

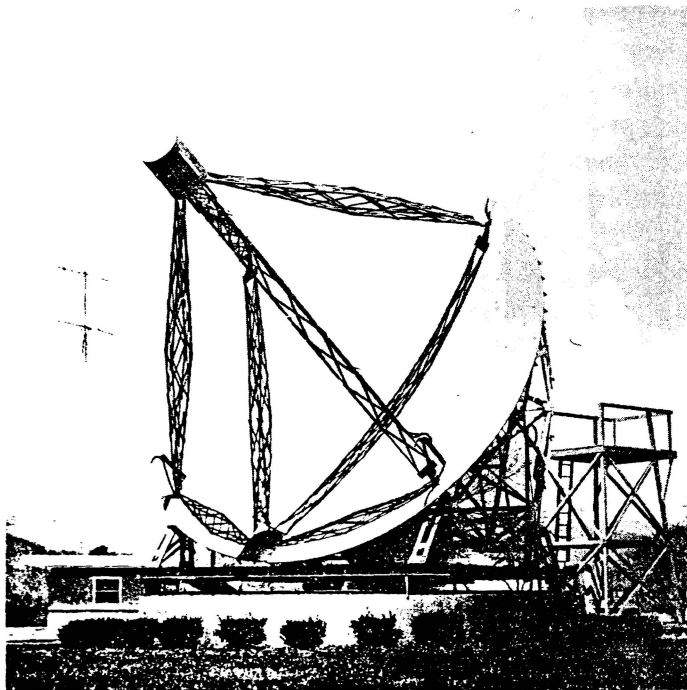
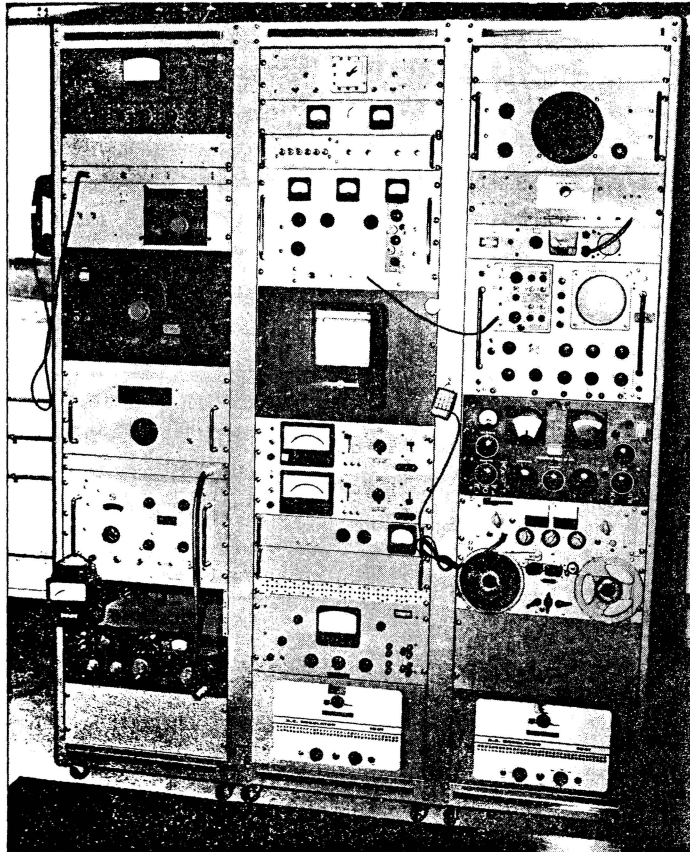
# *The* O B S E R V E R

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REBER TELESCOPE AND RECEIVING EQUIPMENT

### REBER DISH BY M. T. WASLO

Many inquiries from visitors and employees of the Observatory concerning the Reber Dish as seen on the front cover have the impression that this is the original dish as built by Grote Reber. This is an exact replica of the Reber Dish after the 1947 period.

The original dish built in the spring of 1937 by Grote Reber in his back yard at Wheaton, Illinois consisted of the reflector or dish surface, four parapets (feed support legs), and their support structure on two large elevation arches positioned on four railroad wheels and friction driven. This provided motion along the North-Zenith-South meridian. The dish diameter was 31 feet 5 inches and a focal length of 20 feet. His work or contribution to radio astronomy for the next ten years or so can be found in the Proceedings of the IRE (Vol. 46, p. 15, January 1958) and other publications.

