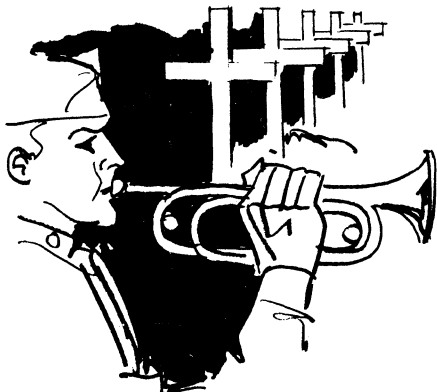
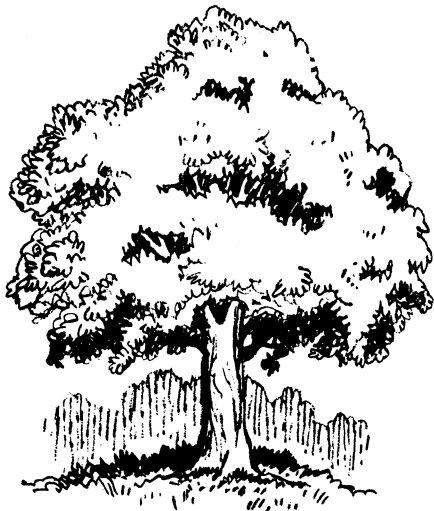




THE OBSERVER April '75

THE REALM OF THE NEBULA
STORY ON PAGE 3



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<p>CONTINUUM RADIO OBSERVATIONS OF THE REALM OF THE NEBULAE</p>

(Special to the Observer from
its galaxy correspondent)

Marc Price

It has been approximately half a century since astronomers have recognized that many of the nebulous objects viewed through optical telescopes were large aggregates of stars. These "Island Universes", as they were sometimes called, were found to be systems like our own Milky Way, made up of billions of stars. These objects are now more commonly called galaxies. They are the major observable building blocks of the universe as we know it.

Galaxies come in many different sizes and shapes. There are three primary types: spirals (like our own galaxy), ellipticals, and irregulars. Each type is of interest to astronomers because of its own particular characteristics. For example, spiral galaxies are flat disk-like systems with spiral arms. Bright, young stars shine in these arms, giving energy to hydrogen gas clouds which then give off their own glow. Dense, dark, dust clouds add another element of beauty to the structure seen on deep sky optical plates.

The elliptical galaxies are exciting for a different reason. Optically, they appear as giant spherical clouds of stars. Their stars are older, and they do not have well defined structure seen in spiral galaxies. But, to radio astronomers, they are an exciting challenge. They are often associated with powerful sources of radio emission. In these cases, they are called "radio galaxies".

Finally, there are the irregular galaxies like our nearby neighbors, the Magellanic Clouds. These aggregates of stars and gas do not have the symmetry or clear structure of the elliptical or spiral galaxies. However, they do present an equal challenge in understanding their disorganized forms, and are often an exciting region in which to study star formation and to observe the evolution of young stars.

In spiral and irregular galaxies, the radio emission that is observed is generated mostly by the cosmic ray electrons spiraling through the weak interstellar magnetic fields. The origin and source of energy for the

fields and the cosmic ray particles are not understood at present. In the elliptical radio galaxies the more powerful emission again comes from the same physical process, electrons and magnetic fields, and again little is understood about the origin or evolution of the radio sources.

Clusters of Galaxies:

Programs for the study of galaxies take many forms at the NRAO. Owen and Rudnick are observing at a number of continuum wavelengths using the 300-foot telescope and the interferometer. Their program is directed toward a study of the interaction of galaxies when they lie close to each other in the sky, forming a cluster of galaxies. A large number of galaxy clusters exist, and are just beginning to be studied in a detailed way. The present studies will help to show the relationships that exist between galaxies in clusters, and perhaps will help us to understand the conditions in the intergalactic gas near clusters. The role of gas in the regions of galaxies and clusters of galaxies is a topic of great interest to theorists, both at NRAO and to others elsewhere.

Elliptical Galaxies:

It has been known for some years that the giant elliptical "radio galaxies" were a hundred billion times more powerful as radio sources than the spiral galaxies. Much interest has been focussed on these elliptical systems. A study of a large sample of elliptical galaxies, chosen only on the basis of optical properties, is what is needed to help understand the connection between optical and radio properties of these objects. Pfleiderer carried out a large survey using the 300-foot telescope at 21 cm (continuum). Sramek has followed this up with a survey at 6 cm. These types of studies point out the radio spectral properties of the elliptical galaxies and allow an estimate of the luminosity function, that is, how much radio emission can be expected on the average from any given type of galaxy.

Brandon, Bridle, Fomalont, and Guindon are presently using the interferometer to carry out a detailed study of the orientation of the components of radio sources associated with elliptical galaxies. This data will be compared with optical measurements of the axis or elongation of the galaxies to provide

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a clearer idea of how the elliptical galaxies produce these powerful radio sources.

Heeschen has looked at small sources in the center of radio galaxies. Additional VLBI measurements by Kellermann and others show compact radio sources are often found in the centers of radio galaxies. Purcell has found that his observations indicate a number of different sources or components of different sizes make up the complex radio sources associated with elliptical galaxies.

Spiral Galaxies:

The first galaxy to ever be observed at radio wavelengths was our own Milky Way. The Jansky Antenna picked up the long wavelength emission from near the center of our galaxy. It was recognized in the early years of radio astronomy that the spiral galaxies like our own were not strong sources of radio emission like the giant elliptical systems. Thus, most observations were of the more powerful ellipticals. It has only been recently that there has been an increase in interest in the structure and properties of spiral galaxies. This is partly due to the spectacular success of the Westerbork Synthesis Telescope in showing the radio details of spiral galaxies. Although spirals are not such strong radio sources, understanding of them will lead to increased understanding and knowledge of our own spiral galaxy.

Much of the initial work has been on nearby spiral galaxies. This allows us to study the relatively weak radio emission in greater detail. Generally, the emission comes from two or three different regions. There is often a small source in the center (nucleus) of the galaxy. Then there is a generally weak, but widely distributed emission in the flat disk of the galaxy. Sometimes this disk emission shows patchy structure or enhanced radio emission associated with the spiral arms. Finally, in a few systems, there is a broad diffuse halo of radio emission which seems to be centered around the galaxy.

Studies of the detailed radio structure of M 31, M 81, and M 101 have been carried out on the interferometer by Burke, Giuffrida, and Spencer.

Bignell and Seaquist have looked in detail at another 14 spirals. Kronberg and de Bruyn are presently looking at several others. The properties of the central regions of several dozen spirals are being investi-

gated by Carlson and Kerr.

Crane and Price have recently completed a survey of over 400 spiral galaxies. A large number of these have similar optical properties and thus form a uniform optical sample and will be used to study connections between radio and optical properties. One result that has already emerged is that the Sersic-Pastoriza galaxies, systems with bright knots of optical emission in their central regions, do not have any large increase in their radio output which might be associated with the activity in their nuclei. This indicates that the bright optical regions observed in these spirals are probably giant regions of young stars and hot hydrogen gas.

This progress report on continuum radio observations of galaxies has not given a detailed summary of all of the NRAO programs in this area. But, I hope that it has reported a representative sample of the broad and interesting types of research on galaxies which are being carried out at the NRAO.

* * * *

CYCLING

Bill Meredith

Last summer, due mostly to the urgings of Hein Hvatum, several of us at the main office building at NRAO Charlottesville began taking bicycle trips on weekends. This started out as a short trip to Via's Lake for a picnic. According to Hein, it was downhill both going out and coming back. Well, it turned out to be more than a 30 mile round trip. I was so sore and tired when I finally arrived home that I could hardly move. After a one hour soak in a hot tub and much liquid refreshments, I tried to pedal my bike around the block. My legs would not move! Try as I may, I could not make my bicycle go.

