

# The O B S E R V E R

Vol. 14, No. 1

February 1973

Page 1

## NRAO TEN-YEAR EMPLOYEES



Left to Right - Lenny Howell, Jim Dolan, Bill Horne, Art Shalloway, Martin Barkley, Ron Monk, Ether Tyson, Anna Grace Ware, Bill Vrable, Don Hovatter, Tony Hamed, Everett Arbogast, Russell Clarkson. (Not present when picture was taken: Winnie Sheets, Dick Skaggs, and Jim White.)

Story on Page 2.

TEN YEAR SERVICE AWARDS

R. Jeffries

At a dinner held in their honor January 3, 1972, NRAO Director, D. S. Heeschen presented ten year service award pins and certificates to sixteen employees. Observatory employees completing ten years of continuous service in 1972 were:

Everett M. Arbogast  
Amos M. Barkley  
Russell M. Clarkson  
James L. Dolan  
Julian M. Hamed  
William G. Horne  
Donald H. Hovatter  
Leonard E. Howell  
Ronald E. Monk  
Arthur M. Shalloway  
Winfred Sheets  
Richard S. Skaggs  
Ether J. Tyson  
William D. Vrable  
Anna Grace Ware  
James S. White

Dr. Heeschen remarked that as of December 31, 1972, there have been eighty-two employees who have received ten year service awards. Of this number seventy-four are still active in our total employment of two hundred fifty-six. There are also two husband and wife teams who have ten years or more of continuous service.

In addition to the service award recipients and their spouses, two retired employees, division heads representing the awardees and NRAO assistant directors attended the dinner.

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Typist: - Vicki Taylor

Photography and Printing: - Brown Cassell  
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Contributors to this issue: - Al Braun  
Dave Buhl  
Fred Crews  
Wade Davis  
Carolyn Dunkle  
Robert Hjellming  
Don Hovatter  
Ross Jeffries  
Jack Lancaster  
Steve Mayor  
Wally Oref  
Seth Shostak  
Mary Ann Starr  
Gerrit Verschuur  
Dave Williams

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A special thanks to all of those who helped assemble the OBSERVER.

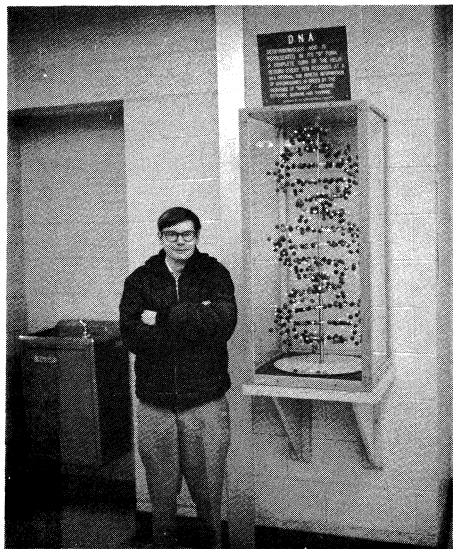
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## OUR COMMON ANCESTOR, THE MOLECULAR CLOUD

Dave Buhl

Recently it has become apparent that the molecular clouds which inhabit the dusty regions of our Galaxy play an essential role in evolution. The evolution involves three periods: (1) the chemical evolution of the molecules in the clouds, (2) the evolution of the clouds into stars and planets, and (3) the subsequent evolution of life on the planets.

Several patterns are emerging from the radio observations of the molecular clouds. One such pattern is illustrated in the molecular chart (Fig. 1, page 5) which shows all the molecules that have been found in these clouds, grouped according to the heavy elements which they contain. This is an attempt to put some order into the chaos of interstellar chemistry and indicates that these molecules aren't just random collections swept off the floor of the 36-ft or 140-ft telescopes after a frantic observing run. They are actually related to each other and in particular to the carbon atom. The bar under the molecule means that the molecule has been seen in several radio sources outside the galactic center while the heavy molecules without a bar appear only in the galactic center. This is probably due to



Dave Buhl shown returning to a local watering hole after bagging another molecule during an expedition into the darkest recesses of Kitt Peak.

the larger amount of molecules present in the center of our Galaxy producing a stronger signal. Most of the heavy molecule spectra are painstakingly produced by hours of arguing with Ben Zuckerman followed by hours of grinding away on the Galactic Center only to return with a very feeble line if you are lucky. So being able to detect the large molecules in sources outside the galactic center requires more sensitive receivers and more congenial observers than are presently available. Consider, for example, the case of ammonia ( $\text{NH}_3$ ) which was initially found only in the galactic center. At the time this was considered somewhat of an anomaly, however more sensitive receivers have been developed and ammonia is now found in a number of different sources. One suspects this will be the case for most of the heavy molecules.

