THE OBSERVER

June '75

IS ANYONE THERE?

STORY ON PAGE 3

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IS ANYONE THERE?

Alan Bridle

At least six groups of astronomers around the world are currently involved in using radio telescopes to listen for signs of intelligent life beyond the Earth. NASA is supporting design work for a huge installation - Project Cyclops - to detect radio transmissions from advanced civilizations on planets in distant star systems. Why do these experimenters suppose that there could be life 'out there' on which to eavesdrop with radio telescopes?

First of all, what is meant by 'life'? A Buddhist monk named Bankei was once publicly challenged to demonstrate a miracle by a rival whose leader had supposedly demonstrated many wonders. Faced with the challenge, Bankei simply said, "My miracle is that when I feel hungry I eat and when I feel thirsty I drink."

Bankei's 'miracle' is what distinguishes living from non-living matter. Left to itself, non-living matter always becomes steadily more disorganized as time passes. Abandoned buildings collapse into heaps of rubble, but rubble heaps never assemble themselves into buildings. Shiny cars rust into useless hulks, but the hulks in the wreckers' yards never spontaneously become new cars. Living matter, whether in a rose or a robin, an ant or an ape, you or me, is remarkably organized in the face of this seemingly implacable trend towards universal disorder. Life's most distinctive property is an ability to grow, repair or reproduce its peculiarly organized structures - at least for a limited time.

Living things achieve this by drawing well-ordered energy (food, sunlight) from their environment. This borrowed energy powers the processes which preserve, enlarge and reproduce the internal organization of living matter, then it is returned to the environment in a disordered state (waste products, heat). Life maintains itself as a temporary oasis of order in a chaotic world by actually increasing the rate of disordering of its environment.

There are some 350,000 different plant and 1,200,000 different animal species on Earth now. Different life-forms have adapted to extreme Arctic conditions, to the near-boiling waters of hot springs, to the thin air of the stratosphere, to the colossal pressures of the ocean deeps, to rain forests, to deserts and even to the high-radiation environments of nuclear power plants. We might therefore hope to gain some insight into the range of possible mechanisms for life, and the range of acceptable environments, by studying the life around us on Earth.

But it turns out that the wonderful variety of species on Earth is produced by the chemistry of carbon combining with only a few of the other 91 naturally-occurring chemical elements to form just a handful of basic raw materials (see Table, page 5). All Earth life from microscopic viruses to giant whales has essentially the same chemical basis. The organization of that basis into different life-forms is achieved by differences in the complex patterns of arrangement of just five molecular 'building-blocks' (the nucleotide bases) in what is known as the 'genetic code'. Our observations of millions of species turn out to amount to knowledge of only <u>one</u> example of life - carbon-compound-in-water life - and even astronomers should shrink from discussing a population of phenomena on the evidence of just one example!

The best we can do without lapsing immediately into pure speculation is to weigh the possibility that <u>L</u>ife <u>A</u>s <u>W</u>e <u>K</u>now <u>I</u>t (which I like to call LAWKI) might exist elsewhere. Our chances of finding <u>some</u> form of life beyond the Earth must actually be greater than those of finding LAWKI.

LAWKI needs a planetary environment with liquid water available, and functions best at transitions between solids, liquids and gases. Most astronomers consider it likely that such 'Earthlike' environments are abundant in the universe, but there is no direct evidence for this. None of the Sun's planets could be detected by present techniques if they circled another Sun at typical interstellar range. There have been claims that some nearby stars wobble across the sky as if under the gentle gravitational pull of unseen companions which could be planets. The most promising results have recently been challenged, however, and this evidence is presently very controversial. The main reason for optimism about the number of Earthlike environments is that planet formation is understood theoretically as a by-product of the formation of the slowly-rotating single

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stars which make up about one-third to one-half of the stellar population. Our own Solar System shows that not all planets are Earthlike but the regulating factor appears to be just distance from the star and it is therefore likely that many planetary systems would contain an Earthlike member.

Both optical and radio astronomy show that the elements needed for LAWKI (see Table) are abundant in the universe, so there is no shortage of the raw materials for LAWKI elsewhere. But having the ingredients does not guarantee that the cake will be baked. Even on an Earthlike planet with the appropriate chemistry, should we necessarily expect to find LAWKI?

Here we are at a crossroads in this discussion. How did the crucial organizing patterns of nucleotide bases appear on Earth? Could that process, or its equivalent, have occurred anywhere else? Laboratory experiments have shown that fragments of LAWKI's chemistry can be produced by normal, essentially random chemical processes in simulations of the primeval environment of Earth. Some of the complexity of the genetic code in today's organisms may strictly be unnecessary; faced with environmental challenges, self-copying molecules responsible for patterning simple organisms have been shown to shed large parts of their structure without losing their ability to copy themselves. The fossil record also suggests that early Earth life was simple and that complexity evolved over billions of years. This all suggests that the first self-reproducing life-patterning carbon-based molecules could have been simple ones that arose randomly and mindlessly in the Earth environment long ago.

No chemical experiment has created LAWKI of any kind in the laboratory. Even if one does, it will not prove that life <u>did</u> appear in that way on Earth. Experiments performed now can only show paths by which life <u>might</u> have arisen in the past. Alternative paths will always be arguable; for example, special adjustment of Earth's chemistry by a supernatural (divine) being, or accidental 'seeding' of the Earth with life-patterns from the sandwich lunch of some visiting astronaut. On any of these pictures, there is some possibility that LAWKI will exist elsewhere.

The tantalizing uncertainty of the above discussion stimulates searches for LAWKI beyond the Earth. The exploration of the Solar System has yet to find evidence for life - the lunar samples were sterile, but we will soon have data from the Viking spacecraft on the surface of Mars. With time, money and continued interest the exploration of other nearby planets could follow. But if the appearance of the life-patterning molecules hinges on some sufficiently rare process, the nearest examples of LAWKI could be beyond the range of travel using our present technology.

They need not, however, be beyond the range of our present radio technology. If we equip the world's biggest radio telescope (the 1000-ft reflector at Arecibo) with its most powerful radar transmitter, it can broadcast a signal detectable by its 'twin' equipped with the most sensitive available receiver at a range of several thousand light years. Within such a range there could be millions of potential homes for LAWKI. If LAWKI with only our own technical capabilities existed on some of these sites, we could become aware of their existence through radio contact now. In practice, their detection would present a formidable problem of searching at the right radio frequency in the right direction at the right time.

But the Sun is not an old star and Earth is not an old planet. We and our environment are recent arrivals on the cosmic scene in astronomical time. Even if LAWKI always needed billions of years to reach our technical level, advanced forms of LAWKI could have been blundering into radio contact with one another for billions of years before Earth existed. So long as technological prowess does not inevitably bring destruction, many contacts between LAWKI in different locations could already have been made. The chances of contact are greatest between forms of LAWKI that achieve long-term social stability. Contact via radiated signals would also be most likely at radio wavelengths, because these are where interstellar space is most transparent and where there is minimum natural 'noise' to compete with artificial transmissions.

If earlier contacts between stable advanced LAWKI had been fruitful, new arrivals like us might no longer face the difficult task of detecting feeble, unintentional transmissions from other young societies. Older forms of LAWKI might generate strong signals designed for easy detectability by fledgling

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civilizations. The possibility that such 'beacon signals' might be picked up with present radio telescopes has stimulated the current round of listening experiments.

Listeners for beacon signals do not expect quick success. The search must cover many possibilities. Beacons may not be located in star systems but at strategic locations elsewhere. The signals will be most easily distinguished from natural signals if they are sharply localized in frequency, but then we must find the frequency. The present experiments all use sensitive equipment that exists for 'regular' astronomical purposes at potentially distinctive beacon frequencies. A popular choice is the 21-cm hydrogen line, which is the most distinctive radio spectral line of the most abundant chemical element in the universe. One of my own experiments uses the 1.35-cm water line, the closest spectral line of a biologically significant molecule to the waveband of minimum natural noise. Most of the experiments are surveying samples of nearby single stars that are likely to have planets, and all so far appear to have met with silence.

The gaping holes in our understanding of the development of LAWKI here on Earth may contain hidden factors which guarantee failure of such experiments. LAWKI may not spend very long experimenting with technology. Advanced LAWKI might achieve contact by means that we cannot presently envisage. The odds in favor of success in present experiments are very small, but we do not know they are zero. They become zero only if we do not try.