I was determined to work myself into some semblance of physical condition, so I began bicycling to work and back and going out every weekend with Hein, Phyllis Jackson, the Bignells, the Mufsons, the La Frances, and some of the summer students. Jim Condon and wife were occasional companions as well

--continued, next page--

as Barry Clark and Big Pete Henderson.



We usually met at the triangle beside the goldfish pond near the golf course at Farmington Country Club. This gave us an idea of how the other half lives. The picture shows a typical group embarking on a Sunday jaunt. Oris Jackson was the photographer. All of us soon became familiar with Albemarle County back roads, as well as with Albemarle County dogs. It was always a surprise how one could muster up strength enough to outrace these hugh beasts. A few times Hein had to use mustard gas to get rid of some of the more persistent ones.

Another danger was the ticks which abound around Charlottesville. Whenever we stopped to rest (quite frequently) we would attract hordes of these pests (shades of Rocky Mountain Spotted Fever).

The most dangerous problem of all was the Virginia motorist. These people are either blind or hate bicyclists with such passion they will do anything to rid the roads of them. I think at one time or another we all had close calls from cars. Bicycles and automobiles are just not compatible on narrow roads. Just recently on Highway 250, a young medical doctor from the University of Virginia was killed while riding his bicycle.

Near the end of summer, the group had narrowed down to the hard core - Hein, Phyllis, and myself. Several times, only Hein and I kept the faith. All of us either carried a snack from home or bought something from one of the scads of little country stores. It sure tasted good after two or three hours of

riding. We tried to always plan a trip with some destination in mind. We travelled to Albemarle Lake, Chris Greene Lake, Via's Lake, and sometimes just to small towns.

One Sunday Hein and I made the circuit from my house on Moseley Drive, down Cherry Avenue, out Ridge Street to Highway 20 then back to Charlottesville via Old Lynchburg Road. Going up the very steep hill on Ridge Street, I slowed down so much that Hein said he would have to use training wheels to keep down to my speed. So much for that; Hein has been riding since before most of us were born.

All in all, it was a pleasant summer for those of us who participated. We're already making plans for summer of '75 and the Bike-centennial of 1976. That should really be something!

Why not try it? You may not like it, but it sure is challenging.

* * * *

RADIO ASTRONOMY AND BREAST CANCER

Alan Barrett

Radio astronomers are often asked for justification of their professional existence, frequently being asked "What good is radio astronomy?" The standard answers go something like "studying the invisible material between the stars" or "advancing mankind's knowledge of his universe", but such answers usually leave the questioner unsatisfied and invariably the next question is "But what good is it to me?" or "What practical use is there?" That is usually the signal that it is time to find the bar and get a drink, thus terminating that conversation.

Practical applications of radio astronomy are indeed limited, although there are a few, mostly associated with Very Long Baseline Interferometry. But the situation is different when one considers the applications of those super-sensitive receivers used on the radio telescopes. There are many more applications of this equipment and, strangely enough, one of the applications may be as an aid in the detection of breast cancer, the disease which kills more women each year than any other.

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Now wait a minute! How can radio astronomy receivers be used to detect breast cancer? Well, that may be a little difficult to explain, but I'm going to try. Radio waves are, after all, just one form of electromagnetic radiation which you are familiar with as light, the doctor's x-rays, and the TV signals which bring you "Sesame Street". Some of these waves can pass right through the body - obviously x-rays do that - others can enter the body but get absorbed before they reach the other side. Light, for example, is partly reflected by a body and partly absorbed, but what is absorbed never even penetrates through the layer of skin. But radio waves are different - they can penetrate several inches into the body. This also means that if one had a little radio generator buried in the body, at a depth of a few inches, one could receive the generator's signals outside the body. That's the first half of my story.

The second half of the story is about that little generator. It is not very practical to go around planting little radio generators in everybody and it is fortunate that this is not necessary because those little generators are already there. It is well known to scientists that everything - and that includes you and me - emits or sends out radiation. Everyone has seen this phenomenon. When something is placed in a fire and heated to about 1000° F, or hotter, it begins to glow, dull red in color. It is emitting light. Cool it down and it is no longer red, but it is still emitting. However, because it is colder it is emitting mostly radio waves. This radiation is called "thermal radiation" because its intensity depends on the temperature of the body. Though there is very little power emitted, the receivers used on radio telescopes are sensitive enough to be able to detect and measure this power. Thus that little generator I was talking about is in every part of your body, even those parts below the skin. And what's more, the strength of that generator goes up as the temperature rises.

So what has this got to do with breast cancer? When a tumor is growing within a body there is increased chemical activity because of the growth process. Along with this activity there is associated a rise in temperature in the region. In short, a hot spot develops, sometimes detectable on the skin. But can it be detected at an earlier

stage of development with a device that can sense the hot spot at a depth of a few inches in the body? Radio astronomy receivers may be able to do just that and at MIT Dr. Phil Myers and I are trying hard to answer that question.

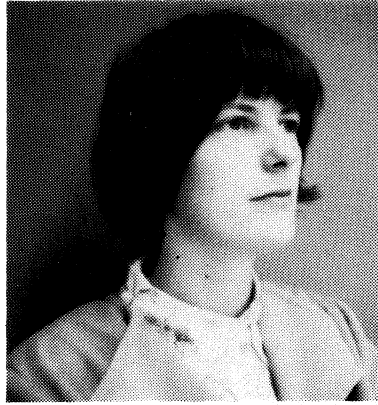
Does this mean that some day Green Bank might be turned into a huge Breast Cancer Detection Clinic? What better use than to wheel the 140-foot telescope hard over to the east horizon and parade dozens of bare-breasted women through the main beam one at a time! Job applications for Telescope Operator would soar. Sorry, this is not necessary. The "antenna" we use is small enough to put in your pocket. In fact, our receiver, which we call a microwave thermograph, is actually used much like a doctor's stethoscope. The antenna is moved from point to point on the breast and the physician or technician records the received radio power, about one millionth of one billionth of a watt, at each point. The examination is painless to the patient, no radiation is sent into the body, no surgery is involved, and the examination may be repeated as often as desired without risk. It is literally as harmless as taking your pulse or listening to your heart beat.

Now you have it. I've tried to make clear how the very sensitive receivers that have been developed for radio astronomy might have use in a very pressing medical problem. Nothing about our idea is proved yet. It may work, but it might not too. If it is not of medical value it is no good. Doctors with whom we have talked are excited about it and suggest many other areas where microwave thermography could be used, such as identifying potential stroke victims in time for treatment. The National Institutes of Health liked the microwave thermography idea enough to have funded it for two years and we hope for continuing funding. I think I qualify as the only radio astronomer to be partially supported by the National Institutes of Health. We are currently examining some 30 - 40 patients per week at Faulkner Hospital in Boston. Hospitals are flooded with women wanting breast examinations since Mrs. Ford and Mrs. Rockefeller became victims. Maybe after a few thousand microwave thermographic examinations we will begin to get some answers. Maybe, just maybe, radio astronomy will turn out to have applications nobody could possibly have foreseen.