The most striking aspect of the molecular groupings is that all of the molecules which have more than one heavy atom in them always have a carbon as one of the atoms (with the exception of  $\text{SiO}$  which has the same bonding configuration as  $\text{CO}$ ). So carbon is extremely important in the chemistry that is going on. The result is these families of organic molecules are built up based on either  $\text{CN}$ ,  $\text{CO}$ ,  $\text{CC}$ , or  $\text{CS}$ . So one gets a hint of considerable organic chemistry taking place. However, the exact chemistry is still somewhat of a mystery even to the laboratory chemist.

Once a molecular cloud has formed, it evolves rapidly on an astronomical time scale. In about  $10^5$  years it has partially collapsed and is well on its way to forming a star and possibly planets to circle the star. The cloud has molecular hydrogen and dust as its major ingredients with trace amounts of the heavy organic molecules. The  $\text{H}_2\text{O}$  molecules in the center of the collapsing cloud emit a very strong line at a wavelength of 1.35 cm. Essentially some of the velocity built up in the gas as it collapses is converted into microwave energy by the maser action of the water molecules and then this energy is radiated out of the condensing cloud. This intense radiation, which originates in a thin shell 1 astronomical unit in radius, signals the birth of a star.

Hence we know that the molecules are

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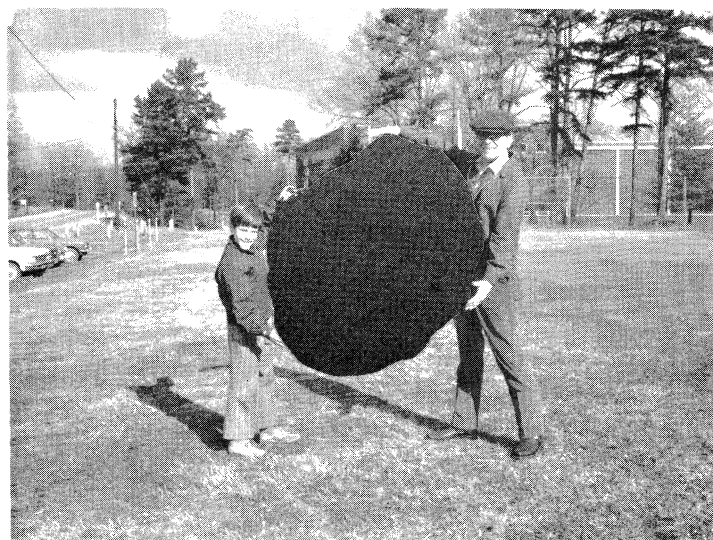
present in the cloud during the formation of a star and planets. There they perform some of the cooling functions and contribute to the early atmospheres of the planets. The Earth is thought to have accumulated a secondary atmosphere along with the primordial molecules. But there is still occasionally some stray remnant from the early solar nebulae which arrives at the Earth. Cyril Ponnampertuma's group at NASA discovered that a meteorite which fell in Australia contained extraterrestrial amino acids. There is also some evidence that comets contain significant amounts of organic molecules since they exhibit fragments of these molecules in their optical spectra when they approach the sun. It is fairly certain that a large number of comets impacted with the earth during its early history. The collision of a comet with the Earth would provide a large amount of organic material. Whether there are sufficient amounts to initiate a sequence which eventually results in a life-like organism on a planet is merely speculation.