TABLE

MAIN CHEMICAL CONSTITUENTS OF LAWKI

COMPONENT	FUNCTION	COMPOSITION
Water	Universal Solvent	Hydrogen, Oxygen
Carbohydrates	Energy Source	Hydrogen, Oxygen, Carbon
Fats	Energy Storage	Hydrogen, Oxygen, Carbon
Adenosine Phosphates (ADP, ATP)	Energy Transfer	Hydrogen, Oxygen, Carbon, Nitrogen, Phosphorus
Proteins	Structural; Facilitate Chemical Reactions	Hydrogen, Oxygen, Carbon, Nitrogen, Phosphorus, Sulphur
Nucleic Acids (DNA, RNA)	Patterns for Protein Synthesis	Hydrogen, Oxygen, Carbon, Nitrogen, Phosphorus-- Organized into 5 Nucleotide "Building Blocks"

* * * *

THE REEK OF THE PENN CENTRAL*

G. S. "Big Daddy" Shostak

The Penn Central Railroad--mention it at any social gathering and you're sure to get wry smiles and synical remarks. It is a catch phrase guaranteed to elicit derisive laughter, much in the way that baldness is, or the cities of New Jersey. We use humor to defend ourselves against the hopelessness of such large-scale pervasive problems. And thereby avoid dealing with the situation.

For the past six months I've been dealing with the problems of the Penn Central, and in this article I shall attempt to explicate some of the reasons behind, and future of, the world's largest bankruptcy.

Well, we all know why the Penn Central went under: corrupt management and late, filthy trains, right? Wrong. It's true that the top executives of the nation's biggest railroad were less than inspired (I note in passing that many of them were Virginia lawyers), and it's also true that the passenger service was not particularly commodious. But these failings, although conspicuous to Mr. and Mrs. Front Porch, were hardly the first-order terms in the bankruptcy equation. To begin with, PC carried about 40% of the nation's rail passengers, including substantial commuter operations in Philadelphia, Boston and New York. And for every dollar paid in fares by the unfortunates who rode its trains, the PC was incurring about two dollars in costs. The resultant loss was a couple of hundred million dollars annually. Despite what you may think, cleaning up the trains would have incurred more costs, without much change in revenues. A well-run passenger service, while socially desirable, is not guaranteed to be profitable. If you have doubts, consider the railways of Europe and Japan, all of which operate at enormous deficits. And they don't have an Interstate Highway system to compete against.

Furthermore, the PC is situated in the North, the part of the country which had the bad luck to win the Civil War. As a result, railway lines were built to every town and village, something which the South couldn't afford to do. A hundred years later, the shift of industry out of the Northeast and the invention of the truck made many of these "branch" lines unprofitable. Nevertheless, the Government, via its antediluvian agent, the Interstate Commerce Commission, only occasionally would allow abandonment of such lines.

Then there's the labor problem. Ride behind the fireman on a locomotive headed for New York. You'll note that the only control on his side of the cab is the windshield wiper. And you can bet his salary is more than yours. The railroad industry is burdened by 140 years of labor entrenchment.

To all this you might add the fact that the U. S. Government has actively subsidized all of the railroads' competitors: truckers, barge lines and airlines. The rails didn't get a nickel.

So you see, bad management only exacerbated an already untenable situation, and those who were aware of that situation were not surprised when in 1972 the Penn Central filed for bankruptcy. Since that time the railroad has managed to continue operating only by deferring maintenance of track and payments to creditors, shifting the passenger burden onto Amtrak, and asking Congress for "loans".

Where do we go from here? Well, we could pull up the tracks and use them for the VLA, but the result of that action would be a shutdown of such firms as General Motors, U. S. Steel and Consolidated Edison. Plus a doubling of the number of trucks bearing down on you on Route 29. Railroad service in the Northeast is essential, so we can forget about paving over the tracks just so Bill Meredith can have a bike path to Boston.

Faced with the demise of the PC (and six other small railroads in the Northeast), Congress created the U. S. Railway Association. This group was promptly charged with divining a plan to reorganize the bankrupts in such a way that they would once again be profitable. The idea is to avoid nationalization and its attendant quagmire of public funding and political pressures (consider the Postal Service). A preliminary plan has been published, and it essentially proposes the same reorganization scheme that the railroads themselves would pursue were they permitted.

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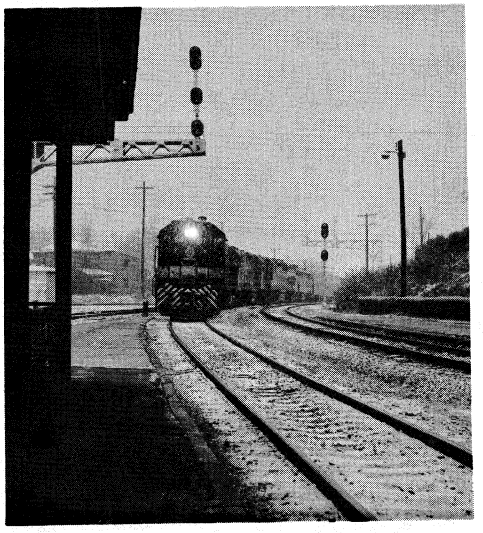
*The PC is operated by the Penn Central Transportation Corp. under grants from the American taxpayer.

In particular, the plan requires (1) greater compensation from Amtrak for passenger service provided by the railroads, (2) the abandonment of thousands of miles of branch lines, (3) renegotiation of the labor contracts, and (4) government loans (to the tune of about $5 billion) to finance repair of the property. Will it happen? Well, only approximately. There is strong political opposition to each of these measures, and the resulting legal battles promise to keep attorneys and politicians exercised for years to come.

Perhaps you wonder how the author, schooled in the lore of radio astronomy, fits into this picture. (Then again, perhaps you don't.) Well, G. S. S. inhabits a small cubicle in downtown Philadelphia and helps in the development of a computer simulation model of the railroad. Presumably this model will allow rational evaluation of the various reorganization plans without the necessity of spending a lot of money. Additionally, as a result of a dubious reputation for having "nimble lips" and the ability to write complete English sentences, I am often asked to give presentations to various groups of vice presidents. Indeed, I had dinner with the number one man in the PC this week, and promptly assaulted him with my ideas for improving service while he attempted to digest an inferior eggplant parmigiana. Unfortunately, this gentleman, while intelligent, is a lawyer, and doesn't know a spike from a slumbercoach. Picture, if you will, the long-term consequences for NRAO should that organization be headed by a businessman rather than a scientist.

Is it interesting? Well, it was. Frankly, I miss the excitement and independence of astronomy, so my tenure here may be short. Nonetheless the railroad is exceptional among man's devices; it is more than simply a crudely fashioned object of utility. It transcends itself, and often manages to touch us emotionally, taunting us with promises of melancholy freedom. Imagine for a moment standing in an open vestibule on the night train to New York. The bleak industrial landscape of New Jersey slides by in the dark as steel wheels clang and chatter on the rails. A cold wind, tainted by dust and steam, assaults your face as you strain to watch the signals sequence along the right-of-way. I would be lying if I said the goosebumps are less now than before.



Southern Railway's train #8 coming into CV

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COFFEE TOPICS

After about ten years of retirement an old Green Bank institution has been resurrected. Roughly once a week a very informal discussion session is organized around the afternoon coffee break in the Cafeteria. This idea dates back to the days of our first director, Otto Struve, but fell into disuse in the mid 60's.

The topic is usually astronomy, and the discussion is usually centered around a visiting observer, but we're open to all sorts of suggestions. For example, rumor has it that there is a scientist coming to the valley to study cave bats. Somebody like this would be a refreshing break from the normal coffee banter.

Anyone is welcome, and if you're interested, keep an eye on the electronics bulletin board or the one outside Dr. Howard's office. We'll try to post a notice at least a day in advance. Again, feel free to suggest speakers or far-out topics of interest.

* * * *

WANTED: 2, good 6.75 - 7.75 x 15 tires.
W. Oref, ext. 270 GB

SYMBOLISM - COMMUNICATION

The necessity to relate - from the beginning to the future, "MANS EXPANSION" has necessitously demanded creativity.

From the primitive to whatever, SIGN LANGUAGE seems To Be The Thing - MAN!

The above photo shows a "NO SPARKING" sign which is a first in the "Regulatory Signs" category of road signs.

Initiated in a meeting of Fisher, C. Moore, Crews, Dolan and Howard, the "NO SPARKING" sign originated.