In 1947 the Reber Dish was acquired by the National Bureau of Standards and was moved to the Sterling, Virginia vicinity where it was erected on a turntable which provided the azimuth motion. The turntable consisted of four railroad wheels riding a circular rail driven by four electric motors with speed reducers permitting an azimuth speed of one degree per second. To locate the dish position in azimuth, 36 pins, 31 inches apart mounted on the riding rail, actuated a riding micro-switch which excited a buzzer or other devices each ten degrees of travel. At 90 degrees, two closely positioned pins rang the buzzer twice, three pins at 180 degrees-three, and four pins at 270 degrees-four. This system is in operating condition at present although a much improved azimuth readout has been installed.

About 1952 the dish was dismantled at Sterling and parts sent to Boulder, Colorado. Sometime in the 1950's the Reber Dish was loaned on an indefinite basis to this Observatory by the Bureau of Standards for

exhibition purposes. In 1959 and 1960, under the supervision of Grote Reber, the original pieces of the 1937 Reber Dish were duplicated and with its 1947 turntable erected in its present position during the fall period of 1960. (Duplication and erection was done by Observatory personnel.) The original pieces of wood from the dish support structure, the parapets, and the dish surface are in storage on the Observatory grounds.

### Interference Protection Work at the Reber Telescope

The ability to detect very weak radio signals in radio astronomy is at present determined mainly by the noise figure, the stability and the bandwidth of the receiver used, and by the size of the antenna system. In the future, however, it is reasonable to foresee that by using receivers with low noise crystal mixers, traveling wave tubes, parametric amplifiers, tunnel diodes, or masers, and with the development of larger antennas, the state of affairs will be reached in which the limit of usefulness of a radio telescope will be set by the noise at the observing site. A number of steps have been taken in the past to insure that the Observatory site will be as well protected as possible against increases in the levels of radio noise. However, a continued program of detecting and reducing interference is necessary in order to insure that the site not only remains quiet but hopefully becomes quieter to match probable improvements in radio astronomical techniques.

Although the Reber telescope was built initially in order to preserve a historic instrument, it was always planned to be used as an instrument for making interference studies. The program of work being carried out with this telescope, and its associated equipment, may be described under the following headings.

1) Soon after the Observatory was started, a radio quiet zone was set up by the Federal Communications Commission (FCC) and the Interservices Radio Advisory Committee (IRAC). This quiet zone is bounded by the latitudes  $37^{\circ} 30'$  and  $39^{\circ} 15'$  North, and by the longitudes  $78^{\circ} 30'$  and  $80^{\circ} 30'$  West. Any new or changed radio transmitting facility within this zone must be referred to the Director of the Observatory and to the Naval Radio Research Station at Sugar Grove to see whether such a facility would damage the operations at either place. One of the tasks carried out at the Reber telescope is the processing and checking of such applications. In most cases this does not involve experimental work, but if it is necessary to make a test of the possible interference at NRAO, such tests can be made using the Reber dish.

2) Our own equipment, both electrical and electronic, and our own and other vehicles operating within the Observatory perimeter and near it are all potential sources of radio noise which can limit the astronomical observations. These sources of noise are measured by using the Reber dish and its associated receiver, together with other field strength measuring equipment. In order to at least maintain the present low level of interference in a number of cases noisy automobiles have been located and in general it has been possible to reduce the radio noise from such vehicles to permissible limits.

3) It is necessary in the development of other facilities around Green Bank to be sure that nothing happens which can hurt the Observatory. To this end the Reber dish has been used in studies of the field strengths which may be radiated to the Observatory site from various possible future sources of transmitters. A particular example of this has been the studies conducted during the summer of 1962 of the path loss suffered by transmissions from the Sugar Grove site and received at Green

Bank. NRL provided the transmitter facilities for these experiments. Successful measurements were made at frequencies of 41.5 Mc, 170 Mc and 304 Mc. No successful transmissions were achieved at higher frequencies. Transmission losses between about 170 and 214 db were measured and these agreed well with calculated losses. The calculated losses at the higher frequencies rise from 210 to 240 db and suggest that the failures to transmit signals is due to these large losses at the higher frequencies.

