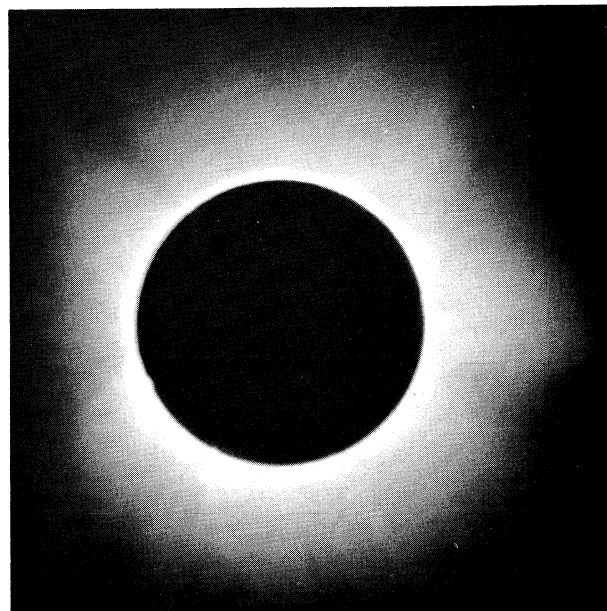


Photo taken in Washington by A. J. Delange. This is included for interest to show total eclipse with corona which is visible only during totality.

DARKNESS AT NOON

Ho and Hsi

On March 7, 1970, a score of NRAOites ventured to the Tidewater area to view an occultation of the sun by the moon which achieves a place in the ranks of trivia along with the American bison and the Pennsylvania Germans by virtue of its being misnamed—an eclipse. This misnomer is, thankfully, ignored by everyone including me, except right now for you who are presumably reading it. Anyway, the path of totality passed through the Elizabeth Manor Golf and Country Club to which we were invited by the Howard family. Those attending were Dr. George Miley, Dr. and Mrs. Jorg Pfleiderer and children, Dr. and Mrs. Robert Brown, Dr. and Mrs. David Heeschen and children, Dr. and Mrs. Richard Manchester, Dr. John Wardle, Dr. and Mrs. Barry Turner, Marjorie Andrews and husband, Dr. and Mrs. Allen Sinclair, Dr. and Mrs. David Hogg and children, Dr. Sidney van den Bergh, Dr. and Mrs. Gart Westerhout and family, Dr. and Mrs. Bruce McAdam and children, Mr. and Mrs. Bruce Balick and daughter, Mr. and Mrs. Jorn Wink, Phyllis Jackson and family, and Dr. and Mrs. John Broderick and children.

After lunch at the clubhouse we wandered outside and set up a vast array of scientific equipment which ranged from a five inch ship's telescope liberated after World War II, to cameras, to a \$16 Japanese telescope (which worked at least as well as one costing half that much), to pieces of overexposed-overdeveloped film, to holes hastily punched in cardboard. As totality drew nigh, an eerie pallor grew over a bunch of nuts running around with makeshift patches over one eye in order to adapt them to the darkness which would soon prevail. A noticeable change came over living things in the area. The gulls and other birds started to roost. My three year old son demanded to be held. People who paid attention to the "public service" announcements by the American Ophthalmological Society ran indoors

so as not to be blinded by the deadly infrared rays which somehow would become more dangerous now; and everybody else started snapping pictures furiously (except for me whose wife broke one of my cameras 20 seconds after the eclipse started). It was indeed a spectacular sight rivaled only by the eclipse itself, which by the way was superior to the only other one seen by me in Maine in 1963. This was because the one at hand occurred in a more active period of the eleven year solar cycle so the corona was much more pronounced. An interesting phenomenon was noted by Bill Howard. Just before totality, shadows of people were sharp at the top of the head and fuzzy on the sides (except for me again whose head is fuzzy enough on the top to overcome the effect). This was because the sun was a thin crescent nearly horizontal and it thus acted like a horizontal line source of light. After totality Dick Manchester pointed out the elusive shadow bands (easily seen on the grass and sand with no special effort made for viewing them). Their orientation and motion convinced me that they are caused by the atmospheric scintillations of the crescent sun which is acting like a line source oriented in the direction of the bands.

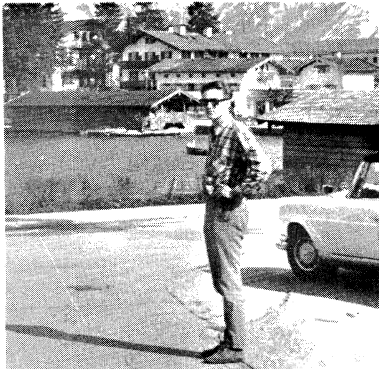
After totality the interest in the eclipse waned faster than the eclipse itself and we were soon over at the Howards' house being treated to refreshments. I speak for all of us who were there in thanking the Howards for their gracious hospitality. Those of you who missed out this time won't have another chance to view a total solar eclipse from Virginia (or anywhere in the Eastern U.S.) this century, although an annular eclipse will occur here in 1984. From reading the census form, it seems however that 1984 is already here and we may look for the annular eclipse any day now.

To end on a happy note, on the evening after the eclipse one of the Tidewater radio stations announced that the emergency blindness clinics set up in honor of the eclipse didn't have any patients but that they didn't feel too dismayed because people might not discover they were blinded until later on that night, or perhaps the next day.

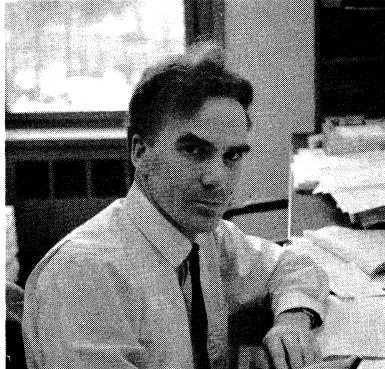
See page 12 for photos of "eclipse watchers". If you would like to see color shots of eclipse, John Broderick would be glad to show you some.

NEW EMPLOYEES

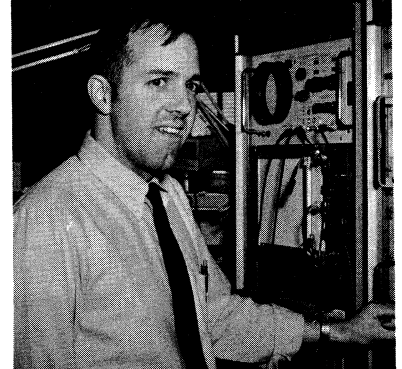
Mary Ann Starr



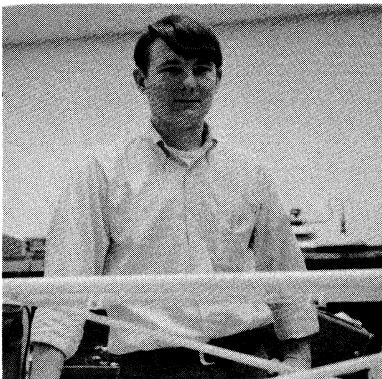
Roland von Hoerner
Engineering - GB



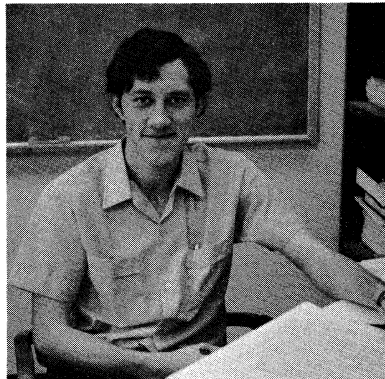
W. Bruce McAdam
Basic Research - CV



Craig R. Moore
Electronics - GB



Charles R. Pace
Electronics - CV



Oscar G. Rhudy
Co-Op - CV



Betty Sue Smith
Co-Op - CV



Virginia W. Van Brunt
Scientific Services - CV

TERMINATIONS

- Gary Bonebrake Co-Op
- Russell Bosserman Co-Op
- L. D. "Jack" Gore Electronics Division
- Roland von Hoerner Engineering Division
- Lemuel Lewis Computer Division
- John Riehm Co-Op
- Glenn Strickland Computer Division
- Claude Williams Co-Op



Continued from page 10,

"Darkness at Noon".