Spark plugs in conventional ignition system vehicles emit radio waves up to 1000 MHz causing interference at the scopes. To minimize and prevent this interference, restriction in the use of such vehicles in necessary. Emission of spark plug cables, high-tension cable, alternators, etc., also cause interference. The sign clearly conveys to all vehicle operators, including our visitors, the restriction of conventional ignition system vehicles.

Sign design and fabrication by NRAO personnel.

Credits of involvement including those already listed: Steinemann, D. Williams, Grandon, W. Cottrell, G. Mayes and Neil McLaughlin. Photo by Ron Monk.

Those interested can refer to:

1. Symbol Source Book by Henry Drefuss in NRAO library, (W. Oref also recommends it.)
2. U. S. Department of Transportation - Federal Highway Administration.
3. Division of Motor Vehicles.
4. Highway Safety Division (of your state).
5. Manual on Uniform Traffic Control Devices. Approved by the Federal Highway Administrator as the National Standard for all highways open to public travel in accordance with Title 23, U. S. Code, Sections 109(b), and 402(a). November 13, 1970.

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THE OBSERVATORY EMERGENCY ORGANIZATION AT GREEN BANK

Bill delGiudice

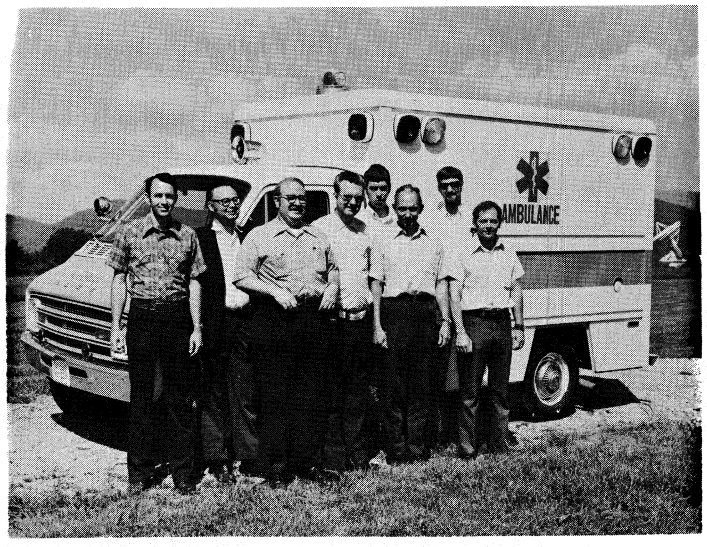
The Observatory Emergency Organization was created on April 14th to replace our previous organization for dealing with medical or fire emergencies. The major changes have been in organization, training, equipment, and communications. Before I elaborate on these changes, note that the mission of the organization has not changed. The primary mission is to protect the Observatory property from loss due to fire or other destructive forces and to provide emergency care of sick and injured employees, dependents, and other victims who may be on site. The secondary mission is to provide support for these same services off the site to public fire and ambulance service agencies in accordance with mutual aid agreements which we have with these agencies.

The organization consists essentially of two units: the fire brigade and the ambulance squad. These units overlap because all ambulance attendants are also firefighters.

The training has been extensive and will be continuing. For example, ambulance attendants are licensed by the State only after 120 hours of training followed by a written and practical examination. Our guards are also ambulance drivers and have advanced first aid training. The squad is trained and prepared to assist in any medical emergency, even if ambulance transportation is not required.

The fire brigade members have completed the first phase of training and continue to expand their areas of knowledge which are not limited only to putting out fires but also to the protection of life and property from any destructive forces whether natural or man-made.

Substantial new equipment has been added to both the squad and the brigade. The most obvious new equipment acquired is a new ambulance which meets or exceeds all state and federal standards. For the first time, we have a vehicle which can handle more than one patient and in which intensive life support efforts can be carried on in transit. This is the best ambulance in the county and equal to the best in the State.



Emergency Medical Services Attendants: R. Fleming, W. delGiudice, R. Weimer, J. Gibb, G. Patton, G. Peery, W. Brundage, & T. Dunbrack

We have improved our communications system. Even during non-working hours and when the guard is away from the guard house, any call received on our "hot line", 456-2299 (ext. 299) will be answered and your request for emergency service taken. Within three to nine seconds the guard and other emergency organization members will be alerted and on their way to assist you. Because the organization is geared to the needs of the Observatory and is not a public safety agency (such as the fire departments in Durbin, Cass, and Marlinton), we do not publish the hot line number for public use. We encourage the public to call one of the county fire departments and if the department dispatcher determines that we can assist we are called under the terms of our mutual aid agreements. This has caused problems in the past because people knowing that we have emergency service capability will call our directory listed number and sometimes get no answer. We are attempttin to overcome this problem but it is too soon to gage the results of our efforts.

Should you ever need the services of the emergency organization due to illness, accident, fire or other emergency, just dial the hot line number, 299, identify yourself, state the type of emergency and the location. Of course, if you are off of the site but in the area, the procedure is the same. If you are more distant, say closer to Durbin, and

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you have a fire emergency, you would want to call The Durbin Fire Co. If you need an ambulance you may prefer to call the Observatory.

In future issues of the Observer I will have more detailed information on the emergency organization. If you have any questions you can ask any emergency organization member, safety committee member or direct them to the WAVEGUIDE editor of the Observer.

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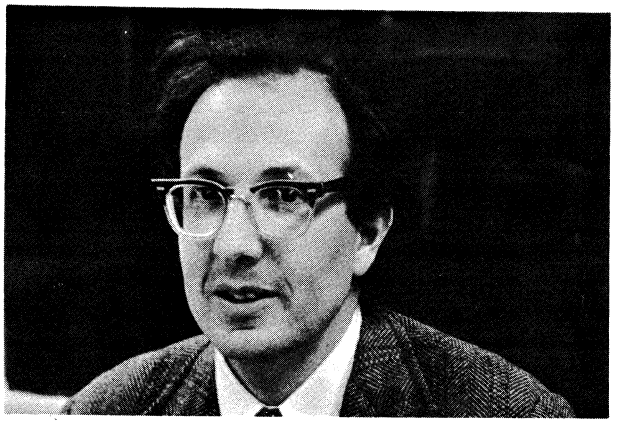
NATIONAL ACADEMY OF SCIENCE ELECTS KELLERMANN

On April 22, 1975, the National Academy of Science announced the election of Kenneth I. Kellermann, Scientist, NRAO, Green Bank, West Virginia, as a new member in recognition of his distinguished and continuing achievements in original research.



Election to membership in the NAS is considered to be one of the highest honors that can be accorded to an American scientist or engineer. Those elected today bring the total to 1,134.

The National Academy of Science is a private organization of scientists and engineers dedicated to the furtherance of science and its use for the general welfare. The Academy was established in 1863 by a Congressional Act of Incorporation signed by Abraham Lincoln which calls upon the Academy to act as an official adviser to the Federal Government, upon request, in any matter of science or technology. This provision accounts for the close ties that have always existed between the Academy and the Government, although the Academy is not a government agency.

BOWLING MATCH - CV vs GB

Dick Hiner

On April 19 GB bowlers ventured across the mountains to Charlottesville to bowl against the CV bowling team. CV won the match by winning 8 1/2 games against our 7 1/2. GB teams 1 and 2 won 6 and lost 2 but teams 3 and 4 only won 1 1/2 games. CONGRATULATIONS CHARLOTTESVILLE. Gerry Valencia had high game with a 214 and a high series total with a 590 scratch.

CV had a pin total (including handicap) of 8231; GB, 8248. CV had a scratch pin total of 6718; GB, 6931. Charlottesville teams have four members each and they figure their handicap 180 minus total pin average multiplied by 75%. Nine of our bowlers had handicaps before the match but the others had to establish their handicaps on the day of the match.

Bill Radcliff made a notable comment on the drive back to Green Bank when he said, "If I had had any help at all, we would have won our games." I'm sure there were several others who shared this feeling besides Bill.

A number of the bowlers took their families and everyone seemed to enjoy themselves. I want to thank all the participants. I'm issuing a warning to you now Charlottesville: WATCH OUT NEXT YEAR.

The following people participated in the bowling match between CV and GB:

Charlottesville: P. Hartline, C. Clark, H. Ward, R. Werner, R. Earnest, J. Davis, R. Durham, J. Earnest, Louise A., Carol B., Mary ann S., Garey B., Bill, Neil, Carol, and Frazer.