4) The Reber dish has also been used to monitor frequency bands which are being proposed for allocation and use by radio astronomers. Two of these bands, one at 326.5 to 335.4 Mc, and another from 404 to 410 Mc, have been monitored for an average of 32 antenna hours per megacycle. These measurements have shown that the 404-410 Mc band is clear of interfering signals at Green Bank to a level corresponding to about  $1^{\circ}$  of antenna temperature on the Reber telescope. The 328.6-395.4 Mc band is not apparently clear. This result, however, is still somewhat in doubt since interference in that band may be due to the second harmonic of air-to-ground voice communication systems.

The receiving equipment used with the Reber dish is basically of the same design as that used on other NRAO radio telescopes. Due to the wide range of frequencies of interest to the Observatory, the receiver was built so that it could be tuned to any frequency between 250 Mc and 8000 Mc with a minimum of modification. The output of the receiver may be fed to a pen recorder, an oscilloscope and audio-amplifier, and to auxiliary equipment such as a Hammerlund SP 600 receiver or a magnetic tape recorder. In order to facilitate the study of the interfering signal and to aid in locating its origin, the receiver is normally operated in the total power mode with a short time constant. The front ends in use generally are a LEL preamplifier, with a 3 to 5 Mc bandwidth, an Empire Devices crystal mixer, and Narda 20 db couplers.

When it is necessary to change frequency these last two components must be changed and the position of the feed toward or away from the dish must also be adjusted. This is true for the logarithmic periodic antenna which is used. This antenna theoretically should operate from 200 Mc to about 2 kMc. Very little work has been done above 1 kMc with this log periodic antenna, but between 240 Mc and 1 kMc it has given satisfactory results. Shielding by means of a screen will be placed around this feed to decrease its susceptibility to ignition interference and to other kinds of signal reception which plague some programs.

The log periodic feed on the Reber dish is the first which has been used to any extent at the Observatory. Although the theoretical properties of such a feed look very attractive, a number of difficulties had to be overcome before satisfactory performance could be achieved. Some of these difficulties were in fact overcome by the time honored method of trial and success. First the impedance of the feed and its associated cable has been measured over quite a wide range of frequencies. The admittance plot on a Smith chart goes around a circle showing a variation of VSWR which lies generally below the 2 to 1 level. These measurements have been made at 400 Mc and at 890 Mc. The beam width of the Reber telescope was measured at 750 Mc by using transits of Cas A and Cygnus A, and the half-power beam width was found to be  $3^\circ$ . The theoretical half-power beam width should be about  $2^\circ 50'$ . The gain of the dish at 750 Mc derived from this beam width measurement is about 35 db. This in turn shows an aperture efficiency close to 50 percent at this frequency. A 10 centimeter horn was designed for the Reber dish and made in the Electronics Division Machine Shop by Mr. Wimer. The theoretical beam width for this feed at 3 kMc is  $42'$ . The sun is too large a source for good beam width measurements with such a narrow beam.

However, checks on the sun suggest that the aperture efficiency of the dish is about 25 percent, although this 10 cm feed may not have been correctly positioned and focused for these measurements.

There is a considerable amount of work to be done by the Reber dish in the future, and it is very satisfactory to know that the oldest steerable parabolic dish in the world is still being put to a good use.

With humidity at high levels during the winter months, ignition interference radiations are severe from some make vehicles, and above acceptable levels on others. The movement of vehicles in the vicinity of the dishes should be on urgent business or other important matters only.

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#### NEW BOOKS IN THE LIBRARY

"Astronomy of the 20th Century", Struve, O., Zeberg, V.

"Theory of Flow and Fracture of Solids", Nadai, A.

"Photography; Its Materials and Processes", Neblette, C. B.

"Advances in Electronics and Electron Physics", Vol. 16

"Solid State Physics", Vols. 11, 12, 13.

"Intelligent Life in Space", Drake, F. D.

"Advances in Geophysics", Vol. 9

"Principles of Radar", Taylor, D., Westcott, C. H.

"Applied Optics First Supplement -----  
OPTICAL MASERS"

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THE COIN CORNER BY L. McPHERSON

I became interested in coin collecting in 1935, but gave it up two years later until 1958, when I again became interested and discovered that most of my coins had increased in value tremendously. The past four years I have spent many happy hours working with my coins.

The art of Numismatics, known to most of us as the hobby of coin and currency collecting, is really not as difficult to master as its title indicates. First of all, let's say there are two basic reasons for collecting coins and currency. No. 1 -- it is a fascinating hobby. No. 2 -- there is a financial gain in the increase in value of coins wanted by collectors. Illustration: My 1877 Indian Head Penny is worth \$75.00. I paid 75 cents for it in 1935.