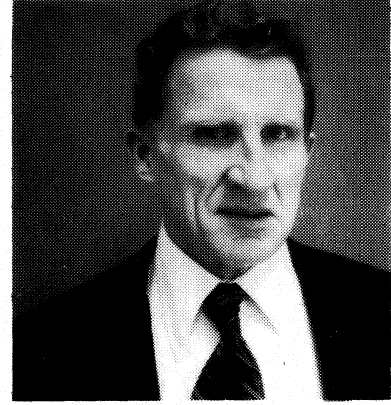
NEW EMPLOYEES



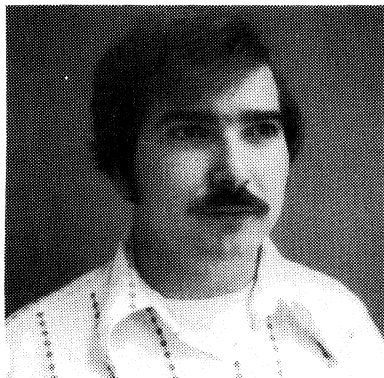
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Harry A. Atwater
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VLA Project - CV

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David H. Doro
Mech. Engineer
VLA Project - NM

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Available

Timoteo L. Ruiz
Janitor
Tucson

TERMINATIONS

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Benito Valenzuela	VLA Project - NM
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Fernandez Ornelas	VLA Project - NM
Stephen L. Galhouse	Tucson Operations
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Thomas E. Hyzak	VLA Project - CV
Jerry C. Shears	Plant Maintenance - GB
Hiroshi Ohta	Electronics Div. - CV
David W. Stoner	VLA Project - CV
Norio Kaifu	Basic Research - CV

SMUG BUG

Richard Fleming

Are you tired of that VW's same ole expression? Is its body about to rust out and drop around its tires? Is that your problem, Buddy? Well, get a face lift. Build it yourself and all kinds of things will happen. Vehicle weight goes down. Wind resistance and center of gravity go down. Gas mileage goes up. Brake, clutch, shock absorber, tire and engine life go up as well as handling and response.



The fun starts when the body and two big boxes of parts and pieces are delivered. There's the fiberglass hard top, tinted windshield ('66 Corvette), plexiglass gull wing doors and rear fastback, bucket seats, custom interior of padded dash, seats, headliner and side panels of vinyl upholstery with carpets to match. Also included is a 12 gallon gas tank, instruments, wiring harness, head and tail lights, hardware and much more too numerous to list. No special tools are required, no cutting or welding is needed, just 5 or 6 weekends, a VW Beetle, (1947-1975) and a helpful wife. You see, wives work good (cheap) and all you have to do is promise to let them ride or drive it ever so often.

The construction is accomplished in several stages. First, the tail and parking lights are installed, then the padded dash, instruments (VDO tach, speedometer, oil pressure, oil temperature, ammeter and fuel gauge) switches and defroster outlets.



The body is then turned upside down and placed on supports (hay bales work fine) for the next stage of assembly. The completely prepared wiring harness is now installed in the body. There are connections from the dash to the lights, horn and brake switch in front and the lights, starter and engine compartment in the rear.

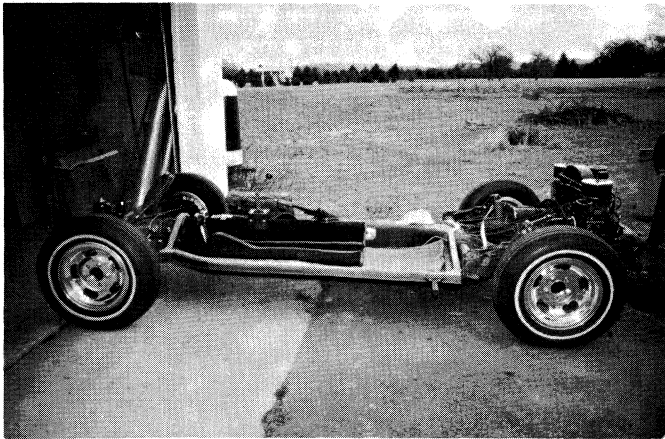
Next the headlight assemblies are installed, and the gas tank is mounted behind the rear jump seat. The nerf bars (small bumpers) and the heater/defroster hoses are installed completing the last body construction stage prior to installing the body on the pan.

Pan, what is that? Well, that is the term assigned to the VW chassis and axles without the body and engine. It is at this point in the construction that I called in additional help. Who else do you see about VW parts but Herb Hanes. Well you see I only needed two small parts--a pan with running gear and an engine. Herb, of course, had both. Tucked away somewhere he had a low mileage pan with transmission and axles. We started on the pan by giving it a good bath, then a thick coat of rust inhibiting primer, top and bottom. Next came new brakes, shocks and control cables (clutch and accelerator). Almost everything else on the pan was taken apart, cleaned, inspected and reassembled in like-new condition. Can you imagine Perryn with grease up to her elbows (of course Brad and Jennifer pitched in to help too)?

--continued, next page--

Selection of an engine would not normally be necessary since the VW engine already on the pan would be used. But, since I had a choice between a VW or a Porsche it was not too difficult. That is like choosing between the Reber Dish or the 140-ft.

Well, needless to say, we started rebuilding a 1960, 356B Porsche engine. A complete internal inspection was made, tolerances and clearances checked and few minor parts were replaced. The pistons were re-ringed, heads reworked and carburetors (twin Zenith 32 NDIX two barrel) rebuilt and the engine reassembled. After installing a new clutch, the engine was bolted onto the pan, valves adjusted, timing rough set, and the oil pressure built up before starting.



After the engine test and adjustments, the time had arrived to bolt the body onto the pan. The original mounting holes for the VW body are used to secure the Bradley body to the pan. This can be accomplished at a neighborhood body raising party. Four to six people are needed to position the body (400 lbs.) onto the pan.

The final stage begins by installing the carpet, padded interior, rollbar, seats, and steering column. Next comes the hardtop, windshield, doors, fastback rear window, mirrors and other trim and accessories.

The best part is next--road test. Mag wheels and Michelin radials were the final touch. It was ready and so were we. A few minutes later all I could say was WOW! The performance is exciting and the handling cat-like. It is as though the center of gravity is below the seat of your pants but with some

doing you can break all four wheels loose in a turn and steer with either the front wheels or rear ones using the throttle.

Driving comfort, in the semi-reclining position, (remember Sterling Moss) is very restful, attested to by 13 hours straight on a recent trip. Gas mileage isn't bad either, 32.5 mpg at 55-60 mph on the interstate.

The fiberglass body is impervious to salt and rust and never needs painting since the color is impregnated into the body.

For comparison between an average VW Beetle and this Bradley GT, the curb weight went from 2100 lbs. to 1550 lbs., the horsepower (SAE) from 50 to 80 and the pounds-per-horsepower from 42 to 19.

A Bradley GT with a stock VW engine has a top speed of 103 mph, a 0-60 mph elapsed time of 10.1 seconds, a 80-0 mph stopping distance of 272 feet, a cornering capability of 0.777 g's and a fuel economy of between 28-35 mpg.

Now in summary, the easiest way to accomplish this body conversion is to already have a VW Beetle, remove the VW body, assemble the Bradley body and install it on the pan. I must admit that we enjoyed the extra rebuilding and reworking that we went through and it will give us a better knowledge and appreciation of the fine sports car we built.



Many have asked the cost of such a project. Well, it can be broken down into three areas:

1. Finished body, parts, and hardware for about the cost of a new VW

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- Beetle.
2. \$200 - \$1000 for a VW pan and engine, of course if you have one you are set. A "Rolled" VW (1967-1974) can be found in this price range also.
 3. Additional accessories can be added, such as special wheels, tires, air conditioner, tilt steering wheel, radio, etc.

* * * *

LETTER TO THE EDITOR

On a beautiful, sunny Boulder day, while the movers are moving my belongings to the planetarium building I sit and gaze at the February 1975 issue of your magazine and I am fascinated by the mugs gallery. Wow, people have changed since I left. Looking at the photos of some colleagues I used to know by name, my imagination conjures up the setting in which the photos were taken.