Green Bank: G. Valencia, L. Gibb, J. Gibb, C. Brockway, R. Hiner, J. Spargo, D. Williams, C. Williams, W. Monk, R. Poling, B. Radcliff, B. Ervine, D. Hovatter, D. Williams, B. Vrable, and R. Hallman.

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By inserting the proper punctuation, see if you can get the correct meaning of this sentence. Answer is on page 17.

That that is is that that is not is not is that it it is

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SOME IMPRESSIONS OF SOCORRO

Dick Thompson

I always enjoy the view from one of the higher floors of the Airport Marina Hotel in Albuquerque. I spent a night there while on a VLA business trip early in May. Looking westward one can see over the city towards a desert landscape of mesas and distant mountains. As daylight approached next morning I watched the city lights fade and the course of the Rio Grande became clearly indicated by the areas of cottonwood trees which follow its banks. The dusty days of early spring were almost over and the cottonwoods looked fresh and bright with newly unfolded leaves.

Later that day I drove south to Socorro down Interstate 25 which follows the river valley all the way down to Las Cruces in the southern part of the state. The first contingent of VLA staff and their families had moved out from Charlottesville one or two weeks before. They included Peter Napier, Steve Maas and Dave Coombes who are setting up the front end for the first antenna, and Read Predmore and Bernie Pasternak who are installing the first 1.25 km of waveguide. Jack Lancaster, the Project Manager, had also just moved out, as had Business Manager, Bob Dorr and Project Accountant Barry Blaisdell. For Bob Dorr, who lived in Socorro before joining the project, the move was a welcome journey home, but for the others it was a big change and I was interested to see how everyone was settling down.

In spite of the limited resources of a town with a population of little more than six thousand, problems of obtaining housing seem to have been solved fairly well for most people. Available houses have been found in a fairly wide range of locations throughout the town, and in addition, two small VLA enclaves appear to be developing. The first of these is in Eastwood Estates, a new development on the northeast side of town, close to the fertile farm land by the river. A small irrigation canal runs through the area and to one side is a large cottonwood grove. It is clearly a good place to have a garden, and visiting there on a Saturday morning I found Peter Napier hard at work with a very large hoe beside his pleasant new house. The exterior of his house is an attractive yellow shade of stucco and like most houses in Socorro it is all on one level. Next door live the Stidstones; Bob Stidstone is the Erection Engineer on the project. Just nearby is a large new house which I was told Bill Horne has been looking at. Altogether it seems an attractive area and the developer has built his own house there.

The second developing area is in the northwest corner of the town and is called Hilton Hills, after Socorro's best known native son, Conrad Hilton. It is located on a higher area with a view to the east across the valley and to the south towards the golf course and the college, the New Mexico Institute of Mining and Technology. To the west is M Mountain with a large M near the top in honor of Tech which was known as the School of Mines in earlier days. The Lancasters have built a very pleasant house in Hilton Hills, which they designed to take full advantage of the fine view of the golf course from their lot. I suspect that the soil on the hill is not as good for a garden as it is lower down in the valley, but with a view like the Lancasters have one can enjoy an ample area of greenery without having to water or mow it oneself. I must admit that this approach is an appealing one to me, after two years of slavery to the oversized kind of lawn which is so popular here in Virginia. As a result, Sheila and I bought the lot two down from the Lancasters when we visited Socorro in November of last year. Getting a house on it proves to be a somewhat lengthly process, and it has taken us almost six months to decide on a plan, to get it drawn up in detail by a designer, and to get a satisfactory quote by a builder. With luck we shall have a house started by the time that these remarks are printed. The builder has already moved his tool shed onto the edge of the lot in preparation, and the sudden appearance of this rather well-used looking structure during my trip was somewhat startling. It provided, of course, a fine opportunity for comic remarks about our choice of house design!

Just across the road from us Bill Sutton, our Procurement Engineer, plans to build a home, and next to him Dr. Perry, the principal of the Socorro high school, has just started building. The recent additions will more than double the number of people previ-

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ously living in Hilton Hills and we look forward to joining a growing community there. I have been asked several times whether houses of adobe are still being built in New Mexico. So far as I can determine there are very few new houses built of this material because of the cost of the hand made adobe bricks. A popular material there is called slump block which is a cement based material and is much more attractive than one might think from the name. One of the colors in which it comes is a light brown adobe which blends very well with the desert landscape. The blocks are slightly larger than a brick and about as heavy, as I well know, since I carried half of one home to Charlottesville in my suitcase as a present for Sheila to show her what her new house will be made of.

Down the hill and a few hundred yards back towards town one comes to the VLA Headquarters in Socorro which consists of two buildings at the northeast corner of the Tech campus. These were initially built for student accomodations and had been unused for some time, but now they have been renovated and provide comfortable office space and plenty of storage room. The business staff have their offices here, and the bus which takes the scientific and technical staff out to the site each day leaves from the office building at 7:30 a.m. and gets back at about 5:30 p.m. I did not have an opportunity to ride the bus, which is run by NRAO, but am told that the last few miles are a little bumpy when the bus leaves the main highway and goes out across a dirt road to the site. The present vehicle is a school bus and we expect to get a larger bus with better suspension later in the year.

The general impression just a few weeks after the first major relocation of people to Socorro is that everything is going well and everyone is finding things to enjoy about their new homes and surroundings. Most of the VLA electronics group, including myself, and the synchronous computer group will be moving out during the latter half of June. The asynchronous computer group under Bob Hjellming, and a small electronics construction group under Jack Campbell will then be the only VLA staff remaining in Charlottesville. Bob's group and their computer will be moving out in the summer of 1976 when the main building at the site is completed.

Although the VLA is the main project bringing scientific and technical people to Socorro this year, it is not the only one. Lincoln Laboratories of Lexington, Massachusetts is developing project GEODSS, Ground Electro-Optical Deep Space Surveillance, under contract with the U. S. Air Force. This system involves a 31 inch optical telescope controlled by a computer and will be set up about 25 miles southwest of Socorro. According to the Defensor Chieftain, the Socorro local newspaper, it will be used for satellite tracking as a part of a national defense surveillance system. Several families are expected to move to town on this project. Also moving to Socorro this summer is Dr. Kenneth W. Ford, of the University of Massachusetts Physics Department, who is to be the new president of Tech. Prospects for an active scientific and technical community appear promising, and those of us waiting to make the move look forward to seeing what Socorro holds for us in the next few years.

* * * *

SAFETY AT NRAO AND HOME

Russell Clarkson

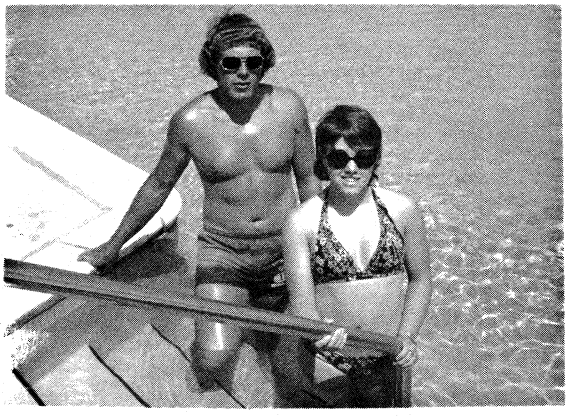
Safety rules at NRAO should not be left behind as we go by the Guard House on the way home. The Observatory and Safety Committee are just as interested in the employees safety at home as well as on the job. If any injury occurrs it is just as costly in time and monies lost if it happens at home or at work. Insurance and Workmans Compensation are each costly items and are necessary and help in time of need. No amount of money can replace suffering and anxiety and plain misery one encounters even with the smallest injury.

Safety toe shoes are a must at work for some employees, but the difference between ten toes and no toes may well be safety toe shoes at home while mowing the yard.