Surprisingly, you will discover that there is an estimated four and one-half million collectors in the United States today. Therefore, with competition such as this it is evident that a beginner must learn all possible about coin collecting. He must learn the basic facts in the shortest possible time and leave the more complicated stages of Numismatics for later. These will include overdates, three-legged buffalos, double die varieties, and a hundred or so other numismatic terms, which mean so little to a beginner, or a near beginner. This is a phase of collecting that can be learned little by little from research and fellow collectors.

Let's see what we have in the way of research. Today there is approximately ninety books on the general topic of coin collecting, ranging in price from forty cents to fifty dollars; over one hundred on United States coins, and one thousand or more on coins of the world, ranging in price from twenty-five cents to one hundred-thirty five dollars each. There is the "Red Book" commonly called the collector's "Bible" by Yeoman, which is published each year and gives you the price trend, amount of coins

minted, and a short and concise set of rules for grading. This is a must for the collector.

Since mint marks will be most important and most confusing to the beginner, let's determine where the various mints were located. The main mint is located in Philadelphia, Pa., and does not use a mint mark (with the exception of the war years of 1942 to 1945 when a large "P" was placed above Monticello on the nickel to indicate the change from copper-nickel to copper-silver manganese which was required by law to distinguish it from regular composition). The Philadelphia Mint was constructed in 1792, and the first coin called a half-dime was struck the same year. All other mints were branches of Philadelphia, of which only one is still in operation. This is Denver, Colorado, which was established in 1863, but was used as the main assay center for all other mints until coins were struck in the year 1906. Denver uses the letter "D" as its mint mark.

New Orleans Mint -- This mint was established in 1838. It did not operate during the Civil War, nor for a period of years after the war. Coining operations were resumed in 1879, continuing until the mint was closed in 1909. Mint mark "O" designates New Orleans coinage.

San Francisco Mint -- This branch of the United States mint was built and put into operation during 1854. It operated continuously until it was closed in late 1955. Coins from this mint are identified by mint mark "S". You will find lots of coins today in circulation from this mint. The mint today is being used as a storage place for a lot of our minted silver, to be delivered to our Federal Reserve banks.

Carson City Mint -- Located at Carson City, Nevada, it was built in 1867. Operations started in 1869. Operated approximately 23 years. It closed in 1893. These coins are identified by mint mark "C".

Charlotte Mint -- The Charlotte, North Carolina mint was operated solely to mint gold coins from the gold mines of North Carolina. It operated from 1838 until 1861, when the gold mines played out. Mint mark "C" on gold coins only identifies this mint.

Dahlongega Mint -- This branch mint also struck only gold coins and was located at Dahlongega, Georgia. It also started in 1838 and closed in 1861, and used mint mark "D". There should not be any confusion between it and Denver's "D", as Denver started many years later.

Most beginners think they should start a collection with the Lincoln cent, dating from 1909 to the present time, but I advise against this. My reasons: This is one of the most difficult sets to obtain because of the scarcity in circulation of several dates and mints. These you must buy or trade for with other collectors. This involves a considerable amount of money. Therefore, it is my opinion that a beginner should concentrate on the Roosevelt-type dime, all of which are still in circulation and which will represent an investment of approximately \$5.00 completed. Minted from 1946 to the present date, this dime series represents a minimum of mint marks, and die varieties which minimize confusion for a beginner.

Next month I will attempt to discuss mint mark locations, describe variations and grading of coins, and also continue with my study of Roosevelt dime collection.

Coins to watch for in your change --

1914-D Lincoln cent  
 1950-D Jefferson nickel  
 1932-D Washington head type quarter  
 1921-D Liberty walking type half dollar.

DID YOU KNOW? There were only 5 1913 Liberty nickels minted. There were no silver dollars minted from 1905 to 1920 inclusive, and none minted since 1935.

Dr. Findlay was in New York City on Jan. 17 and 18 attending a Trustees Meeting. On Friday afternoon, Jan. 18, he spoke to the Bronx Highschool of Science. His subject was radio astronomy and the 300-foot telescope.

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After much moving and re-arranging offices in the laboratory building, things have now settled back to normal. The "old" director's suite has been taken over by the fiscal division, and Dr. Findlay has moved his offices to the far end of the hall. Mr. Callender moved his offices to the first floor in the space vacated by Mr. Pleasants' engineering group when they moved to the works area. The rooms left vacant by Mr. Callender have been filled with members of the Scientific Services Div.