The study of the origin of life seems to be closely related to understanding the molecular clouds. This area of research was given a breath of life by Stanley Miller and Harold Urey in their classic experiment in 1953 in which they showed that water, ammonia and methane ( $H_2O$ ,  $NH_3$ , and  $CH_4$ ) when mixed in a bottle and activated by an electrical spark would produce a number of amino acids. In particular, the molecules which are important as initiators and intermediates in these reactions are the same ones that are found in the interstellar molecular clouds ( $H_2O$ ,  $NH_3$ ,  $H_2CO$ ,  $HCN$ , and  $HC_3N$ ). In the laboratory experiments the usual conditions are a temperature of  $300^{\circ}K$  and a pressure of 1 atmosphere, while in a molecular cloud the temperature is less than  $100^{\circ}K$  and the pressure is smaller by 20 orders of magnitude! Thus it is somewhat surprising that one does get similar molecules under this vast difference in the environment. Formaldehyde leads to the formation of sugars, hydrogen cyanide to purines, and cyano acetylene to pyrimidines, important molecules which make up DNA. Hence the unusual connection between biochemistry and astronomy.

We know that organisms on the Earth go back some  $3\frac{1}{2}$  billion years. There is evidence in fossils that micro-organisms existed that long ago. How these primordial organisms

originated is a very important and difficult question to answer. Certainly a combination of the study of the origin of life and of interstellar molecules will be very fruitful in determining what the origin of our own life forms may have been, and in suggesting what life forms may have evolved on other planets. If the chemistry is extremely important as is suggested by the types of molecules which are produced and if the bonding is so dominant then maybe in the bonds of the very simple molecules themselves you have some of the code essential for producing the more complex molecules. Although the primordial synthesis in a molecular cloud is a preview of the organic chemistry to come, it is not necessarily identical to the subsequent chemistry in a living organism.

The startling conclusion is that the molecules are present precisely at the time when a star and planets are being formed out of the dust and gas in the molecular clouds. If the life span of a star were the same as



Lew and Herm Snyder holding the only molecular cloud known to be in captivity.

that of man, then the collapse of the molecular cloud which gives birth to a star takes place in one day. The entire process seems to be more than coincidental and certainly suggests that the condensation of a star, the accumulation of the dust and molecules into planets and atmospheres, and even the

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subsequent evolution of life are all part of an astronomical evolutionary cycle of very

long time scale. Perhaps this is a very common occurrence in our Galaxy.