NEW GREEN BANK EMPLOYEES

Grounds Crew (Green Bank Mafia)

Rick Wooddell, Benny Campbell, Gary Cassell, and Mike Collins



Lifeguards

Paul Kuhlken and Mary Jane Oref

Tour Bus Driver

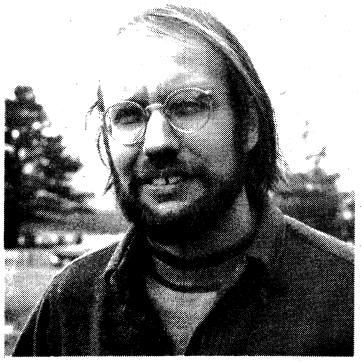
Jerry Matheny

Tour Receptionist

Doris Hungerbuhler

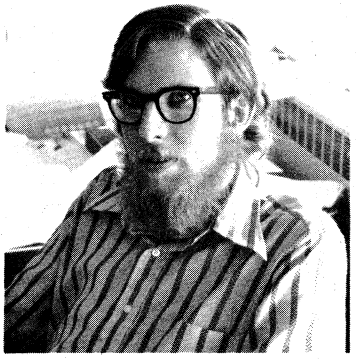
Summer Student

Jeff Waldhuter



Visiting Asst. Scientist

Ed Grayzeck

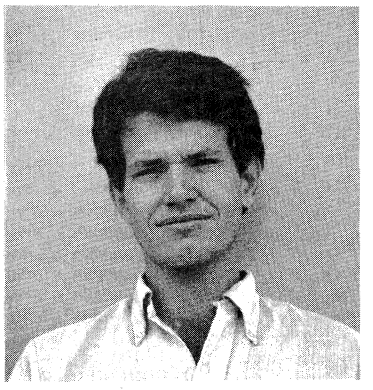


Scientific Assoc.

Carel Veenhuyzen

Summer Student

Walter Gorman



Telescope Operator

Dan McGuire

Terminations

Robert M. Ervine
Electronics Div.

Rehire

Elke Taylor
Adm. Servs.

Transfers

Jon Spargo to New Mexico
Tom Cram to Green Bank

* * * *

REPORT FROM THE MOUNTAIN TOP IV. MODERN PROBLEMS OF OPTICAL ASTRONOMY

Bruce Balick

Summer is now approaching, and with it will be clear nights and unparalleled views of the Milky Way from northern skies. This is generally the time of year in which popular interest in astronomy is greatest, and it is also the time of year in which optical observers who study our own galaxy busily engage in long awaited observing programs. Here at Lick the summer months are coincident with the dry season, and the nights can be counted on to provide brilliant splendor and interesting research.*

In this timely article we investigate the major fields of active research in optical astronomy. As usual, the discussion will emphasize the activities at Lick Observatory.

An observing run is more than just the observations at night. Generally, the afternoon is the start of the day for the optical astronomer, and during this time the equipment is checked and calibrated. The astronomer may check the alignment of the spectrograph or camera, or he may prepare the photographic plates, check out the response of the light sensitive counters, or prepare finding charts which enable him to select the proper star in a crowded region of sky. During the evening hours last minute details are finished, schedules drawn up, and the first of many cups of coffee is drawn.

The night hours are the busiest. Often the astronomer is alone and without benefit of an operator or night assistant. He controls the telescope movement and other equipment by himself. Telescope tracking (called guiding) is a laborious task, expecially for faint objects and long exposures. Here, of course, the guiding must be much more accurate than for radio telescopes, and mechanical drive systems for the telescope are generally very crude compared to those used for radio telescopes. The most common method of guiding involves the precise alignment of a bright star with a set of cross hairs. Also during the night, photographic film has to be changed, or calibrations made, or other tasks performed that break the monotony of guiding. After the night's observing is completed, another few hours developing photographic plates and cleaning up may be involved.

The three basic types of astronomy done today involve 1) photographic maps of selected regions of sky, 2) accurate non-photographic measurements of star or galaxy brightness and color, and 3) detailed spectra of the line emission from interesting objects by means of a spectrograph attached to the telescope. These types of astronomical techniques can be compared to the construction of radio synthesis maps, the determination of the radio continuum spectrum at several frequencies, and spectral line observations using an autocorrelator or filter bank, respectively. It is indeed most interesting that the basic methods of observational optical and radio astronomy are so similar.

In practice, however, the equipment used at radio and optical wavelengths is very, very different. (A discussion of the basic types of equipment used in optical astronomy was given in the first report of this series.)

We turn now to the main theme of this paper, the scientific problems studied by optical astronomers. Historically, the subjects of interest fall into three main categories, to wit: the solar system, the nearby stars, and nebulae and galaxies. Studies of the solar system dominate the history of astronomy for its first two centuries, but are no longer so important in astronomy today. Much of the present equipment used to study the solar system has now gone above the atmosphere or to wavelengths other than optical (especially the radio and infrared), and I shall not discuss this field of astronomy further.

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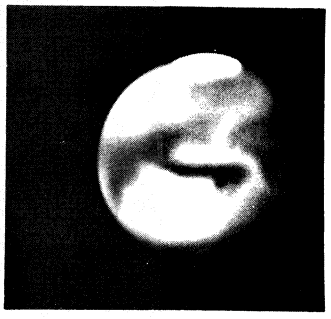
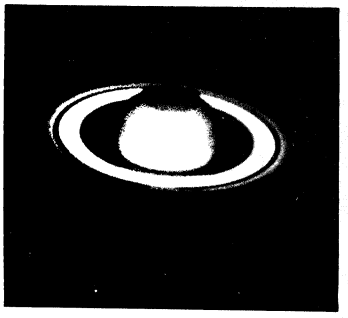
*Moreover, the nights are warm and mercifully short. The warmth is appreciated by most observers who spend the night riding in the telescope. You might expect that optical astronomers would prefer long nights rather than the short nights of summer, but as Alan Sandage, a famous astronomer at Cal Tech has said, there are few astronomers (if any) who think of much other than going to bed after seven or eight strenuous hours at the telescope. However, without exception, the struggle to stay awake in the late hours of the night is forgotten by the time the observer awakens the next day.



A 1971 view of Mars. Note the polar cap and dark markings. Close up views from Mariner probes show the surface to be cratered and barren.



Saturn and its rings. Note the bands in the rings and the relatively dark polar region. Pioneer II is on its way to Saturn and will arrive in mid 1976.

In the late 1700's attention began to turn to the stars and clusters of stars. Somewhat later came the study of nebulae, or fuzzy non-stellar objects. Studies of these fainter objects had to await the development of larger telescopes with better light gathering power before significant progress in their understanding could be made.

The nearest star is 300,000 times more distant than the sun. Because of the distance and the defocusing caused by the earth's atmosphere, no telescope is capable of showing details of the stellar surface as we are able to see on the sun. (Within the past few years, optical techniques similar to radio interferometry have allowed estimation of stellar sizes, but as yet no detailed pictures.) Needless to say, no planets beyond the solar system have been observed directly, although their existence has been occasionally inferred. Studies of stars are generally confined to studies of their colors, brightness, and motions (for nearby stars, these motions are small but observable after a few years). From these studies, the surface temperatures, distances, sizes, and systematic motions have been measured, and the characteristics of many thousands of stars are now known. In the past 50 years or so, theoretical studies have led to tremendous success in the understanding of the burning processes, structure, internal temperatures, and observed characteristics of stars. Today, most efforts are directed towards investigating the evolution of stars, especially the processes governing the birth and death of stars.

Issac Newton was the first to understand the sun like nature of stars. By the mid 1850's, the distances to some of the nearest stars had been crudely estimated. Today, the distances to many stars have been measured. From the distance and the observed brightness of a star, its inherent brightness, or luminosity, can be easily calculated. Measured luminosities range from one 100,000th to more than 100,000 times the sun's luminosity (the supergiants).

Temperatures of stars are determined from their colors. Much as familiar heated substances (such as molten metals or light bulb filaments) glow with characteristic red, yellow, white, or even blue colors, depending on their temperature, so also do the stars. Cool stars are typically 4000° F and appear red (a bright red star marks the shoulder of Orion and the eye of Taurus the bull), whereas the sun and stars like it are white and about $10,000^{\circ}$ F, and hot stars are as hot as $75,000^{\circ}$ F and appear blue-white (Sirius, the "dog star" is an example of a blue star--because of the way the eye responds to colors. Sirius appears white unless seen through a small telescope.)

About a third of the stars are actually double. Some stellar systems contain 3, 4, or even 5 stars. To the unaided eye they appear only as simple points. With medium sized telescopes of moderate magnification some of the double stars can be resolved into two stars, whereas other double stars are known to be double only because detailed analysis of their colors reveals evidence for stars with different emission properties. These stars are very important because the gravitational forces which confine their motions to closed orbits allow the stars to be "weighed", that is, the period of their mutual revolution is related to their masses. Masses of stars between 1/10 and 75 times the mass of the sun have been measured.