Very few phone numbers have been changed, and a new directory of these numbers and new room assignments will be issued as soon as possible.

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Reports have reached us that the building of a Catholic Chapel in Marlinton is in high hopes for this year. Rev. Father J. Hall from St. Catherine's Church in Ronceverte has services each Sunday at 1:30 PM in the Legion Hall in Marlinton.

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Naomi Daniels moved last weekend into her completely remodeled home.

Jim Elliott will be moving his family into their new 60 x 10' "Concord" housetrailer within a few days.

Mr. and Mrs. Michael T. Waslo celebrated their 20th wedding anniversary on Jan. 3rd.

On Jan. 18, several representatives of Goodyear Aircraft Corp. visited W. W. Pleasants to discuss antenna design studies.

ENGINEERING DIVISION

The division now has a new home in the Works Area building, thus giving needed space to other departments in the Laboratory building.

Howard Lambert has filled the vacancy left by Lyndell Brooks as administrative aide.

Gordon P. Hahn, a cooperative student from Drexel Institute of Technology will spend 6 months in the division doing drafting and surveying work. Also, two temporary drafts men, Don Newson and John Jewett, from Allstates Design and Development Co. are working within the division.

Some of the current projects include 6 new houses, jet engine for snow removal for the 300-ft. scope, new road to 140-ft. scope, warehouse building, and an aerial survey of the site as soon as weather conditions permit.

W. W. Pleasants, chief engineer, is planning to attend a meeting in the near future at Georgia Tech, covering the general subject of engineering for scientific programs.

Orville Barr and Basil Gum saw mysterious tracks. Could it have been a man from outer space???

A local M. D. became confused while writing a perscription for an AUI employee's cat. He didn't know if it should be written for a "Cat BIRD" or BIRD Cat".

CHUCKLE -- Sign on an official desk: "Do not get the idea that I'm inefficient. The secrecy of my job doesn't permit me to know what I'm doing."

FICTION LIBRARY

The Observatory fiction library will be re-opened in the near future under the direction of a volunteer librarian, and will be located in the basement adjacent to the west door of the conference room. Present plans call for the library to be open 3 or 4 hours per day, 2 or 3 days per week. The library is now being inventoried and catalogued and should be open for business in a couple of weeks. Final details, such as exact opening hours and a few basic rules, will be promulgated in the near future.

Jerry Shears viewed the WVU-VPI basketball game at Morgantown Saturday night, Jan. 19. His only comment was: Arrived home in the wee hours Sunday morning with very short fingernails. Final score of the game was 86 - 83 for WVU.

Congratulations to the St. Clair's. We hear-tell they have obtained a 55 ft. trailer to be moved to Elliott's Ponds on North Fork Road next week.

Jack Plunkett was on a business trip Jan. 8 and 9 to Lewisburg, W. Va.; Covington, Va.; Staunton, Va.; and Harrisonburg, Va.

Frank Callender attended the Trustees meeting at Brookhaven National Laboratory Jan. 17 and 18.

LAB GAB

The boys in R and D finally got their long awaited filter for the "Thing". They are making exhaustive tests and we should be hearing about it soon.

The Chief's Rambler should be in real soon now, and he's proud of the award of the year that the car got. This should make all Fords turn green with envy. By the way, during this last deep freeze only Ramblers and V. W.'s started after being left outside. Most of the cars that started are the hot-house variety -- being kept in garages.

The new uniforms for the teams are being modeled now -- they can be seen at the local supply room. It's a La Davise Motife this year??

All Dewey can say these days is, "It's what's up front that counts." Mr. Ross, as you know, is one of NRAO's "front men" and, of course, Carl Wooddell and Dick Skaggs bring up the "rear".

By the way, there are a lot of you that don't realize that you've been on Candid Camera at the lab. I could sit and watch this channel all day -- no commercials.

Carl and company have been touching up the closed circuit TV for Dr. Low's 5-foot golden dish. W-H-E-E in Green Bank!

So far the "glass cages" seem to be working out very well. Much favorable comment has been made concerning this innovation. Except for the first few days, some folks had trouble finding the correct doors for awhile, but the situation has cleared up -- with just a piece of tape on the doorknob, until Carl Davis taped them all.

The transportation shortage is getting even shorter. The lab had 3 vehicles to do all our necessary running here and there -- and now there will only be 2 -- a carryall and pickup sedan (a one seater station wagon). So, let's try our best to make the best of a situation.