There is Bob Brown clearly photographed in his Miami hotel while indulging in a bit of wheeling and dealing just before going out on a cruise on his luxury rowboat. And Butler Burton, unshaven and with a black eye, photographed just after being brought in on a disorderly conduct charge. Tom Cram clearly has had a moustache painted on the photo. Phyllis Jackson is so far from the camera that she looks like a mere 20 year old as opposed to the 25 year old that she really is. Dave Hogg looks like a disguised version of the 6 Million Dollar Man and Ted Riffe sent in his high school photo for the occasion. Mort Roberts is clearly doing his imitation of a spiral galaxy while Bob Sanders is laughing at the thought that anyone would want to photograph him. Peggy Weems and Jeanne Ray are clearly the most photogenic of the lot and I am still trying to find Barry Turner. Is that him there in the shade? No, it's John Findlay and there's Jesse Davis in silhouette.

I know Barry Turner is still at the NRAO ...oh there he is. He looks like an NHL goalie with his mask on. Sorry Barry, that wasn't very nice. Clearly your mask is off! Cam Wade is laughing because he just found a better site for the VLA and isn't telling anyone. Sandy doesn't believe it and remembers my party! I believe Dave Heeschen always sits that way while navigating his boat through

shark infested waters while Bob Hjellming is obviously in on a secret that he isn't sharing.

I concentrated on the CV employees because the others are printed too small to see. I figured out which one was Ken K. but he doesn't appear to like having his picture taken. We wanted his picture on the front cover of the NRAO textbook, but gave up that idea for obvious reasons.

But to serious matters. About that message sent to outer space by the Arecibo opportunists. It clearly is a photo of a building block pattern laid out by a child with a partially developed sense of order and symmetry. If anybody ever figures it out, somewhere out there in space, I hope they send it back marked "Address Unknown". No, seriously, there is a message there. Now lets see. Starting at the bottom there is a photo of a wrestler with his arms dangling down. He has appeared on Saturday wrestling on TV. Some of you may have seen him. The stuff underneath him was his last opponent. Just above him is a sequence of vertical blocks and a square, and above that a representation of a "being" with two enormous antennas on his (or its) head. These antennas reach up in two great curves. The pole with notches sticking up out of its head is actually a sort of totem pole left behind by the Pocahontas Indians. It presages good luck for anyone who makes contact with extra-terrestrial intelligence.

In the top part of the diagram there are two rows of blocks stacked up. Many of the stacks are similar. Some are different. This is a simple intelligence test. The lower one with the minimum number of moves. Another being will have shown its intelligence by making the transition in two steps or less.

The very top row is clearly the alphabet, starting from the right it reads A, B, C.....and so on to Y at the left hand end.

Gerrit Verschuur

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CREF UNIT VALUES
1975

January	\$30.67
February	32.79

OSHA ACCIDENT SUMMARY

Bill delGiudice

One of the requirements of the Occupational Safety and Health Act, (OSHA) is that an employer must, at the beginning of each year, post a summary of recordable (those requiring medical attention) accidents for the previous year. In Green Bank this summary (which you can see on the bulletin board in your area) shows six lost-time accidents totaling 123 man-days and 13 accidents or occupation illnesses which resulted in no lost-time.

That 123 days looks bad, and it is. It was one of our worst years in some time. Two accidents account for 103 of the lost days and four accidents account for the other twenty days. None of these accidents could have been prevented by the rules and regulations of OSHA.

The 13 non-lost-time injuries consist of 11 accidents, one skin condition and one respiratory condition. Several may have been preventable by OSHA standards but most appear to have been a result of the injured person neglecting to observe safe procedures or to take advantage of available protective equipment. For example, a man chipping a hole in a concrete block wall without eye protection is obviously very much more subject to eye injury than if he had worn safety glasses.

Statistics tend to indicate that about 20% of industrial accidents can be prevented by guard rails, shielding, adequate ladders and walkways, in otherwords, "things". The remaining 80% are "people" oriented accidents (some act or non-act by a person). For example, neglecting to put on your hard hat and then walking into a low projection, or barging through a door as somebody else is entering. Recognizing where and when you must protect yourself as well as anticipating how your actions might endanger others, are some of the most important accident prevention measures known.

Where you work and what you do has something to do with accidents. All but two injuries involved employees in the Central Shops and Plant Maintenance Divisions. Our experiences show that these are the places where the risks are. Accidents tend to occur where employees work with and around machinery, or move heavy objects. Only six accidents in-

volved other kinds of work. Obviously, employees and visitors to these areas must be extra careful and observe all safe working rules. In short, safety is a state of mind of the individual as much as anything else.

The Observatory is working toward full compliance with OSHA as quickly as possible. Clearly a look at our 1974 accident log shows that OSHA is required to reduce our accident rate. Help yourself to a safe year - THINK SAFETY.

* * * *

GB RECREATION ASSOCIATION NEWS

Chuck Brockway

Among the activities that the Green Bank Recreation Association is sponsoring within the next few months are:

Spring Dance - scheduled for Saturday, April 26. Music will be by the inimitable D. J. Ray. Details will be posted on bulletin boards.

Movies - There have been movies each month since January with the last one to be shown on Saturday, April 12. "Pollyanna" was originally scheduled, but when NBC television found out they scooped us and showed it in March, so we have rescheduled "Summer Magic" with Hayley Mills.

July Picnic - We are already starting the planning for this. There is some uncertainty whether your recreation association has been giving you the kind of picnic you want. We need your ideas. Drop a note in the NRAORA suggestion box in the lobby or talk to someone on the Board of Directors.

Square Dance - probably in June.

Teen Party - in August.

The results of the opinion poll on the pool table recovering vs. potter's wheel was a great help to the Board of Directors in deciding which should be given first priority. The pool tables won out, but it was agreed that both were needed.

A band, "The Centennials", has been retained to play at the dance on New Year's Eve.

If you have not yet turned in your membership form listing names and ages of your dependent children, please do so soon. We need an accurate listing to plan events.

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REPORT FROM THE MOUNTAINTOP III:

AT THE EDGE OF THE ABYSS

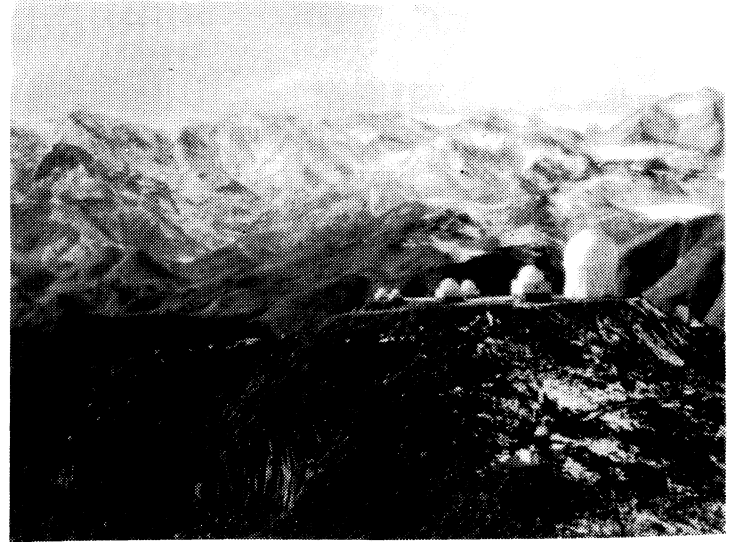
Bruce Balick

Imagine for a moment the borders of California as a rubber band. Stretch the borders north and south by a factor of six, and place them back down on the west coast. Next, multiply the heights of the mountains by factors of two or three. Finally, turn the clock back to the start of the century. Except for the sign of the latitude, this is Chile.