In some stellar systems one star passes in front of the other thereby temporarily blocking out the light of the more distant star. Detailed observations of the light changes allow the sizes of stars to be mea-

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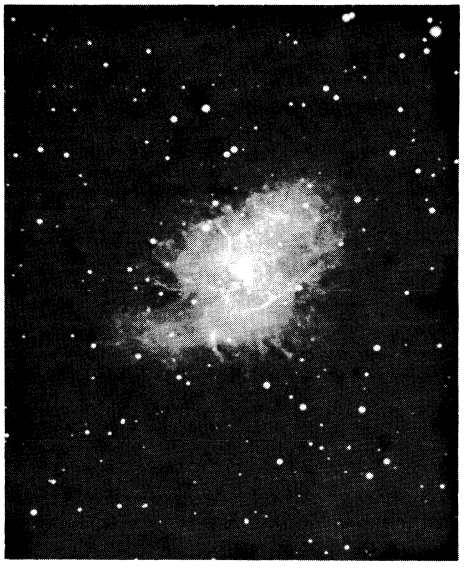
sured. Cool supergiants have a diameter 100 times larger than the sun (about the size of the earth's orbit). White dwarfs are collapsed stars in their final death throes. These stars weigh about as much as the sun but are the size of the earth. A cubic inch of material from these stars weighs several tons. Neutron stars and black holes are even more compacted.

A few percent of the stars are known to vary in their intensity. Some vary irregulary; most of these are thought to be stars in their final phases of formation. Others regularly expand and contract as outer parts of the star try to adjust to changing conditions in their aging interiors. As it turns out, careful study of these stars and their rates of variation and brightness have made these stars the best means for determining the enormous distances to other galaxies.

Some variable stars suddenly increase their luminosity by 100,000 times in a few days, and then fade back into obscurity after a year or two. These are the so called novae, or "new stars". It is thought these stars are stripped of their loosely bound outer layers by nearby companions. Related to the novae are the very beautiful "planetary nebulae" that blow off their atmospheres in very symmetric and colorful patterns. Both novae and planetary nebulae

Example of a planetary nebula. Rings, interlocking helices, and other patterns are characteristic shapes for these objects.

are stages through which many very old stars evolve before becoming white dwarfs.



The Crab Nebula is a supernova which exploded in the year 1054 A.D. Remnants of these supernovae are among the strongest and first radio sources detected.

More massive stars tend to be the brightest and shortest lived stars because their large gravitational forces speed up their burning rates. The normal lifetime of these stars is just a few thousand centuries. When these stars die, they don't just fade away. Their funerals consist of the most spectacular shows seen in the heavens, the "supernova". The Crab Nebula shown above was one such supernova that took place in the year 1054 A.D. The Crab was brilliant enough to be seen easily in the daytime sky (strangely, the event was recorded by the Chinese and American Indians, but not by the Europeans). Other less brilliant supernovae were recorded by Galileo and Kepler in 1572 and 1604 A.D. Remnants of other much older supernovae are scattered throughout the sky. (It is estimated that one such event takes place in our galaxy about every 30 years, yet none has been seen for 3 1/2 centuries.) A few supernovae are observed in other galaxies each year; when they are first observed, they are often as bright as all the other 100 billion stars in the galaxy put together!

One remnant of such an event is the inner core of the exploding star that has been

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highly compressed by the explosion into a tiny neutron star about the size of Charlottesville. These stars spin rapidly, and hot spots on their surface give rise to the radio pulsars. Only the neutron star at the center of the Crab Nebula has been observed optically--it pulsates with exactly the same period as the radio pulsar seen in this object.

So far we have outlined current ideas concerning individual stars. Equally interesting are the systems of stars--nebulae, galaxies, and clusters--which we shall discuss in the next paper of this series. Meanwhile, do yourself a favor. The summer season is a season of splendor in the night sky. Take the family to a dark spot away from all lights and give yourself five minutes to adapt to the dark. By nine or ten in the evening, the Milky Way will be easily seen as a bank of light from a billion stars. You'll notice too that the band of light is marbled with dark regions--these are the nearby dust clouds from which the stars are born. Elsewhere in the sky you'll be able to resolve a thousand individual stars. Notice their colors. If you're interested in identifying stars and constellations, take a copy of the charts from the latest Sky and Telescope magazine (available at your nearest NRAO library).

* * * *

GREEN BANK BOWLING 1974-75

Dick Hiner

The Green Bank bowling team completed a very successful bowling season placing second place in the Tuesday night league at the Elkins Recreation Center. A record of 85.5 - 58.5 was good enough to give us second place. In the first half of the season (thirteen weeks) we posted a 42-30 record and finished the second half with a 43.5 - 28.5 record.

Every Tuesday night--come hail, rain, or snow--we traveled 50 miles one way to Elkins over Cheat Mountain. Despite some hectic trips over the mountain and some disappointing bowling nights, most everyone who bowled enjoyed the season. If you want to number yourself among the stalwarts and would like to bowl next season, please contact me at extension 309. The next bowling season starts about August 26 or September 2. In all probability, I will not bowl the first half of the season so you all will need a new captain. CAUTION is the word if you accept the job because they will use PITTSBURGH RULES as outlined in the following letter I received.

Captain Hiner:

According to the rules and regulations of the NRAO Tuesday Nite 6:30 Bowling Team, when the complete team strikes in one frame (all five players) the captain is obligated to purchase the beer for the following bowling night. You will note that in the 7th frame of the first game on Tuesday, Nov. 26, 1974, the entire team had a strike. After serious deliberation and upon completion of Tuesday night's event, the team voted and decided they would like to try an imported beer - preferably Heinekens beer.

The Team Thanks You

We will have our annual steak cook-out at Old House Run picnic grounds. Don Hovatter will be the Chef and Gerry Valencia will be the Brewmaster for the 20 adults and 17 children planning to attend the cook-out.

The following employees bowled this past season: J. Spargo, R. Hallman, J. Gibb, C. Williams, D. Hovatter, G. Valencia, W. Monk, B. Vance, R. Hiner, R. Poling, and H. Brown.

Year Statistics

	Won	Lost	%
Crystal Spring Key Mkt.	86	58	.5972
Green Bank	85.5	57.5	.5938
Tomblyn Funeral Home	84	60	.5833
Cheat River Inn	82	62	.5694
McQuain Excavators	79	65	.5486
Davis & Elkins College	77	67	.5347
Wilmoth Auto	73	71	.5069
Bata Shoe	68.5	75.5	.4757
Wildlife	61	83	.4236
Butch Store	58	86	.4028
Weese Electric	57	87	.3958
Frito Lay	55	89	.3819

* * * *

Answer to punctuation quiz on page 10: That that is, is; that that is not, is not. Is that it? It is.

HOW TO GET CLIPPED

Fred Follicle

The Big City--product of ten thousand years of cultural evolution. Here one can savor the full spectrum of human experience, even in the pursuit of such mundane tasks as getting a haircut.

Recently I decided to have my ears lowered a bit to improve my looks and reduce my shampoo consumption. Eschewing the usual barber shop, I elected to treat myself to the luxury of a styling salon. Thus, with high hopes and a full wallet, I screwed by courage to the sticking point and entered "Henry's House of Hair", in downtown Philadelphia. Picking my way through a small forest of potted rubber plants, I seated myself in the stylish lounge which adjoined the salon. After a ten minute wait, during which I had the privilege of perusing several old copies of "Crewcut Quarterly", Henry beckoned me to the chair.

"Step right up, fella. I'm a-gonna cut your hair off", Henry smiled menacingly, waving scissors in one hand and a long comb in the other. His own hairdo looked like a giant cat's fur ball. He wore a print shirt, open at the top for the first three buttons. I sat down in the big chair, feeling for a moment like Captain Kirk at the controls of the Enterprise. Trouble was, Henry was pushing the buttons.

"Now, what would you like done?" Henry began to exercise the scissors.

"Uh, gee, I just want a trim. See, my bangs are a little long and the hair gets in my eyes....."

"Just a trim?" Henry was obviously disgusted. "From a man who has studied with the great Bassoon of London you want a trim???"

"Well, gosh, I..."

"Non, monsieur. Not a trim. Not from the great Henry! We will do something more ambitious, more creative. But first we need an analysis. I will call Wanda, our trichologist-in-residence."

Henry pushed a red button on the side of the chair, and a bell rang softly in the back of the shop. Soon a mousey young girl, dressed in a lab coat and sneakers, entered the cutting room.

"Wanda, I want an immediate analysis of this gentleman's hair."