Eclipse watchers (?)



PAST HAPPENINGS

April 3, 1962 Observer — Torleiv Orhaug used 12-ft with old 3 cm receiver for studying short-term fluctuations in atmosphere. . . New employee, Len Howell. . . CCIR (Consultation Committee on International Radio) visits GB and says NRAO is one of finest examples of basic research. . . Cartoon depicts basketball player saying to ref, "Stop saying it's just a game -- it's NOT just a game."

April 30, 1962 Observer — Drive shaft for 300' placed in pit area. . . New employees are Bill Horne, Ron Monk, Jim Dolan, Bill Vrable, and Dick Skaggs.

May 31, 1962 Observer — 300' tilted south on May 24. . . mesh surface work started. . . and control building almost completed. . . Open house held May 26 with Dr. Drake talking and showing movie. . . Jim Olivers have new baby, Anita Sue.

Green Bank Residents: Do you need your garden plowed? If so, contact Merritt Gum - telephone 456-4689.

TOWARDS RESTORATION OF THE ENVIRONMENT

Ken Cottrell

Somewhere it is written that a journey of a thousand miles must begin with a single step. The urgent challenge before man, the task of restoring the earth's environment, the task of restoring its aesthetic quality and its ecological balance is, indeed, a journey of a thousand miles. Responsible contemporary jeremiahs are swift to warn us that it is, also, wont to be a painful uphill climb. There is even serious doubt as to whether we are capable of seeing the journey through. It might require something beyond our mortal powers. It might require a self-imposed, torturous reshifting of values, an era of demanding sacrifice. It might require a generation of saints. Surely, it will necessitate the control of population, and yet, the abolition of war.

Nevertheless, from whence the single step? Who will begin?

A single step is being taken by the West Virginia Department of Natural Resources in the form of the West Virginia Rolling River Campaign. In its initial year, this campaign is the first of its kind in America. It is an effort to improve the state's water resources and is the result of certain successful pilot attempts at stream cleanup, notably the Guyandotte and Elk river projects of recent years. (See photos.) The 1970 Rolling River Campaign is a cooperative venture between the Department of Natural Resources and twenty-one of the state's counties.

In order to set objective improvement standards, a stream rating system has been established for West Virginia. Streams are judged against criteria in four basic categories: scenic, aquatic, recreational, and tourist.

(1) To be classified as scenic a stream must be aesthetically appealing. It must be free of all litter, trash, and junk. Adjacent land use, structures, etc., must be scenically compatible. Its banks must be stable and vegetated. Its bed must be natural looking, often with alternating

pools and riffles. It may have waterfalls and rapids. It may have unique qualification such as being a wild river or canal.

(2) To be aquatic a stream must be able to sustain varied and profuse aquatic life forms. Aquatic streams are free of pollutants. Siltation is low. Flow characteristics are stable with little drought or heavy flooding.

(3) Recreational streams have frequent public streamside access. Adequate recreational facilities are maintained along their banks. Fish and other aquatic life abound.

(4) A tourist stream is rated for its archaeological, geological, or historical features. Abundant wildlife is present. Tourist-support facilities are readily available. Good highways follow nearby. The area is extensively publicized.



The Ladies Lend a Hand
on Elk River Cleanup.

The purpose of the Rolling River Campaign is to improve state streams so that they may be placed and maintained within the above categories.

The rating of streams is done at the county level by the Scenic River Committee, a

Continued, next page --

representative cross-section of county citizens appointed by the County Court. The Scenic River Committees are the front-line administrative arm of the Rolling River Campaign. They formulate and implement the plan of action. They set the objectives and priorities for streams in their jurisdiction. They recruit volunteers. They probe the resources of the counties for any needed equipment.

The counties are, in fact, responsible for supplying equipment and worker volunteers. Equipment is largely being loaned by businesses, organizations and individuals within the counties. Worker volunteers will come independently as well as from clubs, schools, civic organizations and other groups. The Department of Natural Resources gives guidance and supplies that portion of the labor force which is composed of Neighborhood Youth Corps enrollees.



Two Workers and a Small Volunteer Assist on Guyandotte Project

Every participating county is allotted fifty boys from the Neighborhood Youth Corps. This contingent is divided into four teams of twelve boys each. Each team is assigned a supervisor. NYC enrollees are recruited from the county in which they are to serve by the State Department

of Employment Security. The Neighborhood Youth Corps is funded by the U. S. Labor Department. It is a program of assistance to low-income families. Youths in this program work a thirty-two hour week at the minimum federal hourly wage.

The Rolling River Campaign is a cause for young and old but a special appeal is made to youths of high school age. They are urged to assist in stream research or in the actual stream improvement activities. Plans call for five youths to be on each Scenic River Committee. The Department of Natural Resources has planned a "Rolling River Festival" for volunteer youths who complete thirty hours or more of campaign work or research, and for NYC youths who serve at least five weeks on a campaign project. The festival is a gala one-day celebration tentatively scheduled for August 13, 1970 at the Tri-State Fair and Exposition in Ona, West Virginia. There will be many activities including a dinner, address by the state governor, and a folk-country music session starring nationally-known talent. A Rolling River Scholarship Fund has also been founded to help needy students who are studying for careers in natural resources management.

Pocahontas County, location of the NRAO's Green Bank installations, is well along on plans for launching its 1970 campaign. The Scenic River Committee has been appointed and divided into four sub-committees representing the four majestic districts of the county: Edray, Little Levels, Huntersville, and Green Bank. A series of meetings have been held both at the county and district levels. Stream objectives and priorities have been set. Stream improvement work has been scheduled to begin during the first week of June. The Green Bank district committee has decided, as a beginning, to improve the scenic aspects of streams in its area. Green Bank district stream priorities are:

Continued, next page --

- (1) East Fork of the Greenbrier River including Little River.
- (2) Deer Creek, North and South Forks.
- (3) West Fork of the Greenbrier River including Little River.
- (4) Sitlington Creek.
- (5) Greenbrier River below Durbin.

Work on these streams might necessarily cover a period of several years before all of them can be brought to desired standards.

The NRAO is represented on the Green Bank district Scenic River Committee and will make some of its equipment available for use in the campaign. It would be within the mark to state that the Observatory is well complemented by its sharing in this effort, for, although its mission is in charting the way to new worlds for man to inhabit, its success in this noblest of callings is predicated on the continuing habitability of cradle earth.



NYC Team in Action

(Photo Credits: The West Virginia Department of Natural Resources.)

300-FOOT TELESCOPE

Troy Henderson

The following is a list of dates and events that are to take place at the 300-foot starting this summer. More will be reported on these events as work progresses.

New telescope surface by RADIATION SYSTEMS, INC.