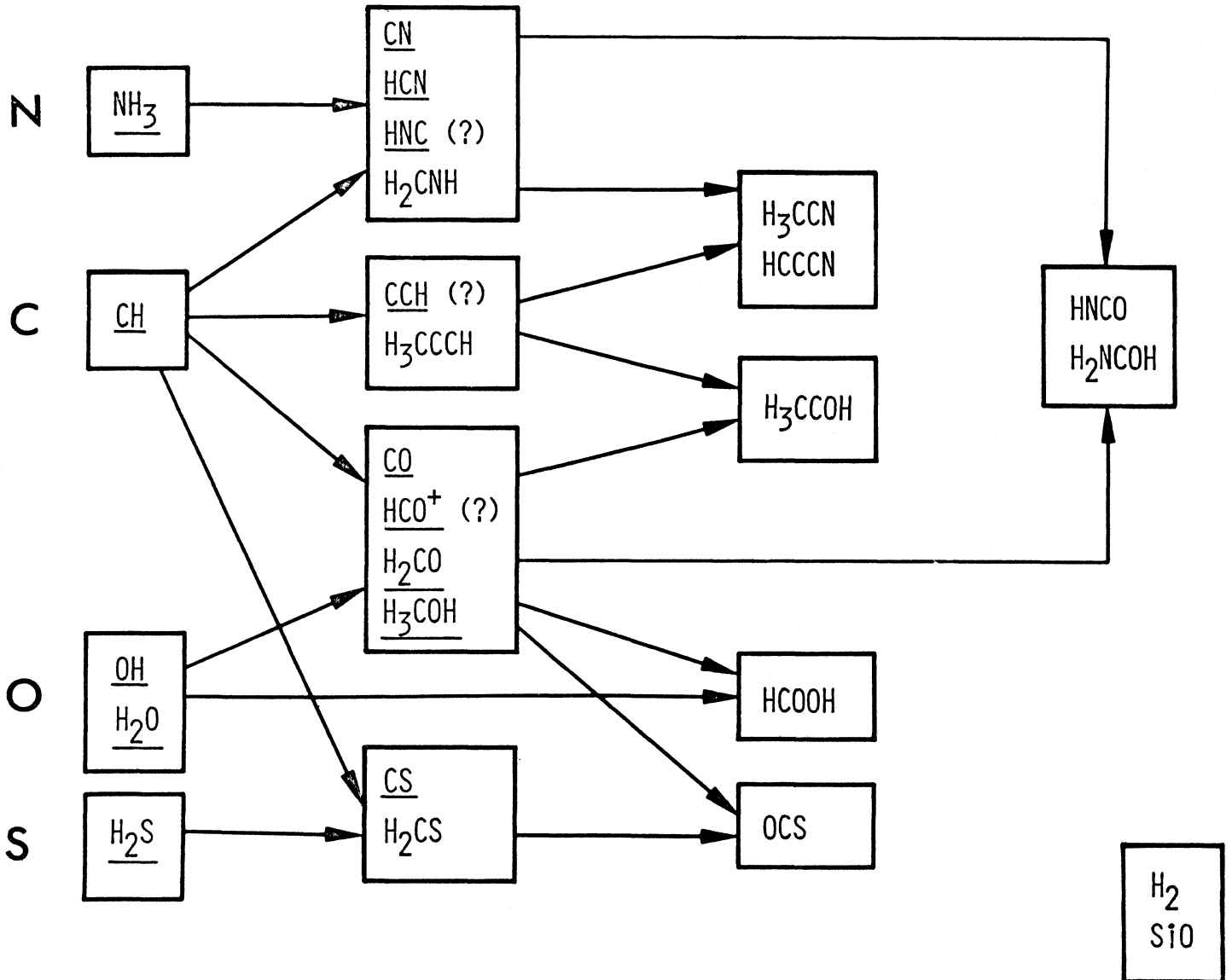


Fig. 1 - This is not the master plan for the VLA nor a government organization chart. It shows all of the molecules which have been detected in molecular clouds grouped together into families based on their heavy atoms. The arrows show similarities in the family tree and possibly represent chemical pathways. The molecules with a bar underneath have been found in a number of galactic clouds and are fairly abundant. The (?) indicates a possible identification of two molecular lines at a wavelength of 3mm (X-ogen and Y-ogen).

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WHAT'S HAPPENING WITH THE VLA?

Jack Lancaster

The answer to that question is "lots!"

The pre-proposal conference held at the New Mexico Institute of Mining and Technology on January 23 was attended by representatives of the prime vendors who received the RFP for the design, fabrication, erection and test of the 28 antennas. Many potential subcontractors sent representatives as well.

Availability of labor, labor laws, industrial resources and doing business in New Mexico were topics discussed by officials from the New Mexico State Planning Office and the State Department of Development. A discussion of the proposed erection site layout was given by Bill Horne, followed by a lively technical session; then came lunch in the Institute's Cafeteria and a bus tour to the VLA site.

Rights-of-entry have been obtained from all of the landowners involved in the VLA site and the U. S. Army Corps of Engineers in Albuquerque has started the necessary land acquisition; a contract has been negotiated with Limbaugh Engineers, Inc., of Albuquerque to develop two-foot contour maps of the central wye section and the wye arms, and in addition, Limbaugh will complete digitized cross-sections of the arms so that engineering calculations can be made to determine the most advantageous location and profile of the wye arms.

The final design of the transporter is complete and work on specifications and the RFP has begun. Electronics development work is well underway on front ends, oscillators, IF transmission and delay lines. Purchase contracts have been placed for 400 meters of waveguide, half of which will be tested in Green Bank and the balance will be tested by various installation techniques at the site. Basic hardware specifications for the computers are being prepared, which will be finalized and issued for pricing in mid-summer.

The VLA staff has grown considerably with the transfer of 18 people from the NRAO staff on January 1. Mr. Forrest Wells has joined the VLA staff as the chief engineer "on-site" and will be moving to New Mexico in late March.

Response from Architect/Engineering firms to our solicitation and ad in the Commerce Business Daily requesting expression of interest and information has been overwhelming, and the VLA office is overflowing with letters and material sent in by these firms.