Wanda said nothing, but carefully preened my scalp for an appropriate specimen. With a quick yank, she removed a single hair which she proceeded to mount on a microscope slide. Having done so, she disappeared the way she had come in. In the meantime, Henry had retired to a nearby sofa, picking up a copy of "Scalp Digest" on the way.

For ten minutes I sat alone in the chair, with nothing to do but listen to the innocuous background music being piped into the room. I fidgeted uneasily. The corner barber had never analyzed my hair. I mean, hair's hair, right?

Wrong. Wanda returned, with a clipboard in her hands and a frown on her face. Henry looked up from his magazine and inquired as to Wanda's researches.

"I ran a standard analysis, including the usual chemical and physical tests. The client's hair is deficient in basic protein, seven fundamental amino acids and lanolin. Furthermore, it lacks sufficient lithium, berylium and boron, not to mention GL-70 and MSG. Follicle structure is weak, and the shaft shows considerable physical damage. Frankly, it's fourth-rate hair, unfit for human consumption unless baked in a tuna casserole."

Henry knitted his eyebrows for a minute Putting down the needles, he excused Wanda and walked back over to my vicinity.

"I see we have a little problem with your hair's condition. Let me ask you sir, do you use a rinse after shampooing?"

"Well, I usually have a hot water rinse after shampooing with a bar of Zest."

"Yes, I see." Henry put his finger to his lips and began to examine my head carefully. "Well, we could try a Bouffant Blowout. Or a Modified Mohawk. Or, perhaps a Kinky Kurlie. No...., I think what you need is....a Cossack Cut."

"Huh?"

"Yes, definitely. A Cossack Cut will take advantage of your hair's natural limitations. Besides, it's very fashionable. The women will love it, and you'll be the envy of the office."

I could sense that Henry was committed now, and my protests were to no avail. Carefully he began to snip away at the fringes of my coiffeur.

"Mmmmmmmmmm...." Henry was really getting into his work now. He began to chew vigorously on a stick of Juicy Fruit. The

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scissors were flying faster.

"Aaaahhh....." A veritable torrent of hair was falling on all sides now. Henry's scissors were beginning to glow a dull red. He was chewing faster, and his pupils began to dialate. He was a man possessed. I strained to see myself in the mirror, but my view was blocked by Henry's chest. Five minutes went by, then ten. My head began to feel lighter. Suddenly Henry stopped. Stepping back about a yard, he held his thumb up to guage his handiwork.

"C'est magnifique!" cried Henry, making full use of his remembered high school French. "Yessir, you're the height of fashion now--the epitomy of good grooming. A shear masterpiece!"

Henry stepped to the side, and I could finally see the mirror. I was stunned--he had cut it all off, Yul Brynner style. Trembling, I climbed out of the chair, counting out $20 as Henry gave me two free tubes of depilatory cream.

Henry was still beaming as I walked out the door and headed for a hat store.

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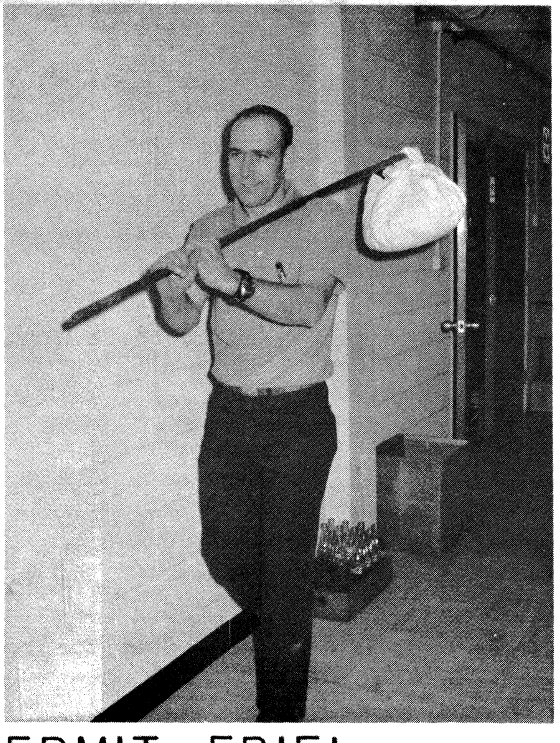
BE SEE'N YA - MOV'N ON



KERMIT FRIEL

RECREATION ASSOCIATION NEWS

Chuck Brockway

The NRAORA annual picnic has been set for July 26 at the recreation area. The picnic will be generally the same as for the past few years except that this year there are some new carnival games, and also we hope to speed up the food serving lines. Guest tickets will again be available at $2.00 for adults and $1.50 for children under twelve. See Harry Wooddell for guest tickets.

Anyone who has not received the new membership cards for employees and dependents is asked to contact the NRAORA secretary, Judy Moore. It may be necessary to have the membership cards for the picnic.

The Board of Directors welcomes two new members to fill vacancies on the Board. They are Bill Radcliff and Henry Taylor. Their terms of office are from May 19, 1975, to December 31, 1976.

The only things that the NRAO suggestion box in the lobby has produced in the past six months are two spiders. Recreation association members are reminded that one of the surest ways to bring a matter to the attention of the Board of Directors is by way of the suggestion box.

The men in the Maintenance Division have been working hard to keep and improve the condition of the rec. area. It is hoped to have the ball field in playable condition before long. Occasionally, someone is still discovered using the tennis or basketball courts with hard heel shoes. Members are reminded that these areas represent a substantial investment and will be quickly ruined unless tennis shoes are worn.

A memorandum will be sent to all employee members in mid-June concerning the signing up for swimming lessons. The lessons will probably start in early July and run to mid-August.

A square dance is being planned for June. We are hoping to be able to have this outside, probably at the pool. In order to keep ticket prices low, the rec. association will not furnish chips or pop. To entice beginning square dancers to the dance, instructions will be offered at the dance by the more experienced dancers. Watch bulletin boards for further details.

* * * *

ANOTHER METEORITE STORY

Wally Oref

Some astute astronomer once said that meteorites come in showers. Maybe meteorite stories come the same way. In the February, 1975, issue Frank (Meteorite) Clark told us his thrilling story about searching for the Anastasia meteorite in the boondocks near Laurel Mountain. Frank's story prompted one of our employees to tell me about a meteorite that fell in the early 1920's (the 20's were good years for meteorites). I'll admit when he started telling me the story I thought to myself, "Oh, oh, here comes another one." But I listened and the story took on a familiar note. It made me recall that back around 1962, another native of the area had told me a similar story about the same meteorite. Unfortunately, I never followed up the story because I wasn't very interested in meteorites. The basic information in both stories was pretty much the same but the latest story contained many more details. This is the story he told me.

One fall evening in 1925, two high school age cousins were walking home from a school activity at Green Bank High School. By the time they started up the Old Green Bank Road, (road past H. Hevener's) it was dark. They had almost reached the home of the boys when suddenly a bright light lit up the sky. For a few seconds it was daylight. They looked up to see a big bright ball of fire falling towards the ground. They watched it crash into a cornfield off to their right and not very far from where they stood, awe-stricken. Immobilized for a few seconds, their feet failed to move. But once they were functioning again, they took off for the nearest home as fast as they could run. They were scared to death because they didn't know what it was that they had seen.

After reaching the first home they breathlessly told what they had seen. The people at home believed they saw something alright, but no one jumped up and rushed down to the cornfield that night to look. People in Durbin saw the fire ball and newspaper reports indicated it was seen by people hundreds of miles away. The next day a couple of older family members - mainly out of curiousity - went down to the cornfield to see if anything had really fallen there. Much to their surprise they found a roughly circular area where the cornstalks were bowled over and either burned or singed. Lying in the middle of the area was a dark, boulder-like rock so big and heavy that they couldn't budge it when they tried to turn it over.

The story made hearty conversation around the community and all kinds of speculations were made about just what it was that fell out of the sky that night. A few people came to see the "big stone", but no one had any real interest in trying to find out what it really was. Several years later - around 1927 - the local biology teacher, Mrs. Harwick, came to look at the rock and broke several pieces off and took them back to school to show to her students. This is when our older employee saw the fragments. As best he could remember, the pieces looked shiny - like they had metal in them. He definitely remembers her bringing the pieces to class and he said it was in 1927. Until he read Frank Clark's story, he had forgotten about this meteorite.