June 2: Delivery of panels and start field work (probably night time observing).

June 9: Suggested date for telescope to go out of service.

June 23-Sept. 16: Telescope out of service.

Sept. 16-Oct. 21: Probable night time observing.

Oct. 21-Nov. 5: Clean-up of grounds and equipment.

Addition to 300-foot telescope control building — architects for the project are STAINBACK and SCRIBNER of Charlottesville.

March 2: Received preliminary drawings from architects.

March 13: Returned suggested changes to architects.

April 21: Received final drawings.

May 18: Invite bids from contractors.

June 16: Receive bids from contractors.

July 1: Start construction of building.

December 31: Building completion date.

Congratulations to the GLADWELLS and the J. SUTTONS. Each family has been blessed with new members; a son to the Suttons and a daughter to the Gladwells.

CORRECTION to March issue, "Coffee Consumption" — Green Bank employees drink 2,000 cups of coffee per month—not 20,000. (Sorry, Bill.)

—Ed.

The following is an article received from Nigel Keen, former employee, now with the Max-Planck-Institut fur Radioastronomie. For those of you who never met Nigel, see photo. A single man when he left here, he is now married and the father of two sons, Christopher and Sebastian.

FROM THE OTHER SIDE
OF THE DRINK

Snodgrass

When I first arrived in Green Bank, in 1962, I believed that the Observer was a British Sunday newspaper, fitting approximately into the category of an "intellectual" or "heavy" (according to whether one read it or wrapped fish and chips in it). The NRAO Observer was too small for fish and chip wrapping, and thankfully was "light" enough not to disturb our pioneer digestive systems. The rumblings of discontent in esoteric circles on this side of the Atlantic are at about the same level as those with which we anticipated the hominy grits of departed friends (one in particular... Are you reading me, Bob, over there in Charlottesville?). Please don't change your name, my old standby when Marja Baars had borrowed my most recent novel, or John Findlay, Tom Williams, and Ed Felten were not around to play bridge. Observing is not only performed on paraboloids, and most observations in the Observer were in spite of, rather than due to, those paraboloidal task-masters...

I have it on good authority from Christopher Keen (three years) and Sebastian Keen (four months) that this will be a tough year in Effelsberg. The 100-meter antenna is really imposing on us to such an extent that we sometimes don't get in to the pubs until half-an-hour after they have opened. One consolation is the beer: anything pasteurised and below 5 percent would result in justifiable homicide... This part of Germany is ideally suited to beer-mat collectors (or beer collectors — depending on whether one is collecting souvenirs or memories!). I also collected a wife here, but that is another story.



Author Keen

The list of old NRAO lags in or around Bonn is formidable. Sometimes it is more like an old folks home than an observatory. But the place is humming with activity at last. The digital and systems groups are already in the Effelsberg labs, and Peter, Johann and Wilhelm are frequently working with the on-line computer. From the prime-focus we have a fabulous view of the surrounding countryside, although the main surface of the telescope is below the level of the hills in the immediate vicinity of the telescope. Prognostications of doom have turned out to be unfounded, insofar as the interference level in the Effelsberg valley is concerned. Very preliminary measurements on the roof of the lab (using mixers at 11 and 21 cm) detect only the electric-arc welders of Krupp. Of course, paramps up in the prime focus may tell a different story; but it cannot be at the high level experienced on our Stockert telescope.

Another reason that we are looking forward to the time when the Effelsberg antenna is ready: then there will be an excuse for some of the Observer readers to visit Bonn. But if you find yourself tearing up your return ticket, don't blame me.

For those of us who have had to work in cooperation with the various firms involved in the construction of the Effelsberg telescope, it has been a pleasant surprise to see that industrial efficiency is not an American prerogative. Recent experiences in France and Britain might be pointers

Continued, next page --

for a decline in other booming economies, but I cannot see it happening in West Germany for quite some time to come. Of course, work is not everything, as my two years in France amply demonstrated; that special "camaradie" of the Meudon group has helped many people from abroad through the financial and administrative difficulties inherent in French life. And across the Straits of Dover there are always the Beatles.

It is still snowing today (April 5th), although the snowdrops and crocuses have been out for a couple of weeks now. The experts are looking through their record books to see when a previous winter lasted as long. They will have a lot of difficulty, certainly, in finding a summer as long and as hot as the coming summer in Effelsberg!



Christopher holding Sebastian Keen.

(Mr. Keen also stated that, "The questionnaire [attached to the March issue] cannot stress sufficiently my objection to changing the name of the 'Observer'. I hope there are like minds in Green Bank."

Nigel, you will be glad to know that nobody wants the name changed!

WINNERS OF THE
AUI TRUSTEES SCHOLARSHIPS

No photo available.

Kjeld Hvatum, Albemarle High School,
shown with parents, Dr. and Mrs. Hvatum.



Marilynn McLaughlin, Green Bank High
School, shown with parents, Mr. and Mrs.
Bill McLaughlin.

TALK OF THE TOWN

Jo Anne Byram

What the NRAO secretaries have to cope with is unbelievable. This one is told on John Wardle as Frances Copper was doing some technical typing for him. As she finished, she discovered a typographical error on the word "but" and had to make the correction. Dr. Wardle looked at the paper and approvingly declared, "It's immaculate!" Frances hesitantly asked him to take a closer look. Dr. Wardle held the paper up to the light to get a closer look, and discovering the corrected word, said, "Oh, you've got a blob on your 'but'!"

On another occasion, Campbell Wade came rushing out of his office with a short paper for the ever busy, overloaded Phyllis Jackson to type up for him. After convincing Phyllis of its short contents, Dr. Wade added, "I also have a short appendix."

Speaking of the director's office—overheard on the telephone was Dr. Hvatum saying to Jim Dolan, "Do you know what they say here? It's easier to get the 140-foot to Charlottesville than it is to get Jim Dolan here."

You know, if you can be in the right place at the right time you can pick up some amusing bits of conversation. The right place in Charlottesville seems to be the canteen and the right time seems to be around 12:00. Overheard on one particular occasion was a discussion among some of the daily 12:00 patrons. The subject centered around the fact that an electrocardiogram could be sent over telephone lines and a specialist at the other end could read it. Neil Albaugh, making a statement of foresight, added, "I can hear the party at the other end now saying, 'Speak up, man, stop your murmuring.'"

The lower level parking lot also seems to be one of those "right places". As this mysterious phenomenon is rather irregular and happens only once a day, it's hard to pinpoint the time. We'll call this one the case of the "burping" truck. It's not unusual to walk by a blue Ford pick-up truck and hear it bellow out with a "burping" sound. It seems that Garnett Taylor has the only vehicle

in Charlottesville that burps—without being patted on the back! He believes that it's the radiator cap but there are those of us who believe it's that high octane gasoline he uses. What proof is it anyway, Garnett, about 86%.

John and Ann Sutton have been blessed with the birth of their first born. David John, weighing 7 lbs. 14 ozs., arrived March 15, 1970. Instead of cigars and candy, John had fruitcake and sherry for the occasion—a delightful change.

Easter found Phyllis Jackson and family enjoying the warm climate of Valdosta, Georgia and Jacksonville, Florida, while Elaine Litman and family were digging out from under eight inches of snow in Boston, Massachusetts. Dr. Howard and family spent Easter in Albuquerque, New Mexico.

We have a total of 37 summer students for both Charlottesville and Green Bank this year.