With all this activity, a good, one-word answer to the question, "What's happening with the VLA?" -- It's B U S Y !

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TEST THOSE OLD SEEDS

Before you throw those old packets of seeds away (now costing 50-75 cents each) because you don't think they are any good, why don't you test them to find out if they are worth planting this year. To test seeds for germination is a simple test, very inexpensive, and only takes a little time. Here's how it's done.

You will need: a double thickness of soft paper toweling (11" x 11"), a piece of Saran Wrap or its equivalent, a ballpoint pen, and of course, the seeds you want to test.

With the pen, number each of the seed packets. Number the top of the paper towel with the same numbers and space about 1" apart.

From packet number 1, take ten seeds and place in a vertical column below number 1 on the paper towel. In a like manner do the seeds from the other packets. In a corner of the towel note the date of the germination test. Dampen the towel with water, but not sopping wet. Carefully roll the towel into a cylinder and in turn roll the towel in Saran Wrap. Place the roll with seeds where the temperature averages 70 degrees.

In four days inspect the seeds for germination. Be careful when you unwrap the paper towel because it tears easily. Note how many seeds have germinated. Reroll and inspect seeds twice more in the next eight days.

If seven or more seeds out of the ten germinate, they will be as good as this year's seed. If less than seven germinate, throw the seeds out and buy new ones.

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**LUPO'S FOR LUNCH BUNCH**

Bud Taste,  
Registered Gourmand

As the noon hour approaches, NRAO's Charlottesville contingent braces its collective belly for another gastronomical adventure. Filing out the Observatory doors in packs of four and five, celebrated men-of-science pit their stomachs against the best food this town has to offer. And victories are rare.

In an effort to aid the inexperienced astronomer gastronome, your roving reporter-at-large (somewhat larger after this report), Bud Taste, is providing this critical review of the Charlottesville lunch scene. The information contained herein is based on meticulous research at every restaurant, coffee shop, diner, grill, and chophouse in Jefferson's city. For those who may think the results too subjective, the author hastens to point out that he has a calibrated stomach, registered with the USDA.

In Table I are listed the major feed bags frequented by the NRAO. Each has been rated for paunch peril on a scale of one to four, using the precepts set out by the American Association for Nourishment. You'll note that several of the eateries are rated at four skulls. Such establishments are best approached with an ample supply of Di-gel.

We now discuss individual bistros in somewhat greater detail.

SHONEY'S -- Perhaps Charlottesville's most mis-managed eating emporium, this Formica paradise remains ever-popular. A recent disheartening turn is the development of a highly malodorous atmosphere which is threatening to peel the paint off the walls. PIZZA INN -- Commonly known as the CONCRETE CHICKEN due to presence of same on the roof. Definitely the best hoagies in town, and the pizza's pretty good, too. Be sure not to sit in the booth next to the juke box since the music will resonate your liver.

LORD HARDWICKE -- The food and atmosphere here are both 'way above norm. The menu is, however, somewhat limited in its luncheon offerings. A particular attraction for the young and virile is the high proportion of good-looking waitresses.

TABLE I  
RESTAURANT RATINGS

SHONEY'S	☠☠☠
PIZZA INN (CONCRETE CHICKEN)	☠☠☠
LORD HARDWICKE	☠☠☠
MCDONALD'S	☠☠☠
LI'L DEL	☠☠☠
DUTCH PANTRY	☠☠☠
BARNABY'S	☠☠☠
UNIVERSITY CAFETERIA	☠☠☠
VIRGINIAN	☠☠☠
VILLIAGE INN	☠☠☠
ARBY'S	☠☠☠
HARDEE'S	☠☠☠
GLASS HAT	☠☠☠
LUPO'S	☠☠☠
LA HACIENDA	☠☠☠
COPPER KETTLE (PANCAKE HOUSE)	☠☠☠
CANTEEN (NRAO BASEMENT)	☠☠☠

The symbols indicate degree of stomach hazard.