Our deepest sympathy to Jim Ware who recently lost his mother.

Congratulations are in order for Mr. and Mrs. Jim Dolan who are the proud parents of a son born January 24.

Everyone will be pleased to know the costumes of the "bunnies" at the Playboy Club have been approved.

Mr. and Mrs. Bert Hansson left Jan. 13 by helicopter for a week's visit in Florida. Their travels took them to Cocoa Beach, the Cyprus Gardens, Tampa, St. Petersburg, Sarasota, Miami, Miami Beach, and Fort Lauderdale. They returned to Green Bank Jan. 20 via Washington, D. C. and Staunton, Va.

FOR SALE

... Basketball shoes, size 8 1/2. Same as new. See Jerry Shears, ext. 227.

... One pair of skis. See Lillian Ness.

... One set of bunk beds. See Tom Carpenter.

... No. 1 -- BC-348-J Superhet Receiver. 8 tube - 6 band receiver for aircraft communications type, for voice, tone, and cw. 200 to 500 Kc, and 1.5 to 18 Mc, 100 v. AC operation. Excellent condition. Qst. price \$80.00. My price \$60.00

... No. 2 -- Unitron 3" F 16 alti-azimuth mounted refractor type telescope. Accessories include 7 eyepieces (from 48X to 260 X), erecting prism, star diagonal, complete mount, sunshade, lens cap, sun filter and finder scope. Perfect condition. New cost \$280.00. My price \$200.00.

See Arnold Davidson for above items.

FOR RENT

60 x 10 house trailer, three bedrooms, 1 1/2 bath. Located in Green Bank. See or call Ed Gardner.

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NRAORA BASKETBALL

The second season of the NRAORA basketball league got underway on Dec. 13, 1962. The opening night spectators were treated to two hard-fought, closely played ball games. Survivor of the initial clash was the Brown Bombers (1961-62 Tournament champions) who defeated the Red Raiders (1961-62 Seasonal champions) by a score of 39 to 38. The second game on opening night, also hotly contested, was won by the Blue Devils 37 to 35 over the Green Hornets.

The season is now seven weeks old and after an early season dog fight for the lead position, the Red Raiders have taken sole procession of first place by winning their last four games. The other three teams are engaged in a battle for the runner-up position at this time, each determined to over-haul the high-flying Red Raiders. The remaining games on the schedule promise to be more exciting than ever in the battle down the stretch for the seasonal title.

The teams are now sporting new uniforms, seen for the first time in the games of Jan. 24. These bright shiny uniforms were purchased with the combined funds acquired through certain fund raising activities conducted by Carl Davis and an appropriation by the NRAORA for this purpose.

It has been a successful season so far, both in team participation and in spectator attendance. The players consistently put on spirited, aggressive performances, with an occasional laugh thrown in. We do solicit greater spectator support by members of the NRAORA, not only in regard to the Basketball League but in all NRAORA sponsored activities. In an effort to foster greater participation, a complete listing of all remaining games on the regular season schedule is included in this issue of the Observer, with game times indicated. There is a double-header every Thursday night. Come and enjoy yourselves.

Results of games played on the night of January 24 are:

Red Raiders	42
Brown Bombers	37
Green Hornets	65
Blue Devils	36

BIRTHDAYS THIS MONTH -- February

10	Ronald Monk
14	Jim Simmons
15	Bill Horne
16	Fred Cole
19	Carl Wooddell
25	Orville Barr
28	Ted Riffe
29?	John Parker

Kenneth McLaughlin's temporary employment in the Machine Shop was terminated on Jan. 4. By now he is an officer in Uncle Sam's Army, with the hopes of starting helicopter training. Good luck, Kenneth.

Dr. Marc Vinokur left Green Bank on Jan. 23, after two years at NRAO. His new address is Radio Astronomie Observatoire de Meudon, Meudon (S et O), France. Best of luck.

Melvin Groves, mechanic, left NRAO on Jan. 25. He has returned to his home at Clarksburg.

Anyone interested in joining the Works Area Boxing Club should see Bedford Taylor.

NRA

One of the many benefits of belonging to the National Rifle Association is the legislative bulletin which is sent to members when legislation affecting firearms or the use of them has been proposed. A case in point is the bulletin recently received by West Virginia members.