Others viewing the eclipse from the Eastern Shore that were not mentioned in the "Darkness at Noon" article were Dr. and Mrs. John Findlay and family, Dr. and Mrs. Ivan Pauliny-Toth and family, Dr. and Mrs. Ken Kellermann, Dr. and Mrs. Takenori Nakano and family, all at Virginia Beach and Frances Copper and children at Newport News.

* * * *

DANDELION WINE

1 gallon of dry dandelion flowers
3 pounds sugar (6 3/4 cups)
Juice of 3 oranges and 1 lemon
1 slice Rye bread, toasted
1 teaspoon active dry yeast.

Put flowers in 2 gallon crock and cover with boiling water. Cover and let stand 3 days; then strain through a cloth and squeeze all the liquid from flowers. In deep kettle, mix liquid, sugar and juices; bring to a boil and simmer 20 minutes. Put liquid back in crock and cool to barely luke warm. Sprinkle toast with yeast and put on top of liquid. Cover with cloth and keep at room temperature (70-75 °F) for 6 days. Strain into gallon jug and plug jug loosely with a wad of cotton.

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**OBSERVATORY TO EXPAND
TOURIST PROGRAM**

Wally Oref

The Observatory plans to expand its tourist program this year by having daily tours, by extending the length of the tour season, and by increasing tour content.

A tentative schedule calls for daily tours from about June 5 through Labor Day. Tours will start every half-hour beginning at 9:30 a. m. and ending at 5 p. m. From September 12 through October 31, tours will be given on week-ends only.

To extend the schedule it will be necessary to change the location of the tour center for part of the season. When school is out, the tour center will be located at the Green Bank High School as in previous seasons. When school is in session, the tour center will be located at the west end of the warehouse.

About 2,400 square feet of the warehouse is being modified into an auditorium and assembly room. It will contain a movie area, rest rooms, and a small exhibit area. When not in use for tours, the space will be available for other NRAO functions.

The daily program calls for running the Observatory movie continuously and for buses to leave every half hour. Telescopes and buildings will be described on the tour by a prerecorded tape operated by the bus driver. Information panels will be located near the tourist center to convey information about the NRAO and to occupy the tourist's time while he waits for the movie to begin or for a bus to depart.

Three site stops are planned where visitors can get off buses and spend as little or as much time as they please. The first stop will be mid-way between the 40-foot and 140-foot telescopes. Here visitors will watch a small tourist radio telescope observe the sun. A guide will be on hand to explain the operation of the telescope and to answer questions.

A short distance from the tourist telescope a path will lead visitors south of the 140-foot. Along the path and within good view of the

140-foot will be information panels telling about the 140-foot telescope. The path will end just south of the 140-foot at a bus stop.

The last stop where tourists can get off the bus is mid-way between the interferometer and the 300-foot. A series of panels with information about the 300-foot and interferometer will be located here.

The whole program is designed with the idea of permitting visitors to set their own pace. They can spend as little as 20 minutes on a bus tour or as long as two hours taking in everything.

* * * *

NRAORA NEWS

Beverly Weatherholt

Events:

- 1) Valentine's Dance was held Feb. 14.
Good attendance — good time.
- 2) The Spring Dance will be held May 16.
Music will be provided by the Esquires.

Sorry, no other information available at this time.

* * * *

Dandelion Wine (continued)

Keep in dark place 3 weeks; then pour into bottles without disturbing sediment. Cap tightly and store at least 5 months.

This is an old West Virginia recipe handed down from generation to generation. Since there is an abundance of dandelions, we thought you might be interested in brewing your own wine.

* * * *

PLANT MAINTENANCE

Jane Chestnut

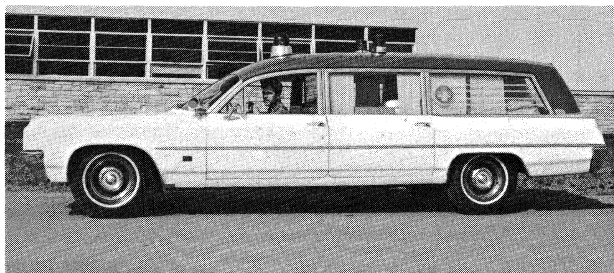
"NRAO Rescue Squad"
Paul Devlin, Supervisor

The rescue squad is manned by a crew of seven men whose duties consist of guards, firemen, ambulance drivers, and attendants. The area is serviced 24 hours a day, year around, for fire fighting and ambulance work. This squad has completed the advanced Practical Course on "Emergency Care and Transportation of the Sick and Injured" at WVU Medical School.

Our ambulance is equipped with all necessary equipment needed in emergency work — stretchers, resuscitator, oxygen units for eight hours travel, orthopedic stretcher, maternity kit, portable rescue saw, and all types of band-ages. Two fire-pumper trucks have equipment to fight all types of fire.

In the past year, 46 ambulance runs were made, such as heart attacks; maternity; broken legs, arms, and shoulders; skull fractures, and numerous car accidents. Also, 14 fire-fighting runs were made.

Emergency squad members are Ether Tyson, Roy Pennington, Jimmie Simmons, Chester Cassell, James Pennington, and William Lovelace.



NRAO Ambulance and Fire Truck

NOTE OF THANKS

Mrs. William Barnewall and Mrs. Marjorie Kanode are very grateful to the NRAO for the use of their ambulance and the kindness of their drivers, William Lovelace and Jim Simmons, and to Miss Harry Wooddell for her help. We thank you!

FACTS FROM FISCAL*

Harry Fox

The Tax Reform Act of 1969 is a new addition to the laws governing your Federal Income Tax during the year 1970. Here are certain provisions that may affect you:

1. The surcharge continues until June 30, 1970, but at a rate of 5%, reduced from 10% in 1969.
2. The personal exemption is increased from \$600 to \$625; this can be considered in the amount withheld only after July 1, 1970.
3. For persons with income up to \$6,100, the minimum standard deduction can be as much as \$1,100.

Mr. Fox did not mention the new look of the gals in Fiscal. They pierced their ears (with self-piercers). Some people thought they had "flipped" when they saw them with binder clips, heavy buttons, etc., hanging from their ears. But now everything is back to normal and they are wearing the "store bought" earrings.

* Information supplied by NRAO Fiscal Division.

36-FOOT TELESCOPE

Dewey Ross

Just as in other parts of the nation the winter weather in Tucson has caused many problems. Sunshine storms accompanied by high winds produced gigantic "sunshine drifts". Travel was not hazardous; however, there were reports that shoveling driveways resulted in "back" strain for some employees.

Even under these adverse weather conditions, observing proceeded as scheduled. Observations were made at 1, 3.5 and 9.5 mm. Observers since January 1 include K. Kellermann, I. Pauliny-Toth and N. Conklin of the NRAO; P. Boynton and R. Partridge, Princeton; M. Kundu, U. Maryland; M. Simon, State U. of New York; W. Dent, Massachusetts; R. Hobbs, NASA/GFSC; A. Penzias, Bob Wilson, and K. Jefferts, Bell Telephone Labs.

Equipment failures (primarily the 3.5 mm beamswitch) caused a great deal of down time during the past three months. As a result, Tuesday, March 17, 1970 was proclaimed as the "First Maintenance Day" and every Tuesday thereafter as scheduled maintenance day. Wednesdays are reserved to repair breakdowns which occurred on Tuesday and Thursday to repair Wednesday breakdowns, etc.!!

The AUI Trustees held their annual meeting in Tucson February 19 and 20.