The Promise

MCDONALD'S -- What can I tell you that you don't already know? You can taste a McDonald  
--continued, next page--

Table I

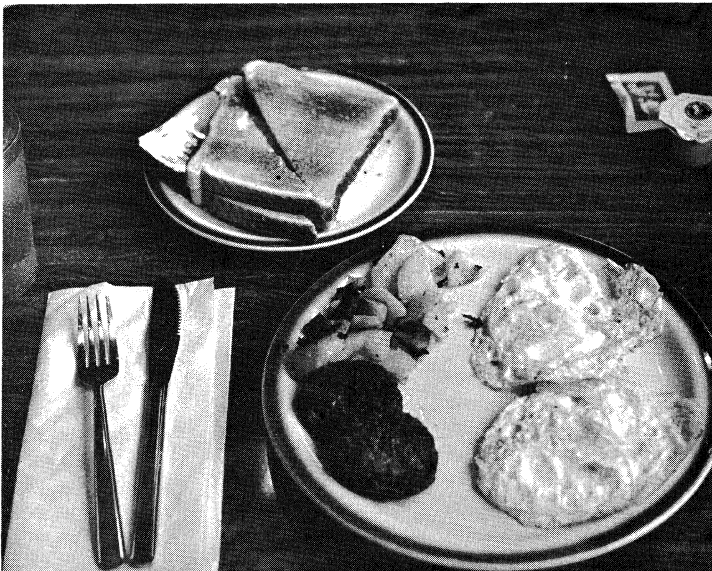
burger even before you get there, and you're never wrong. One of the few places you can still eat lunch for less than a buck. The quarter-pounders (named after a particular type of ballistic used by Lord Nelson) are overrated.

LI'L DEL -- The eatables here are definitely overpriced, and the portions were once rejected by the incredible shrinking man for being too small. If you really want to read the menu you'd better bring a flashlight, as the manager deliberately keeps the place dark so he can develop negatives from Cary's Camera Shop (next door) in the soup de jour.

DUTCH PANTRY -- Personally recommended by Bill Howard because of the chef's salad. Reminiscent of the comestibilia on turnpikes and interstates, and the only place in town where you order entirely by alphanumeric characters.

UNIVERSITY CAFETERIA -- Good food for the price, but the surroundings are reminiscent of college days (unless, of course, you're still in high school). According to Cuisine Quarterly, Betty Crocker once slept here.

VIRGINIAN -- High-backed wooden booths, orange and blue decor, college pennants--pure distillate of U. Va. The sandwiches all have names such as "Joe Nameth", "Booth Tarkington", "Johnny Unitas", and "Clifford Irving".



The Reality

HARDEE'S -- The hamburgers here are about the best around, mainly because of their high bituminous content. Contrary to rumor, the girls

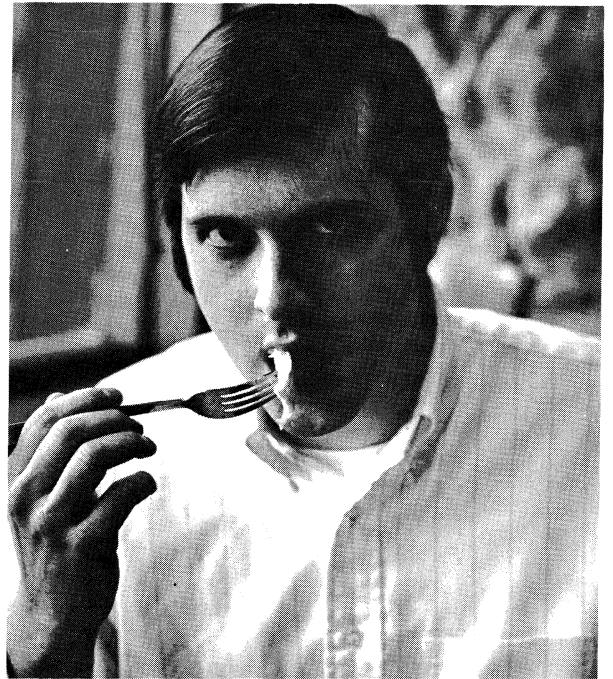
who work here did not graduate from the College of Medusa.

LUPO'S -- Barry Turner's home-away-from-home. Have the world's only 10W-30 steak sandwiches, conforming to all major auto manufacturing specifications except in regard to emission control.

LA HACIENDA -- Formally renounced by the Mexican government, claiming the chef didn't know beans about frijoles.