Chile stretches from latitudes corresponding to about Mexico City to southern Alaska, and has about the same range of climate and geographical features. In the north one finds deserts (some with no measurable rainfall ever recorded), the highest town in the world (about 20,000 ft.), rich copper and iron deposits, and fertile valleys where fruits and vegetables are grown. In the south are active volcanoes, lush forests, and a system of fjords and rivers. The coastal waters are a brilliant blue green, and the beaches and nearby waters abound with clams and abalone as well as other types of marine life. The people are relatively poor economically, but rich socially in many ways that seem to have become lost in the United States with the advance of technology. On summer evenings, the parks and streets are crowded with strollers, and dinners are late and leisurely. Pickups, microbuses, and televisions are items seen in store windows, but play no role in daily activities. The pace of life is comfortable, and people take the time to know one another.

In the north (at about the latitude corresponding to San Diego) is a little town called La Serena, situated near a sky blue bay on the Pacific. Looking down, the city appears as a vast plain of red tile rooftops pierced by church bell towers. Arid mountains surround the bay to the north and south; to the east are the "foothills" which rise to meet the 16,000 foot peaks of the Andes about 50 miles distant. Although the mountains are barren, green orchards are obvious markers of mountain streams winding their way to the ocean. Atop one of these mountains, Cerro Tololo, is a clump of stark white domes seen in brilliant contrast to the subdued reds,

browns, and yellows of the 4000 foot precipice on the western slope and the backdrop of larger mountains further east. Cerro Tololo literally means "edge of the abyss", and the description obviously fits the geography.



At night, the domes open, and the telescopes peer into the depths of the brilliant southern night. (One soon realizes that "Cerro Tololo" is really a double entendre.) The scene is breathtaking but somehow not easily described. By midnight, the world below has become covered with a soft layer of ocean fog, and only the Andes and the stars have any real shape or visual impact. The air is still, and except near the horizon, the stars do not twinkle. The heavens are brilliant--the galactic plane winds through the sky past the easily seen galaxies called the Magellanic Clouds and down into the western mountains. Somehow the still air makes it easy to see the various colors of the hundreds of bright stars, and between them are thousands of fainter ones; one also gets the impression that millions of stars lie just above the threshold of vision. Before dawn Jupiter rises, and causes shadows of the domes to be cast upon one another. Later, a yellow-green cast appears behind the black Andes to the east signaling the end of night about an hour hence. The fog below reflects the subtle colors of the pre-dawn light as the stars fade slowly, and the visual impact is one of overwhelming majesty. At times like this

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one can not outwardly react; one can only stare and delight in the moment.

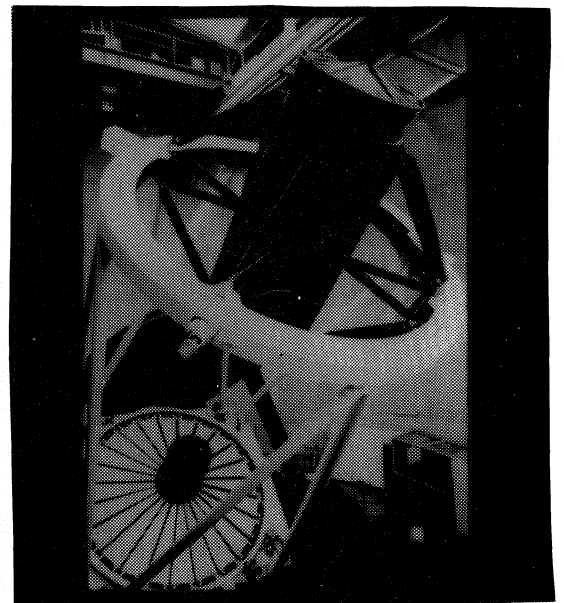


This is the Cerro Tololo experience, and it is most memorable. The observatory itself is a new addition to the mountainscape, and seems very unnatural in its setting. Especially conspicuous is the gigantic dome of the new 4-meter (158-inch) telescope, one of two telescopes of this large a size in the south (both completed about six months ago). This telescope is the pride of the observatory, and it has worked almost flawlessly since the



beginning. At the top is a black cylinder, called "the cage". At present, the astronomer crawls into the cage after sunset with a box of photographic plates and emerges the next morning with his exposures. (Claustrophobic

astronomers need not apply.) As new instrumentation, now under construction, becomes operational, less bizarre methods of observing will be possible. It is difficult, however, to think to the future with the exciting wealth of results now being obtained. Superb photographs of southern nebulae are posted almost daily around the observatory, revealing many new features and objects never before seen. The atmosphere at the observatory is electric, and expectations for future research run high.



The other telescopes on the mountain include a 60, 40, 36, and special wide angle 24-inch telescopes. An impressive array of light processing equipment is being prepared both in Chile and in the shops of Kitt Peak National Observatory in Tucson, where most of the major equipment is first built and tested. These include light intensifier devices of many types (called image tubes), and a special high speed television system for both telescope pointing and data acquisition.

The observatory headquarters are in La Serena, about 50 miles west of the mountain. Many vehicles run daily to the mountain and back. Most of these carry personnel to the mountain and back (no one lives permanently on the mountains, rather, most of the support staff go up for 12 days and then take a 9 day holiday). Special vehicles transport water, oil (for the generators), gas, refrigerated and non-refrigerated food, and other supplies on a regular schedule. There

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are telephones on the mountain which break down quite frequently. Often, the easiest way to establish contact between the mountain and the main office is through a phone patch on the radio to Tucson.

La Serena is much what I expected a town of its size to be, but with more flowers. About 30 years ago, a president from the area decided to move the government of Chile to La Serena, and many beautiful parks with dozens of marble statues can be found in the older parts of the city (the move never actually took place). There are hundreds of small shops and markets, each specializing in certain goods. Food is purchased in farmer's markets (no supermarkets here!) where farmers, ranchers, and fishermen sell their meat, fish, eggs, and produce (all fresh and "organic"). I particularly enjoyed the local wines, abundant fish, and fresh fruits (peaches and apricots 15¢/lb.; lettuce and artichokes 5¢/head). Typical Chilean meals are similar to those in the states, but with more vegetables and fruit; moreover, each item is served as an individual course, and meals (and the attendant conversation) last for hours. Dinner is served only after the children are asleep. The meal is a time for relaxation after the travails of the day, and bedtime follows soon after dessert.

The only endings to this report which come to mind are trite. Chile and its people are easy to like (more than half of the scientists who come as bachelors marry local girls within two years - compare this to the record of NRAO bachelors in Charlottesville). I most look forward to returning to Chile and Cerro Tololo (in spite of the lousy working hours of an optical astronomer).

This has been a year of travelling for me - France, Holland, Germany, Austria, Italy, Brazil, and Chile - and it is with no hesitation that I recommend Chile specifically to anyone with an urge to travel abroad.

The next report of this series will be the report I had originally planned for this issue of the OBSERVER. It is a report on optical data analysis, and I have been successfully procrastinating any visits to our friendly local computer in order to being the data reduction.

* * * *

ARECIBO MESSAGE RECEIVED

Ed Fomalont

Sklar had rarely received a radio message quite like this one. Ten days ago while scanning the output of the radio sensors, which probe the entire sky to pick up possible distress calls from the fleet, the central computer flashed a message on the CRT that an intelligent-type signal had been received. The transmission of three minutes duration consisted of nearly 1700 consecutive bursts of only two noticeable burst-types. Very strange. Not the usual distress call. At the same time the message was also picked up on two other sensors located millions of miles away. Sklar knew that by interferometric triangulation they would be able to pinpoint the direction of this radio message.