Drs. Heeschen, Howard and Hvatum attended from CV. During this time G² was presented with a pin and certificate for 10 years of service to NRAO. Other NRAO visitors to Tucson were Bill Horne and Sandy Weinreb.

Jerry has recovered from his bout with Valley Fever and Bill Daniel and several doctors won their battle with a crab spider which bit Bill.

* * * *

INVITATION TO VIEW TRANSIT OF MERCURY has been extended to NRAO by the Leander McCormick Observatory, Charlottesville, on Saturday, May 9 — ending at 8:15 a. m. They will provide instruments for viewing. All you have to do is to be there early.

LIBRARY

May Daw and Virginia Van Brunt

We are pleased to welcome Virginia Van Brunt (whose picture appears elsewhere in this issue). Virginia will be replacing May Daw, who moves to Williamsburg at the end of June.

April 12 through 18th was designated National Library Week in libraries all over the country. Librarians worked feverishly preparing exhibits and distributing leaflets to publicize the occasion. At NRAO we thought long and hard to pick the best idea to celebrate such a momentous event. Should we carefully paste microfiche around the outside of the fish tank in the CV library, to educate the fish, and call it a microfiche tank? Should we sponsor a relay team to compete in a race between the GB lab building and the 140-foot, having each participant carry any three consecutive months of Physical Review? Should we finally give in to Dr. Hvatum's request and subscribe to Playboy? Being unable to agree on a course of action this year, we are beginning to plan for next year.

For those interested in statistics, the library recently completed a long-term project which reveals over 11,000 volumes in the combined libraries. In CV there are 3,469 book volumes and 6,057 journal volumes; in GB there are 611 book volumes and 982 journal volumes. We may be asking your help soon to locate missing volumes.

Do you know that you may obtain personal books at discount prices by purchasing books through Sci-Tech Book Service, Inc.? Sci-Tech offers 12% discount on most scientific, technical and business books; 20% discount on fiction and non-fiction; and 10% discount on University Press titles. You may order books yourself by obtaining the forms available in both libraries.

* * * *

The man attending a movie sat behind a young lady with a collie dog. The dog sat up in the seat and laughed at all the humorous parts of the show along with the other people. Amazed, the man leaned over and said:

"I just couldn't help myself, I have to tell you this is the most astonishing thing I've ever seen. Imagine, a dog laughing like that and seeming to enjoy the movie so much."

"I'm amazed, too," she replied. "He hated the book."

NRAORA BASKETBALL

Dave Williams

On March 13 the GB NRAO basketball season became history with a smashing victory over the CV NRAO team. Well, maybe not a smashing victory, but a victory nonetheless.

The GB team consisting of 13 players, their coach (yours truly) and our whistle tooter, "Tojo" Ratliff, left GB at 1:00 p. m. on Friday, the 13th. Now some people say Friday the 13th is unlucky but we proceeded on, just the same. We went straight to the lab at CV and from there we dispersed to various places for chow and then to the bowling alley. You should have seen the preparation made by the CV people for our game — posters on all the bulletin boards, napkins announcing our game, and the rental of the old University Field House. They wanted to rent the new Memorial Field House but it was being used for the State High School Tournament, and they felt this was a little more important than our game. We arrived at the gym at approximately 6:30 p. m. to a capacity crowd of over 50 people with 30 of these players and other participants.

The game began at 7:00 p. m. The first quarter was nip and tuck with the GB team leading 14-12. The second quarter was a different story with CV leading 27-24 at the half. Now any of you people who have been to Cass to see any games know that we play a little rough at times, but you have never seen anything like this game at CV. There was no partiality shown by the officials, but we were not use to playing so rough and not having fouls called. So the decision was made at half that we would have to be a little more aggressive, i. e. , rougher, or we would end up on the short end of the stick. The third quarter showed no gain for either team with each scoring 8 points. The fourth and final quarter proved to be the downfall of the CV team, with Brown and Chester Cassell along with Russ Poling pushing through a total of 14 points to only 9 for CV, with the final

score being 46-44 in favor of GB. The high scorer for GB was Russ Poling with 10 points and the only player in double figures. Those in double figures for CV were Allen - 13, Bosserman - 12, and Copper - 11.

One very interesting item came out in the scoring for GB. John Riehm, one of our illustrious co-op students, lead the scoring in regular games at Cass with a 26.9 points per game average. Claude Williams, another co-op, averaged only 3 points per game but out-scored John 2 to 1 in the CV game. There were rumors going around after the game that John may have attempted to throw the game, since there was some big money bet on the outcome.

After the game we were invited out for a steak dinner but we were in a hurry to get back to GB, so we settled for some pizza and beer. From there we departed at different intervals for GB, with some not arriving back until 2:30 a. m. Someone said that Tojo left his pizza and beer along the road on some mountain in Virginia; what a waste.

The actual climax of the season as far as GB was concerned was the annual beer party held at the Redwood House on April 3 with plenty of beer and chow for all.

The totals for the year are listed on the next page, including the CV game.

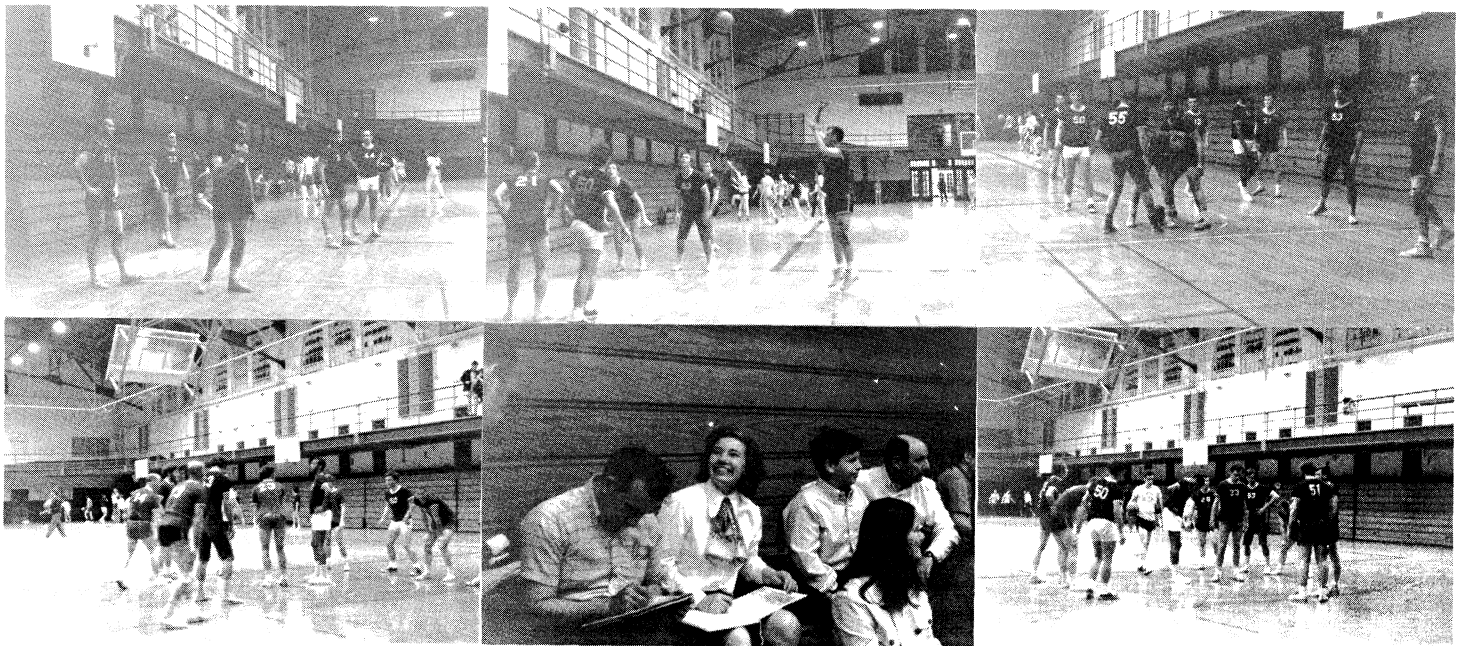
A commissioner of the basketball league this past year, I would like to thank all those who helped make the league the success it was; see you next year.