One of the firearms bills before the current Legislature is House Bill No. 116, which would permit a licensed hunter over 21 years of age to carry a .22 caliber handgun while hunting. Upon payment of a two dollar fee, the exhibition of a valid hunting license and the satisfaction of the county sheriff that the permittee is not a drug addict, habitual drunkard, or of unsound mind, a special permit would be issued. This permit would not authorize the holder to carry a handgun on the person or in an automobile unless going to, returning from, or engaged in hunting.

The other bill pending at present is House Bill No. 22, which would withdraw the present requirement of publication in a newspaper of intent to apply for a pistol permit. The bond requirement would be raised from \$3,500 to \$5,000 and the permit would be valid for two years rather than one.

A handgun may now be used for hunting in West Virginia, providing the hunter is licensed. House Bill No. 116 would authorize hunting without going through the regular application process and bonding.

Most sportsmen will be interested in the passage of House Bill No. 116. Its current status is that it has been referred to the House Committee on the Judiciary. The chairman of this committee is Representative H. Laban White, Jr., and the vice-chairman is Representative Jack R. Nuzum. Tom Edgar is our Representative to the Legislature. These people will receive mail addressed to them at the State Capitol, Charleston. Why not express your opinions to these people on the subject bills?

NRAORA MEMBERSHIP CARDS

Membership cards have been issued to all employees and family members for the year 1963. If for some reason you did not receive your card or one for each member of your family, please contact Harry Wooddell, ext. 221. (It is not necessary for younger members of your family to receive cards if they are too young to visit the recreation grounds by themselves.)

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NRA CLUB MEETING

February 1, 1963 at 4:30 PM in basement conference room. All interested persons please attend.

OVERHEARD IN A TAVERN - IN ELKINS

## I.

Say, Zeke, down Pocahontas way,  
They've set up gear, and some folks say  
They "listen" to the stars -- by day!  
At "Astronomy", in Green Bank.

## II.

If your ignition jumps its pace,  
They say it fouls up news from space;  
And you could be in real disgrace,  
At "Astronomy", in Green Bank.

## III.

If "interference" means to you,  
Just football ways of getting through;  
You've misconstrued the worst taboo  
At "Astronomy", in Green Bank.

## IV.

They do what National Science wishes,  
Make mathematics sound delicious;  
But rarely ever wash their "dishes",  
At "Astronomy", in Green Bank.

## V.

They're smart I know, yet I maintain,  
That if you're sick, you can't complain;  
'Cause "Doctors" don't relieve your pain,  
At "Astronomy", in Green Bank.