COPPER KETTLE (PANCAKE HOUSE) -- The probability of dying of old age in this establishment is non-negligible. Won a sealed-bid contract to cater at the Black Hole of Calcutta.

CANTEEN (NRAO BASEMENT) -- Service is fast, prices low. But the customers are definitely low class.



Bud Taste, owner of registered stomach #347, on the job.

With the above information in hand, your midday dining pleasure is assured. You can help maintain the small operations against the mounting mediocrity of the chains by voting with your stomach. And remember, any lunch you can walk away from is a good lunch. Burp!

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MOTORCYCLES ARE FUN

Bill Meredith

What has a dual overhead cam engine, uses torsion bars as valve springs, develops 1 bhp for each 10 cc's of piston displacement, accelerates to 60 in 5.5 seconds, does the quarter in 14 seconds and consistently goes 45 to 50 miles on a gallon of gas? Furthermore, it comes to a complete stop from 60 in 112 feet, has factory installed dual exhausts, a carburetor for each cylinder, hydraulic disc brake in front, and costs, brand new, just over \$1000.

The Ferrari 365GTC4 has a DOHC engine, disc brakes front and rear, but gets only 12 miles/gallon, requires 7.3 seconds to get to 60, 173 feet to stop, 15.7 seconds to reach a quarter mile, and costs \$27,500.

The Jaguar XJ6 at \$9,000 also has a DOHC engine, but is a little slower, requiring 10.7 seconds to reach 60, does the quarter in 17.1 seconds, and gets 15 miles/gallon.

The Porsche 911E has only a single overhead cam engine, accelerates to 60 in 6.6 seconds, costs \$9,200, turns the quarter in 15.4 seconds, and gets a whopping 19 miles/gallon.

Of course the exotic vehicle must be a motorcycle - in particular a Honda 450K3. I ride one to work almost every day. Mine was purchased new in 1970, has more than 9000 miles on the odometer, and runs as smoothly as a fine watch.

There has been a phenomenal increase in the number of motorcycles in the U. S. during the last 10 years. The Japanese lead the world in production by a large amount. The only motorcycle manufacturer in the U. S., Harley-Davidson, can't seem to become part of this increased popularity, although the largest and most expensive mass produced motorcycle is a Harley.

Are motorcycles dangerous? In a word, yes, but not as dangerous as might be expected. An overwhelming number of accidents occur either on the first few rides, or on a borrowed cycle. My opinion is that an experienced motorcycle rider is safer in town than a bicycle rider. This, mainly because a motorcycle can easily keep up with traffic, and the rider is, by law, better protected. On the open highway, a motorcycle is probably much more dangerous than an automobile. There is almost no margin

for error, and very little protection in case of an accident. Helmets are not much help in a high speed collision with a tractor-trailer.

In this day of plush, air-conditioned, softly sprung, kilo-buck priced, power steered, power braked, automatic transmissioned, idiot lighted, multitoned Detroit monsters, motorcycle riding is an anachronism. Shifting gears, with the foot, is precise, steering is accomplished by merely leaning in the direction of turn, and the bike is started by a quick transfer of weight to the kick lever. Front and rear brakes are independent, the right hand controls the front brake, and the right foot works the rear. The right hand also operates the twist grip throttle. The clutch is operated by the left hand, and the gear shift lever is moved about by the left foot. On some motorcycles, the rear brake and gear shift lever positions are reversed. British motorcycles are notorious for this, as well as leaking oil.

The unlimited vision, superb maneuverability, quick acceleration, and complete rider control, all contribute to the joy of motorcycling. There is a feeling of freedom that car drivers will never attain. So forget the stigma usually associated with motorcycles. Meet some of those nicest people on Hondas. Cut down on pollution and traffic congestion. Buy yourself a motorcycle and have the time of your life.

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ARTICLES WANTED

People who are not NRAO employees but who are on our mailing list, are invited to submit articles to the OBSERVER.

Articles for future issues of the OBSERVER should be in the editor's office by the 26th of the odd months. The OBSERVER is printed during the first week of the even months.

Articles about 375 to 750 words are about the right length. A picture or illustration with your article is always welcome.

How about it you people out there....let's hear from you.