Peggy Weems took quite a few polaroid shots of the GB-CV game. However, lighting was poor and the photos did not turn out as well as expected. A few of the better ones are shown on the next page.



Continued, next page --

Player	Games	Field Goals	Fouls			Total Points	Average	High Game
			Attempt	Made	Avg.			
John Riehm	12	135	79	53	67	323	26.9	46
Len Howell	7	60	17	9	53	129	18.4	29
Benny White	2	24	1	1	100	49	24.5	32
Ron Monk	10	76	46	23	50	175	17.5	23
Chester Cassell ..	7	46	42	29	69	121	17.3	27
Brown Cassell....	7	39	24	12	50	90	12.9	20
Wendell Monk.....	15	96	34	14	41	206	13.7	26
Russell Poling....	15	85	38	20	53	190	12.7	22
Tom Carpenter ...	11	56	17	12	71	124	11.3	16
Ken Anderson	8	36	33	13	39	85	10.6	25
Bob Vance	5	19	12	7	58	45	9.0	18
Maxie Gum.....	12	47	55	26	47	120	10.0	17
Jerry Shears	12	50	7	3	43	103	8.6	20
Ronald Gordon ...	4	10	4	4	100	24	6.0	12
Bill Vrable	12	31	22	17	77	79	6.6	12
Bill Brundage	11	31	19	6	32	68	6.2	14
Carl Davis	8	20	20	7	35	47	5.9	15
Gary Bonebrake ..	10	35	8	3	38	73	7.3	18
Basil Gum	5	7	4	1	25	15	3.0	11
Claude Williams ..	9	13	6	1	17	27	3.0	9
Bob Nichols	7	3	5	2	40	8	1.1	5
Jim Simmons	1	1	3	0	0	2	2.0	2



POCAHONTAS COUNTY
HIGH SCHOOL

Bob Vance

The construction of the new consolidated high school for Pocahontas County has added to the scenery as one drives along the Brown's Creek road towards Huntersville. The site is located south of Seneca State Forest and adjacent to it. This location was selected due to the travel distance as the geographical center of the county. The seventy-five acre plot was purchased from H. L. Comer by the Board of Education. Davis and McClintock of Harrisonburg, Va., were the architects who designed the buildings.

A twelve-year bond issue was approved by the voters to pay for the construction. State and Federal matching money is available for the vocational building and equipment for that building.

Contracts for construction and equipment have been awarded to the following:

Academic and Vocational Building - Central Valley Construction Co., New Market, Va.

Electrical and Mechanical - Trumbo Electric Co., Broadway, Va.

Plumbing - Riddleberger Brothers, Harrisonburg, Va.

Gymnasium Equipment - McManus Office Supply, Inc., Elkins, W. Va.

Library Furniture - Myrtle Desk Company, High Point, N. C.

Vocational and Classroom Furniture - McManus Office Supply, Inc., Elkins, W. Va.

Vocational Business Machines - Ray Office Supply, IBM, McManus Office Supply, and May Office Supply.

Water Supply System - McCue Construction Company, Summersville, W. Va.

Cafeteria Furniture - J. S. Latta, Inc., Huntington, W. Va.

The construction of the main academic building and vocational building are progressing very rapidly towards completion.

The masonry work on the main academic building is about 99 percent complete. The band room lacks a couple of partition walls and some concrete to complete the elevated floor levels.

The vocational building lacks some floor slabs and partition walls. On the total job, very little masonry work remains to be done.

The concrete pouring in the main academic building is complete except for the band room, under the stage, and the corridors. The corridors will be terrazzo and this must be applied within a few hours after the corridor slabs are poured.

In the vocational building, they lack four bays in the classroom area and one bay in the welding shop.

The plumbing contractors have completed nearly all of the water and heat lines. The heat lines have been tested for leaks. The heat for the building consists of hot water from an electric boiler. The heat units are installed in the academic building and the vocational building is now being completed.

The electrical contractors have completed most of the conduit work and have pulled a good portion of the wire. The lights are hung in the gymnasium. The mounts for the lights are installed in the academic building.

The painters are applying the block sealer and have completed one-half of the academic building. The ceiling grids are being installed in the classrooms as the painters finish the sealer.

The storm and sanitary sewer lines are installed. The treatment plant has been placed but not yet tested.

Pocahontas County High School will open this fall with Fredric Smith as principal. There will be a faculty of approximately forty teachers and approximately 600 students, grades 9-12.

The curriculum is designed for College Preparatory, Vocational, and General. The Vocational subjects will be taught in two and three hour blocks for the junior and senior year. College Preparatory students may select electives from any department including vocational subjects; however, they should be aware of the specific requirements of the college they hope to attend and plan their schedules accordingly.

The new high school should serve each student to attain the goals he desires. Both the curriculum advantages and the new environment should please every citizen of this county.

Continued, next page --

Marlinton Elementary will use the relocatable classrooms now used by the high school. Four more of these units have been purchased and are now being delivered to accommodate the entire student body. The Marlinton schools have been operating on a split-shift basis in order to attend school in the space available. The students, parents, and local citizens are to be commended for their fine cooperation with the Board of Education in this situation.

Green Bank Elementary will use the building at Green Bank. Cass Elementary students will be transported to Green Bank along with the seventh and eighth grades of Durbin.

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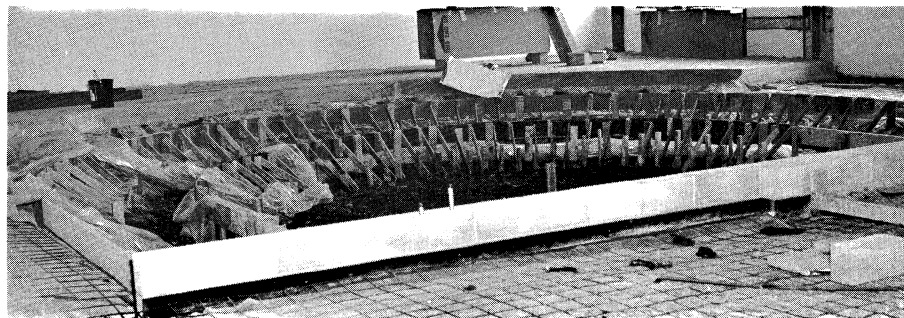
Main Academic Building (rear view)



Main Academic Building (front view)