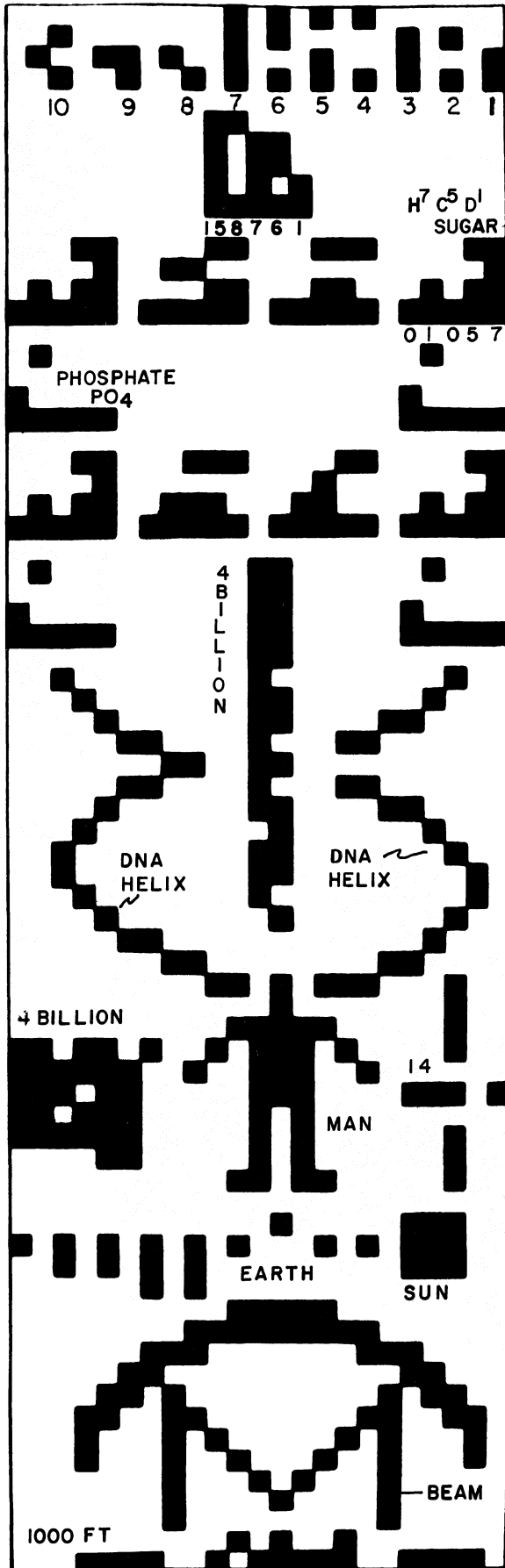
No spaceships of the fleet were known to be in the signal direction which was nearly coincident with an average star about forty light years away. The past history of radio events from this star, although a bit suspicious was not startling.

Cryptographic analysis of the message was begun the next day. The binary pattern of the bursts was obvious and the number of bursts $1679=73 \times 23$ suggested a two-dimensional raster as the message form. Within several minutes a giant screen in the security room of the Alien Communication Laboratory glowed with a hieroglyphic picture from that distant star. The best minds went to work to decode the message. Within five minutes Drang, the quickest decoder of them all, roared with laughter, "Well, gentlemen, at least they know how to count to ten". He labelled the top sequence for us on the screen. The next prominent group was easily recognized as the sequence 1, 6, 7, 8, 15. What an odd sequence. The remainder of the message completely mystified the group for the next several days.

Yesterday the message was completely decoded and Sklar, as telecommunications officer, was present at the briefing. The message was shown on a big screen in the middle of the gigantic room. The security chief listed what had been learned about this alien civilization from their crude yet telling message.

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THE DECODED ARECIBO MESSAGE, 1974



Number Sequence: bottom block is a "number label". Binary number system.

The sequence 1, 6, 7, 8, 15 represents atoms of hydrogen, carbon, nitrogen, oxygen, and phosphorous.

Various organic substances composed of the above five elements. The number of atoms for each substance is shown by each group of five numbers.

Symbolic representation of DNA, the "cornerstone" of life. Four billion possible pairs of human DNA.

A figure of a man. Fourteen units (1 unit = 12.6 cm, the wavelength of signal). Four billion people.

Our solar system.

A telescope with two beams of radiation.

Size of telescope.

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- 1) Their organic form is based on the carbon atom. In view of our contacts of other such civilizations in the past we know that such civilizations are extremely unstable. They lie dormant for extended periods of time and then explode technologically so quickly they become an uncontrollable menace to themselves and their neighbors.
- 2) The understanding of their own chemistry is sufficiently advanced so that intellectual breeding will be occurring. This hastens biological supremacy of a small unstable group. The overcrowding of this planet also contributes to a dangerous condition.
- 3) A reanalysis of our deep space radio monitors suggest that this civilization has utilized thermonuclear devices. Thus they will soon be capable of extended space travel and direct contact with our civilization. At any moment we should expect extended radio contact with them.

The decision of the security chief was inescapable. "Gentlemen, I am authorizing the telecommunications officer to transmit a high intensity Q-beam toward this planet."

It has taken twelve hours for the generators to store the energy needed for the Q-beam. Sklar watched the clock, finger poised on the activator switch. It will take nearly forty years for this pulse of energy to reach its destination, the third planet of an insignificant star that is called RG12536. The planet and all its inhabitants would be destroyed within five minutes. Sklar wondered if anyone on that doomed rock would realize why.

* * * *

EINSTEIN SAID

Albert Einstein was at a scientific meeting when a noted astronomer said, "To an astronomer, man is nothing more than an insignificant dot in an infinite universe". I have often felt that Einstein replied, "but then I realize that the insignificant dot who is man is also the astronomer".

* * * *

WHITLOOF CHICORY - A WINTER SALAD
YOU PLANT IN THE SPRING

Wally Oref

Most people are familiar with the chicory used as a substitute for coffee. Less well known is another variety of chicory called Whitloof chicory or French endive. The roots of Whitloof can be forced indoors during the winter to provide succulent salads. The plant, however, must be grown during the regular growing season.

The main aim of planting chicory in the spring is to grow tall, leafy plants which will produce healthy root systems by fall which you can take up or leave in the garden until ready for forcing. Whether roots are taken up in the fall or later, stems must be cut off 3/4 of an inch above the root crowns. Fall harvested roots are stored in a box filled with a dry soil mixture of peat and sand (two inches of dry soil on the bottom followed by roots and six more inches of soil) and kept in a cool, dry place until ready for forcing.

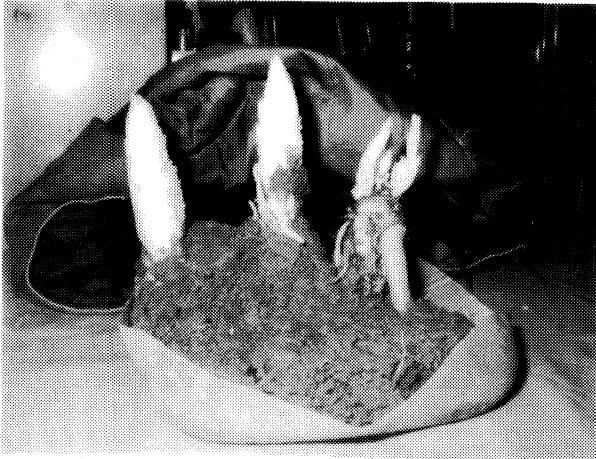
When you are ready to force the roots, water the soil thoroughly, drain away any excess water and cover with a piece of plastic to keep moist. Place box in a warm place (65-75 degrees). A few days after watering, growth will begin where the stem was cut off. In about three to four weeks, each root will produce a crisp, creamy-yellow, blanched "chicon", a head-like cluster of well blanched leaves about six inches long and about one-half inch in diameter somewhat resembling Cos lettuce but shorter. Just before the "chicons" are ready to cut, their upward growth will cause the soil to bulge slightly. This is your signal to watch closely for an emerging tip. When you see a tip barely breaking through the soil, the "chicons" are ready to cut.