Well, I was impressed by the story alright. Especially since I had heard it once before. However, before I was going looking for that rock from outer space, I was going to hunt up more facts to substantiate the story. I didn't do it immediately, but started my investigation about two months later when I had the story re-told to me and taped. After that I began checking information in the story by talking with people who might have seen the meteorite while it laid in the cornfield. Unfortunately, I wasn't able to check with either one of the cousins who actually saw the fall; one had died and the other had long since moved away from Green Bank.

However, a brother and a sister to one of the eye witnesses were still living near Green Bank. When the brother was contacted, he said that he remembered running into the meteorite with a plow, and that it was big - so big that, thereafter, they plowed around it for several years but eventually they dug a hole and rolled the meteorite over into the hole and covered it up. Asked if he could locate the meteorite, he replied, "No, I tried several years ago and I couldn't. All I can tell you is that it is in the field on the lower bench." The latter statement at

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least told us which of two fields it was in. Later I called the sister and she confirmed the story. She said that she recalled her brother telling about the big ball of fire and hearing that people in Durbin also saw the fire ball that night.

My employee friend said that he knew which field the brother meant. It was a pasture of several acres and hunting for the meteorite would be like looking for a needle in a haystack.

"True", I said, "but if it's a metallic meteortie, you could detect it easily with a metal detector."

"Well," said my friend, "when are you going to look for it?"

"I don't know. I'll have to talk to George and Frank about it" I replied.

* * * *

TO: WAVEGUIDE 64751

CONCERNING: The future of NRAO in Charlottesville.

Is it possible that NRAO may transfer its main headquarters from Charlottesville to the VLA site, perhaps Albuquerque?

If so, when might such a move be expected and how much notice will be given to the employees before such a move?

ANSWER: Obviously one cannot say that such a move will never occur. Yet in terms of our current thinking, moving our headquarters away from Charlottesville is not being considered - at least not at the Director's level, where such a decision would be made.

While there would be advantages to having a headquarters nearer to both the VLA and our millimeter wave telescope site, it should be evident that Charlottesville and Green Bank enjoy a very valuable, close relationship of mutual support. This situation, combined with the fact that Albuquerque is nearly as far from the VLA site as Charlottesville is from Green Bank, and that such a move would be expensive, dictate against a headquarters transfer for the foreseeable future. Naturally every attempt would be made to notify our employees in time to make their own personal plans if a transfer were ever to occur, but a transfer is not even being considered now. - DEH

1975 NATIONAL YOUTH SCIENCE CAMP

The 1975 National Youth Science Camp opens on June 29, 1975, when 100 delegates report to the Pocahontas 4-H Camp near Thornwood for three weeks of scientific and non-scientific study, recreation, and relaxation. During their stay in Pocahontas County the delegates will come to NRAO for a morning visit on July 9. In between these dates, NRAO will have three staff members speak at the camp.

There will be something different about the delegation this year. Instead of an all male group, we can expect to see possibly 30 females among the 100 delegates. It should be a mighty interesting year for the National Youth Science Camp.

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A TOUCH OF COLOR

During the first week of June members of the Green Arbor Garden Club, a group of Observatory wives headed by Lisa von Hoerner and Hennie Kellermann, planted a variety of bedding plants around the Lab, Cafeteria, and main entrance to lend a little color to all the lush green.

Scads of blooming marigolds, petunias, salvia, zinnias, and ageratum were planted around the flag pole and Jansky plaque in front of the Lab, along the entrance and road sides of the Cafeteria and around the NRAO sign at the main entrance.

Thanks ladies! These beautiful flowers give the place a touch of color and brightness.

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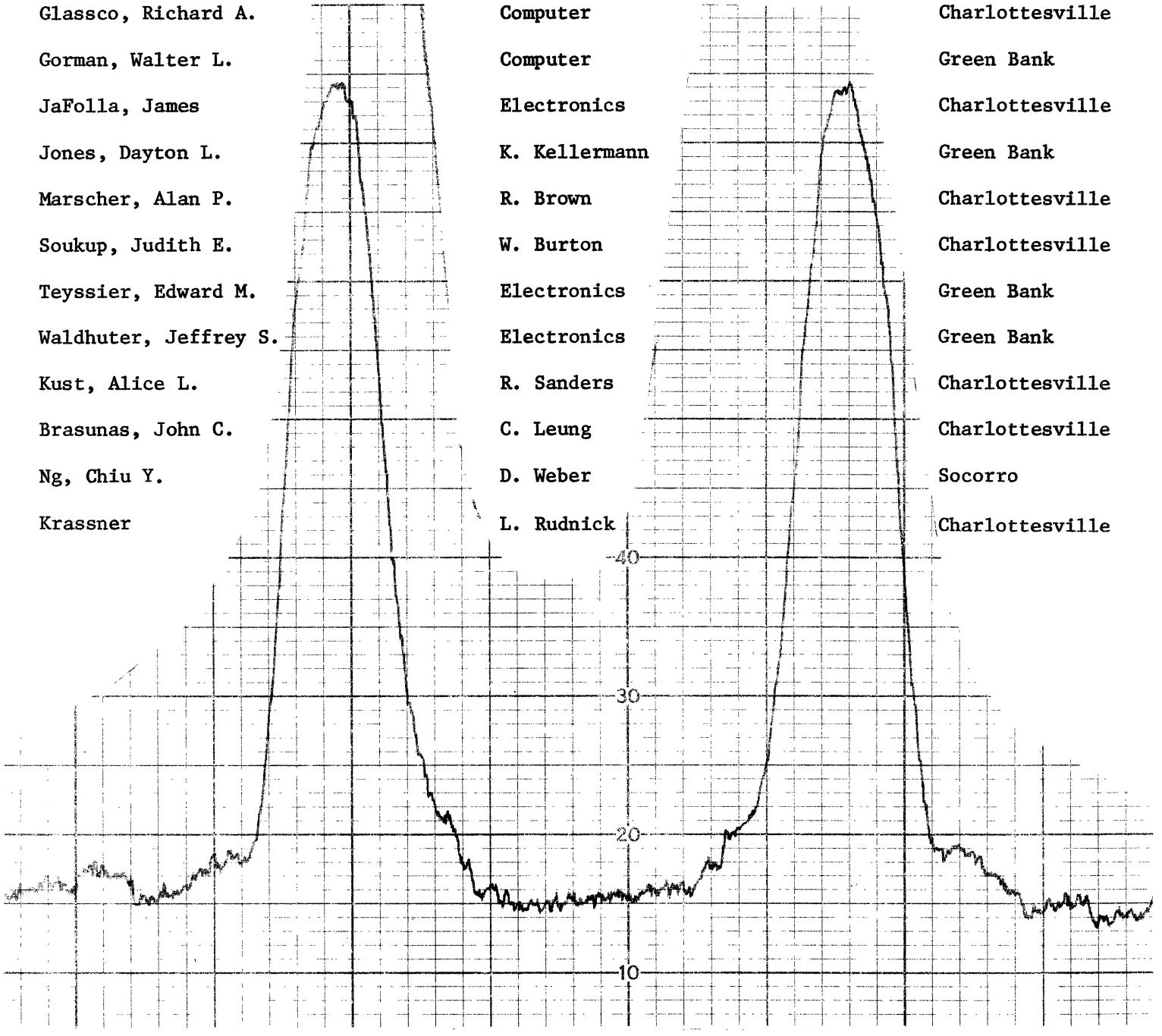
1975 SUMMER STUDENTS

Name	Advisor	Site
Baines, Kevin H.	E. Greisen	Charlottesville
Berg, David M.	D. De Young	Charlottesville
Burns, Jack O.	F. Owen	Charlottesville
Carter, Michael J.	Electronics	Charlottesville
Cosner, Kenneth J.	J. Lyon	Charlottesville
Glassco, Richard A.	Computer	Charlottesville
Gorman, Walter L.	Computer	Green Bank
JaFolla, James	Electronics	Charlottesville
Jones, Dayton L.	K. Kellermann	Green Bank
Marscher, Alan P.	R. Brown	Charlottesville
Soukup, Judith E.	W. Burton	Charlottesville
Teyssier, Edward M.	Electronics	Green Bank
Waldhuter, Jeffrey S.	Electronics	Green Bank
Kust, Alice L.	R. Sanders	Charlottesville
Brasunas, John C.	C. Leung	Charlottesville
Ng, Chiu Y.	D. Weber	Socorro
Krassner	L. Rudnick	Charlottesville




YIPPEE! THE SUMMER STUDENTS ARE HERE AGAIN.