Front View of Main Building - Vocational Building Rear Right



Main Academic Building - Band Room

RADIO ASTRONOMERS EAGER FOR LEACH EQUIPMENT*

If you have ever tried to look at the planet Venus using a pair of binoculars, you'll remember that it was fairly difficult to hold steady and resolve a true image. However, with larger telescopes, astronomers have learned many significant facts about the planets and the universe. The geologist, unlike the astronomer, has only to walk out in the hills and pick up some samples to examine the structure of earth in order to learn more about earth's origin. Can you imagine how frustrating it must be for the astronomer? His laboratory samples consist of some pieces of meteorites, and, thanks to the Apollo astronauts, some pieces of the moon from which to study. Astronomers, such as Dr. Barry Clark, rely on optical and radio telescopes to help answer questions. The most powerful telescope in the world is the 200-inch reflector (mirror) at Mount Palomar, California. But even this device has its limitations. Therefore, the radio astronomers rely on whatever information they receive on radio waves of hydrogen gas striking earth to help unravel the secrets of the universe. These radio waves are apparently being emitted from objects too far away to be seen with any telescope. But with existing radio receiving equipment and techniques, astronomers have been able to monitor waves in the two million cycle frequency range. "From this data," says Dr. Clark of the National Radio Astronomy Observatory in Virginia, "we have determined that the source of the radio waves is quite small and very far out in space." Exactly how small and how far these quasi-stellar, or "quasars" (as they are popularly referred to), are can only be guessed. "We think they are anywhere from 100 million to five billion light years distant — about $\frac{3}{4}$ of the way to the end of the universe!" Is there an end to the universe? "According to Einstein's theory, yes." How big are these quasars? "About one light year across." That's small? "When you compare it to the size of our Milky Way Galaxy which is about 100,000 light years across, yes. The size of the sun is about five light seconds, our earth, about 42 light milliseconds!"

Dr. Clark and his colleagues will be able to monitor a wider frequency range of gas radio waves with the new Leach equipment using HDDR[®] (High Density Digital Recording). "We will be able to look at four million cycles of data, and who knows what new information will be gained?" Dr. Sandy Weinreb, who built the first radio astronomy auto correlation receiver in 1961, and is the Project Manager at NRAO, will be working on a coordinated effort with: Dr's. Will Klemperer of Environmental Lab Services, Boulder, Colo.; Bert Hansson (Research Engineer) Chalmers University of Tec., Goetborg, Sweden; Marshall Cohen, California Institute of Technology; D. L. Jauncey, Cornell University, Ithaca, New York; A. E. E. Rogers, Massachusetts Institute of Technology; and the research personnel at the Naval Research Laboratory in Washington, D.C.; all of whom will be using Leach Controls equipment in their quest for a greater understanding of our universe. Obviously, Dr. Clark, who will be responsible for processing all data of Dr. Weinreb's project, and other scientists and engineers at NRAO, as well as astronomers around the world, are quite anxious to put the system to work. Leach Project Engineer Bob Andersen is very optimistic about the operation of the Leach record and reproduce terminals, in spite of the big push to meet delivery dates. Engineers Dick Nelson, Frank Spriggs, Fred Hampton, and Gary Kaleta, and other Engineering personnel such as Ken Rogers, Steve Addis, Larry Angel, Phil Krawczyk and Bruce Bodiker all have given up weekends and evenings to help meet the delivery schedule with equipment in perfect working order. With that kind of spirit and teamwork, success is practically guaranteed.

HDDR[®] Registered trademark of Leach Corporation.

* From the March 1970 issue of Crosstalk, a monthly publication of Leach Controls, Azusa, California.



Scientist Dr. Barry Clark (left) of National Radio Astronomy Observatory and Controls Project Engineer Bob Andersen view part of equipment being tested.

* * * *

FIRE FIGHTING COURSE

The first class of a 10-lesson fire-fighting course was held in the conference room, GB, on April 9. Ten people attended the first class which covered two lessons, "Fire Extinguisher Principles" and "Water Distribution Tools".

Classes will be held in the conference room on Thursday evenings at 7:30 p. m. until the course is completed. Approximately 18 hours of instructions are required to complete the course. Classes are 2 to 3 hours long, depending upon content.

Anyone interested in taking the remaining lessons or only certain lessons may do so.

The course is being taught by Bill Del Guidice of Frank and the course is sponsored through the West Virginia Appalachian Center.

If you have any further questions, contact Tom Williams or Wally Oref.

* * * *

THE GREEN ARBOR GARDEN CLUB*

For the March 10 meeting the hostesses were Mrs. Jack Irvine, Mrs. Harry Fox, and Mrs. James Dolan. They had delightful and colorful Easter decorations for the luncheon table and lounge. Eighteen members and three guests were present to enjoy the beautiful setting. (See photos.)

Mr. Wally Oref, our guest speaker, gave a most informative lecture and demonstration on the subject of "Why Raise Your Own Plants?" With our short maturing season he recommends that we concentrate on raising the earliest blooming plants so that we may enjoy the fruits of our labor. Furthermore, he says your own plants make sturdier, stockier plants and are much cheaper. He demonstrated window-sill culture and the various types of hot houses or cold frames which can be useful in our gardening pursuits.

Mr. Oref now has a tomato-producing plant in his NRAO office. He told us of the acid soil in this area and demonstrated how we can correct it so that we can all raise sturdy plants. His biggest challenge, since moving to the Green Bank area, has been to find seeds that will mature during our short frost-free summer season.

Sixty Paper White Narcissus bulbs have been ordered to present to the Green Bank Grade School rooms and to Mr. Harris, principal, to bring a touch of spring indoors for the school children.

Five members (Mrs. Thomas Williams, Mrs. Harry Fox, Mrs. William Kane, Mrs. Gilbert Peery, and Mrs. William Barnewell) attended the Annual Meeting of the West Virginia Garden Clubs at the Greenbrier Hotel on March 23. There were many interesting reports and exhibits, and a delicious luncheon was served to more than 300 members.

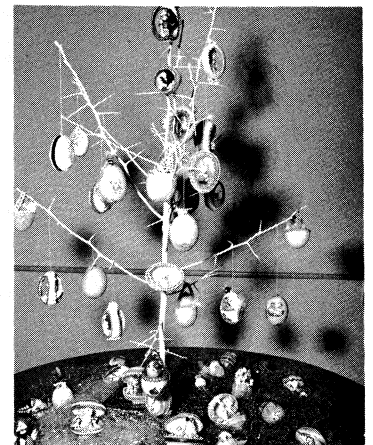
For the April 14 meeting the hostesses were Mrs. Libby Horne, Mrs. Joan Smith, and Mrs. Marlene Yost. Mrs. George Patterson (Vice President of West Virginia Garden Clubs)

and Mrs. John Fisher, both of Lewisburg, assisted us in joining the Federation of Garden Clubs.

If you are interested in joining the Green Arbor Garden Club, contact Mrs. Thomas Williams, president.



Mr. Oref speaking to GAGC members.



Easter Egg Tree



Centerpiece

* Material submitted by Marjorie Kanode, Emma Beard and Iva McC. Barnewall.

AN INTRODUCTION TO SPELEOLOGY

Rosemary and Michael Balister

Speleology, or the study of caves, is an excellent hobby to pursue in Pocahontas County, as a long strip of limestone running along Back Allegheny mountain south to Greenbrier County is literally honeycombed with many interesting cave systems. We hope in this series of articles to introduce the beginner to this sport and science.