The accompanying photo shows part of my second crop of Whitloof chicory - two mature "chicons" and a root with several immature sprouts. Roots for this crop were taken up from the garden in late February. Notice the size of the mature root and the multiple sprouts.

Multiple sprouts occur when the stem is cut too close to the crown. None of these sprouts would have matured into full size

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"chicons".



Don't throw the roots away. According to my garden books, the same roots can be used to force more than one crop by merely repeating the forcing process. I can't verify this claim. I goofed on my first try at forcing a second crop from the same roots. After cutting off nine beautiful "chicons", I unwittingly let the roots dry out too much. With my second crop of roots, I was more careful. After cutting off the "chicons", I stored the roots in a dry sand/peat soil. I'll keep them this way for a couple of weeks and then try forcing a second crop. If I get a second crop, I'll try a third, fourth.....

* * * *

ANOTHER OBSERVER EXCLUSIVE!
AN INTERVIEW WITH MR. FLASH INGLIGHT

Conducted by Jon Spargo & Shep Sutton

Recently, another milestone was achieved here at the 300-ft. telescope that went largely unnoticed until our ever alert supervisor, Bob Viers, pointed it out to us. To rectify this grievous oversight, your reporters set about bringing this happening to the OBSERVER's attention by writing an exclusive story. Much to our surprise, however, we discovered that the subject had a personality all his own and we thence changed our plans and instead of an article, came up with the following interview. Our interviewee made his debut on the NRAO scene a little more than ten years ago, Sep-

tember 16, 1964, to be exact. He has been the source of much talk, many questions, and in general has provided us with many interesting moments over the years. But, we will let him tell his own story.

Observer: Mr. Inghlight, would you.....

Mr. Inghlight: Please, call me Flash!

Observer: Okay, Flash, would you care to describe for us how it felt to join the NRAO team ten years ago?

Flash: In these declining years, I am Ever-ready to acknowledge that it was a surprise to me.

Observer: You do seem to be slowing down some, any reason for this decline?

Flash: I suppose it's because of my lack of general interest. Nothing has ever given me a real charge! (see Fig. 1 below)

Fig. 1

MR. FLASH INGLIGHT'S PERIOD OF DECLINE

$$P_D = \frac{P_C - P_B}{A} = \frac{40 - 0.75}{10.5} = \frac{39.25}{10.5} = 3.738$$

where:

P_D = Period of Decline, given in sec./year.

P_C = Current Period, in sec.

P_B = Period at Birth, in sec.

A = Current Age, in years.

Observer: Do you often have a run down feeling?

Flash: Well, a running down feeling better expresses it.

Observer: Do you work in spurts?

Flash: No, just in my normal clothing.

Observer: What has been the high point of your career at NRAO?

Flash: It was a peak rather than a high point. I would have to express it with a formula.

Observer: Are you satisfied with your mission in life?

Flash: It is my emission in life that's noteworthy.

Observer: Do you resent being assembled from discarded parts?

Flash: Dis card or dat card, who cares?

Observer: How would you describe yourself?

Flash: A light at the end of a tunnel diode.

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(For a better description, see Fig. 2 below.)

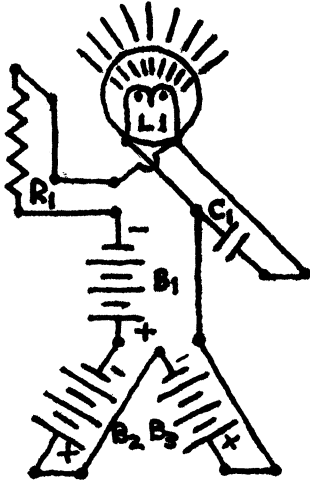


Photo unavailable - artists sketch of Mr. In-glight.

Fig. 2

Vital Statistics:

Period: 40 sec. (26 March 1975)

L_1 : NE-51

C_1 : 0.5 uf - 400 VDC

R_1 : 22 megohms - 0.5 watt

$B_{1,2,3}$: Eveready no. 467 - 67.5 volts

Born: September 16, 1964.

Mother: Naval Research Lab., chart recorder

Father: Bill Terrell

Observer: Did you love your mother?

Flash: Oh yes! She had other children, of course, some of whom are now part of home projects all over the county.

Observer: How about your father, did you love him too?

Flash: Maybe, but years ago he deserted my mother and me for the bright lights of Tucson.

Observer: Do you mind this battery of questions?

Flash: I don't exactly get a charge out of them.

Observer: Do you have an active sex life?

Flash: I still have my original capacity!

Observer: Have you ever blown a fuse?

Flash: I am not really that hot headed.

Observer: What, or who, has been the guiding light in your life?

Flash: I have always worshiped the lighthouse off the coast of Lewes, Delaware.

Observer: Thank you, Flash.

Interviewer's Postscript: If you wish to join the throng, and witness our beloved Flash in action, you may see him daily during working hours in the executive dining room at the 300-ft. telescope.

* * * *

WEATHER

John Weaver

As I write this, the official first day of spring was more than a week ago and winter was supposed to be gone. If this is true, then what in blazes is that white stuff fluttering down outside? Oh well, Doc Pluvius will look at the calendar sooner or later.

As our winters go, the one just past had nothing very spectacular to offer. The average daily mean temperature was on the low side but there were no drastic extremes. The lowest temperature recorded was -8° on December 5th. Total snowfall was greater than average but there were no huge single falls. It just snowed a lot more often. The most significant feature was the duration of cold, wet, gloomy, wintry weather in general. One outstanding phenomenon was a windstorm on February 25th when the observed wind velocity hit 68 miles per hour.

One aspect of this winter will be of interest to gardeners. Since there were no prolonged periods of extreme cold, the ground was not frozen to a significant depth. This means that a much larger number of insect eggs, larvae, fungus spores, etc., will have survived than would ordinarily be the case. So, if you are going to plant a garden, be prepared to spray a lot or do a lot of bug picking.

Climatologically, our winter weather is mainly influenced by large, cold, high pressure air masses spreading down from the Cana--

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dian arctic and the polar regions. These highs migrate across the great plains and the mid-western U.S. and then move off toward the northeast. The highs are separated by cold fronts, along which wave formations occur which develop into low pressure centers or storms. Our mean temperatures result from the highs, while our violent types of weather and precipitation result from the lows.

I have been asked by several people about a seeming contradiction when they have listened to weather broadcasts and have heard about a cold polar air mass being replaced by a colder arctic air mass. They wonder why polar air isn't colder than arctic air. In fact it is. The reason for the contradiction dates back to World War I and the explanation is similar to that of why 85-3 is located between 85-1 and 85-2.

When World War I produced much impetus to develop better techniques and methods for forecasting weather than had existed previously, a group of Norwegian meteorologists discovered that the earth's atmosphere was not homogeneous, as had been thought previously, but consisted of large clumps, or masses, having individual identifying characteristics. They determined that these masses did not mix readily with each other but tended to blend slowly. The researchers began plotting these air masses on maps and drawing lines to indicate their dividing borders. Since the lines resembled lines on battle maps of the day, they were described as fronts. It was believed then that the entire polar region was covered with one large cold air mass and tropical regions another with the dividing front meandering somewhere around the temperate regions. These air masses were labeled polar and tropical. It was later discovered that there was yet another division between the air masses located around the polar caps and that of the lower arctic regions. Since the polar label had already been assigned, this newly discovered mass was labeled arctic.