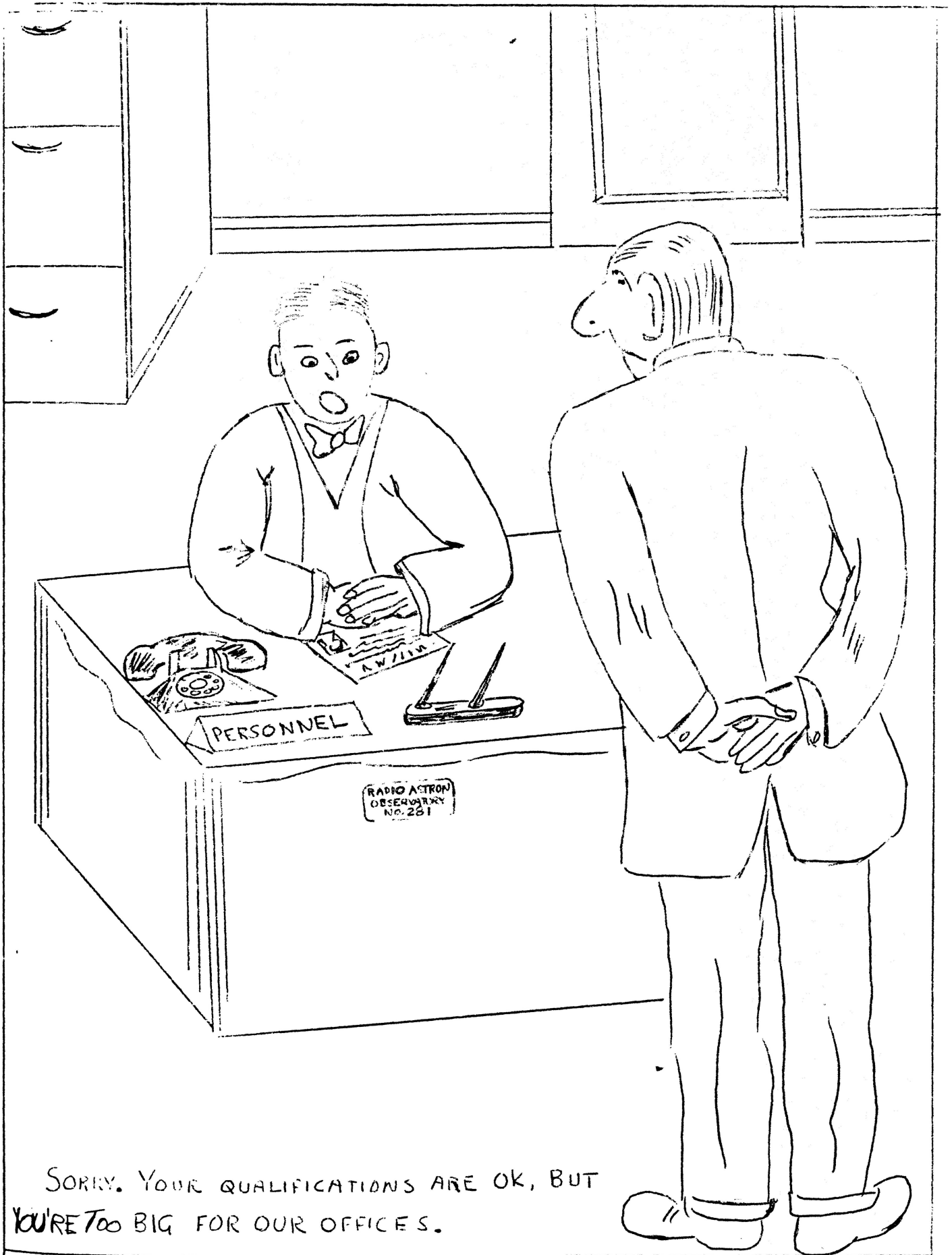
## VI.

Their "Milky Way" is without cream,  
And "Venus" disappoints your dream;  
And telescopes aint what they seem,  
At "Astronomy", in Green Bank.

## VII.

But hold on, Zeke, they've got real Class,  
On that You're safe to bet your glass;  
That goes for every lad and lass,  
At "Astronomy", in Green Bank.

A. N. Onymous



SORRY. YOUR QUALIFICATIONS ARE OK, BUT  
YOU'RE TOO BIG FOR OUR OFFICES.

LEAGUE STANDINGS

<u>Team</u>	<u>Won</u>	<u>Lost</u>	<u>Games Back</u>	<u>Points</u>	
				<u>Scored</u>	<u>Allowed</u>
Red Raiders	5	2	--	331	267
Brown Bombers	3	4	2	334	321
Blue Devils	3	4	2	277	335
Green Hornets	3	4	2	324	343

TOP FIVE INDIVIDUAL SCORES

	<u>Points Scored</u>
Ronnie Monk, Green Hornets -----	124
Brown Cassell, Red Raiders -----	115
Chester Cassell, Blue Devils -----	97
John Cassell, Brown Bombers -----	90
Jim Arbogast, Brown Bombers -----	83

REGULAR SEASON SCHEDULE\*

Date

1/31	(E)	Brown Bombers	vs.	Blue Devils
	(L)	Green Hornets	vs.	Red Raiders
2/7	(E)	Blue Devils	vs.	Red Raiders
	(L)	Green Hornets	vs.	Brown Bombers
2/14	(E)	Blue Devils	vs.	Green Hornets
	(L)	Red Raiders	vs.	Brown Bombers
2/21	(E)	Blue Devils	vs.	Brown Bombers
	(L)	Red Raiders	vs.	Green Hornets
2/28	(E)	Brown Bombers	vs.	Green Hornets
	(L)	Blue Devils	vs.	Red Raiders
3/7	(E)	Red Raiders	vs.	Brown Bombers
	(L)	Green Hornets	vs.	Blue Devils
3/14	(E)	Red Raiders	vs.	Green Hornets
	(L)	Brown Bombers	vs.	Blue Devils
3/21	(E)	Blue Devils	vs.	Red Raiders
	(L)	Green Hornets	vs.	Brown Bombers

Game Time

(E) 7:00 PM

(L) 8:15 PM, approximately.

\* The week of March 28 will be set aside for make-up in event a game is lost because of weather. The play off tournament is tentatively set for the first week in April.