For a first trip it is important to select a fairly easy cave and if possible an experienced guide. Suitable ones close to Green Bank are the upper part of Cass Cave, Windy Cave near Cassell's Pit off Back Mountain Road or Dill Cave on the banks of Mill Run near Cass. You will need several layers of old, warm clothing, preferably with a set of coveralls on top, boots and a miner's helmet with a carbide lamp attached — the latter has proved the most efficient form of lighting in caves. A bag — ex-Army is ideal — containing spare carbide, water bottle, matches in waterproof container, electric flashlight and some concentrated form of food, e. g., candy bar, should cover any emergencies likely to arise. You should be prepared to get wet, perform simple rock climbs, crawl snake-like through narrow passages and emerge covered in mud.

There are many interesting things to notice underground. The most beautiful

stalactites, stalagmites and other flowstone formations are relatively rare and often found in the least accessible places although even in these easy caves you will see some good examples. Watch also for unusual shapes worn by the water into the rocky walls of the cave. Sometimes geological rock strata are clearly seen in a large chamber, also evidence of faulting. For those interested in living things there are cave salamanders and bats.

Some books on caves you might enjoy are: Depths of the Earth, W. R. Halliday; Celebrated American Caves, edited by C. E. Mohr and H. N. Sloane; Exploring American Caves, Franklin Folson (paperback); Caverns of West Virginia, W. E. Davies; and The Darkness under the Earth, N. Casteret.

We hope in subsequent articles to describe one or more specific caves and if there is sufficient interest to arrange a visit.

Below: Stream passage in Dill Cave.



QUESTIONNAIRE RESULTS

"Speak now or forever hold your peace! "
Of the 350 copies of the Observer distributed, only eleven returned the questionnaire. None wanted to change the name of the Observer.

Everybody checked that they liked to read most of the articles. A few suggestions were made. For the most part, though, everybody stressed that they wanted the Observer continued.

Many employees and visitors verbally commented that Dr. Kellermann's article was "the most". We had hoped to print the conclusion in this issue, but Dr. Kellermann's busy observing schedule and then abroad to meetings did not allow him time to write it. We look forward to it in the July issue.

* * * *

PLEASE NOTE

Carolyn Dunkle has resigned as Observer editor. For the next few issues we will have guest editors. The first one will be

Mrs. Barbara Hallman,

Ray's wife. We hope that you will give her full cooperation.

Please turn in your articles for the July issue by June 8. Address the envelope to Observer Editor, Green Bank. Barbara plans to visit around the site and meet the people with whom she will be working.

* * * *

The Observer will be mailed to those who send a written request on their institution's letterhead. Mail request to: Observer Editor, NRAO, P. O. Box 2, Green Bank, W. Va. 24944.

THE OLD ASTRONOMER
TO HIS PUPIL*

Reach me down my Tycho Brahe, I would know
him when we meet,
When I share my later science, sitting humbly
at his feet;
He may know the law of all things, yet be ig-
norant of how
We are working to completion, working on from
then to now.

Pray remember that I leave you all my theory
complete,
Lacking only certain data for your adding, as
is meet,
And remember men will scorn it, 'tis original
and true,
And the obloquy of newness may fall bitterly
on you.

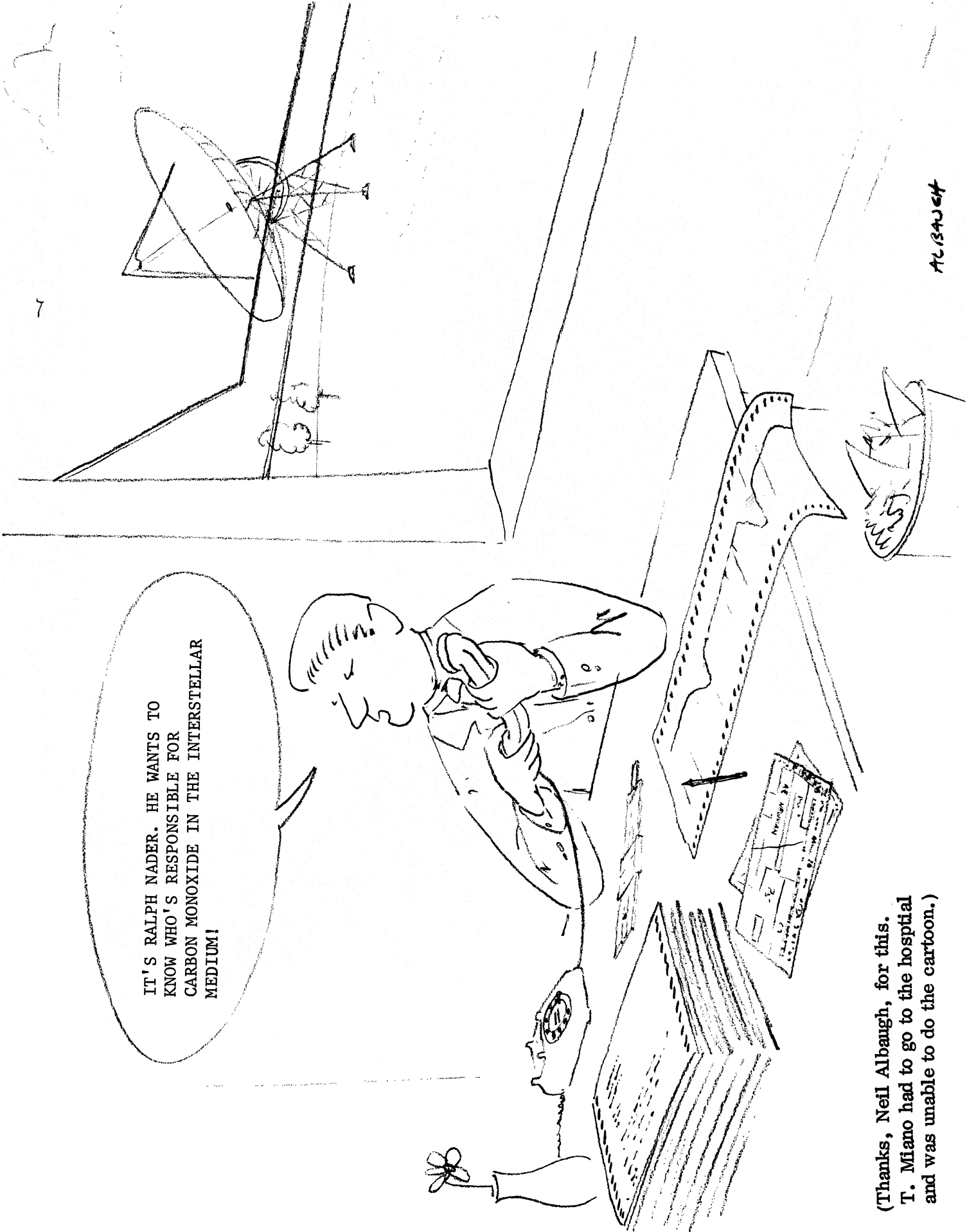
But, my pupil, as my pupil you have learned
the worth of scorn,
You have laughed with me at pity, we have
joyed to be forlorn,
What for us are all distractions of men's fel-
lowship and smiles;
What for us the Goddess Pleasure with her
meretricious smiles!

You may tell that German College that their
honor comes too late,
But they must not waste repentance on the
grizzly savant's fate.
Though my soul may set in darkness, it will
rise in perfect light;
I have loved the stars too fondly to be fearful
of the night.

—Sarah Williams

* Submitted by Ken Cottrell. Found in Best Loved Poems of The American People, a selection of Hazel Fellman's.

* * * *



(Thanks, Neil Albaugh, for this. T. Miano had to go to the hospital and was unable to do the cartoon.)