Oh yes, the theme started out to be winter. Sorry about digressing into a boring meteorology lesson. One good thing that we can say about winter in general is that it contains Christmas. Speaking of Christmas, did you hear about the telescope operator who received a pair of water skis from Santa? He hasn't used them yet because he can't find a lake with a slope.

* * * *

GREEN BANK BOWLING

Dick Hiner

We are sorry to lose Jonathan Spargo from the bowling team and also Green Bank. Good luck in New Mexico, Jon!

As of March 26, we had 23.5 wins and 16.5 losses. We tied one game with D & E on February 18. Our big gun since the last Observer is Howard Brown with a 593 series and a high game of 233.

On April 19 at 2:00 p.m. we have a match with Charlottesville at Charlottesville. There is a possibility that we will need a few extra bowlers. If interested, contact Dick Hiner at extension 309.

* * * *

GROW MORE ONIONS

Make room for onions in your garden this year, even if you have no space. Grow some in tubs, cement blocks or what have you. In the flu epidemic of 1918, people who ate lots of onions showed great resistance to the disease. Also, a recent British medical report states: "Onions may soon become a primary weapon against heart attacks." A team of physicians found that boiled or fried onions increased the blood's capacity to dissolve clots.

If you like the large "hamburger" onion, order some plants of Sweet Spanish. You can grow boiling onions from seeds started directly in the ground. There's a new variety called Nutmeg which produces firm onions even when started from seed. If onion plants or sets are short in supply, don't hesitate to sow onion seed. You'll get good size bulbs, and plenty of bunching onions or "green scallions". Onions like a rich, sandy soil, or muck land. If your neighbor has some "multiplier" onions, get a few from him. Plant them in the garden and you'll have green onions every spring. All you do is pick off the side shoots and eat them. Leave the center to grow new ones, and you'll have free onions the rest of your life. They are perfectly hardy and need no care.

* * * *

IRRESPONSIBLE PARKERS

Incensed (to arouse extreme anger) by that clod who parks his car like there was no one else in the world but him? I mean like the driver who takes one and one-half spaces in Heck's parking lot; like the driver who takes three and one-half car lengths along a city curb; like the driver who double parks on main street while he runs in for a pack of

smokes; or like the worst one of the bunch, the driver who parks out in the middle of the road while he chats with an acquaintance in another parked car. If these kind of thoughtless parkers cause your ulcers to ache, your face to turn deep red, or make your heart pump harder, here's a way to turn it all off. Just issue him or her a parking violation ticket like one of the two printed below. Please feel free to clip these out for future use.

PARKING VIOLATION

[Empty box for State]

STATE

[Empty box for Automobile License Number]

AUTOMOBILE LICENSE NUMBER

[Empty box for Time]

TIME

[Empty box for Make of Automobile]

MAKE OF AUTOMOBILE

This is not a ticket, but if it were within my power, you would receive two because of your bullheaded, inconsiderate, feeble attempt at parking. You have taken enough room for a 20-mule team, two elephants, one goat, and a safari of Pygmies from the African interior. The reason for giving you this is so that in the future you may think of someone else, other than yourself. Besides, I don't like domineering, egotistical or simple-minded drivers and you probably fit into one of these catagories.

I sign off wishing you an early transmission failure on the expressway at about 4:30 p.m. Also, may the fleas of a thousand camels infest your armpits.

WITH MY COMPLIMENTS

PARKING VIOLATION

[Empty box for State]

STATE

[Empty box for Automobile License Number]

AUTOMOBILE LICENSE NUMBER

[Empty box for Time]

TIME

[Empty box for Make of Automobile]

MAKE OF AUTOMOBILE

This is not a ticket, but if it were within my power, you would receive two because of your bullheaded, inconsiderate, feeble attempt at parking. You have taken enough room for a 20-mule team, two elephants, one goat, and a safari of Pygmies from the African interior. The reason for giving you this is so that in the future you may think of someone else, other than yourself. Besides, I don't like domineering, egotistical or simple-minded drivers and you probably fit into one of these catagories.

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WITH MY COMPLIMENTS

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PUBLICATION SUMMARY

Contents of Ap. J., Ap. J. Lett., Astrophys. Lett.,
A. J., Astronomy and Astrophys., Ap. J. Suppl., and A. and A. Suppl.

Radio astronomy papers based on observations made in the U.S.A.
(excluding solar and low-frequency Jupiter work)

Year	<u>Number of Papers Based:</u>		% of NRAO based papers
	on observations at NRAO	on observations made elsewhere in U.S.A. including Arecibo	
1964	5	23	18
1965	9	28	24
1966	15	19	44
1967	21	35	38
1968	29	34	46
1969	47	36	57
1970	81	35	70
1971	85	52	62
1972	52.5	42.5	55
1973	78	55	59
1974*	81.5	43.5	65

* 1974 complete. Astrophysical Letters excluded in 1974. Not published.

The half is usually a VLBI paper.

Gerrit L. Verschuur

GROUP MEDICAL INSURANCE

Monroe E. Petty

The Personnel Office frequently receives inquiries about various medical expenses which are not spelled out clearly in the Certificate of Insurance. Using as little insurance lexicon as possible, we've attempted to explain the manner in which several of these expense items are treated by our insurance company. We'd appreciate hearing from any employee who has questions about these or any other insurance claim matters he has experienced at NRAO.

Outpatient Emergency Treatment

Full coverage is provided under the hospital portion of our insurance plan only if the treatment:

- a. is necessary as a result of accidental injury (sudden illness is not covered on an outpatient basis, except under major medical);
- b. is rendered within 48 hours after the accident;
- c. is received at the outpatient clinic of a hospital.

Since no hospital is within immediate access to Green Bank personnel, Dr. Aga's office is regarded as an outpatient hospital clinic by special agreement with the insurance company.

Follow-up care which is rendered after 48 hours have elapsed is not regarded as emergency treatment and, therefore, is not covered under this provision; however, it is covered under major medical.

Elective Sterilization

Hospital and surgical expenses are covered for both males and females.

Cosmetic Surgery

Coverage is provided only when surgery is required to correct disfigurement, remove visible scars, or correct a physical impairment. For example: if surgery is undertaken merely to reshape an individual's nose, benefits would not be provided. If, however, an individual's nose is reshaped in the course of

correcting a breathing difficulty, benefits would be provided.

Oral Surgery

The NRAO medical insurance plan does not provide coverage for ordinary dental procedures. However, a limited number of oral surgical procedures commonly performed by a dentist are covered. We advise contacting the Personnel Office anytime the procedure involves work primarily on the gums, rather than the teeth. It's possible that surgical benefits may be payable.

Diagnostic Laboratory Tests and X-rays

Each insured individual is covered for up to \$150 in any 12-month period for diagnostic tests and X-rays provided his physician is checking a confirmed or suspected illness. Therefore, tests performed as part of a routine physical examination, such as blood tests, chest X-rays, etc., are not covered. The only exception to the above is Pap tests, which are covered under all circumstances.

Prescription Drugs

Drugs purchased under a lawful prescription are covered under major medical, provided they are for treatment of an illness. Over-the-counter drugs, vitamins prescribed by your doctor, or birth control pills are not covered.

Chiropractors

Coverage is provided under major medical for a chiropractor's charges, provided he is operating within the scope of his license. For example: if a chiropractor treated a patient for high blood pressure, the insurance company would most likely question the claim.

Well-Baby Care

Routine pediatric care and inoculations administered to healthy children are not covered by our plan. The child must have a confirmed or suspected illness before coverage applies.

* * * *