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## GENERATOR CONVERSION PLANS

Steve Mayor

To convert a 6 volt or 12 volt automobile generator to a 110 volt, 60 cycle, 350 watt alternator, the following materials are needed:

### Materials:

1. 6 or 12 volt automobile generator with a 14 slot armature.
2. Fish paper.
3. Approximately 1 lb. No. 20 enamel-covered wire.

### Procedure:

**Preparation:** Remove the armature from the generator. Remove the pulley and the front cover from the armature. Remove all of the old wire on the armature. Remove old paper insulation from the armature slots. Clean the armature. Be sure that the insulation on the end of the armature laminations are intact; if not, repair or make new ones. Cut a groove in commutator flange. Using old paper insulation as a pattern, cut new ones from fish paper for the armature slots, being certain that the fish paper is the length of the armature laminations.

**Re-Winding:** Begin with the armature standing on end with the commutator down. Start winding in a clockwise manner from the commutator end. Wind through slots 2 and 14 (see Fig. 1) 50 turns. Continue to slots 3 and 13, 50 turns. Continue to slots 4 and 12, 50 turns. Then continue to slots 11 and 5 winding in the opposite direction, 50 turns. Continue to slots 10 and 6, 50 turns, and 9 and 7, 50 turns, ending with the wire at the end opposite the commutator. As each winding is complete, wedge the windings in the slots with the old wedge or wood. Slots 1 and 8 are not used. Check that the windings are not shorted to ground. Solder wire opposite commutator end to armature shaft. Solder wire at commutator end to commutator. Wrap a wire in the groove on the commutator and solder wire to all the segments, forming a slip ring. Paint the armature windings with shellac or varnish. Remove the ground brush from the generator. Replace the end cover and pulley on the armature. Put the armature into the generator housing and replace the end cap.

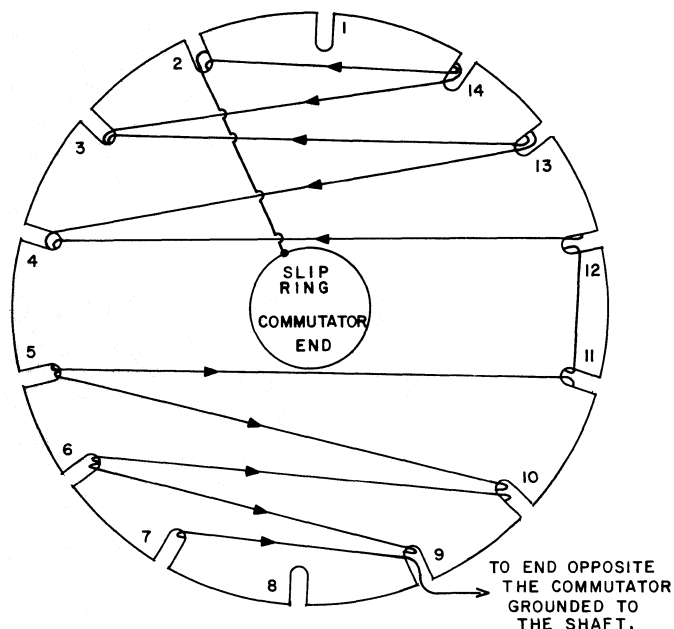


Fig. 1 - Armature Winding

**Testing the Alternator:** For 60 cycle operation the generator must turn at 3600 RPM. Mount motor to a power source with a pulley arrangement to turn the alternator at 3600 RPM. Hook up a 6 (or 12) volt source, depending on the original generator, to the field and ground terminals through a rheostat approximately 25 watt, 50 ohm. Connect a 100 watt light bulb between the armature terminal and ground. Connect an AC voltmeter between the armature terminal and ground. With the alternator turning at 3600 RPM turn on the 6 (or 12) volt field voltage. The bulb should light and the voltmeter should read 110-120 volts. If the output voltage is high or low, adjust the rheostat, varying the exciter current, thereby varying the output voltage. If the voltage is too low and cannot be increased, remove the armature and parallel the field windings. Re-assemble the alternator and repeat the Test Procedure.

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Habits are at first cobwebs, then cables.

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**NEW EMPLOYEES**



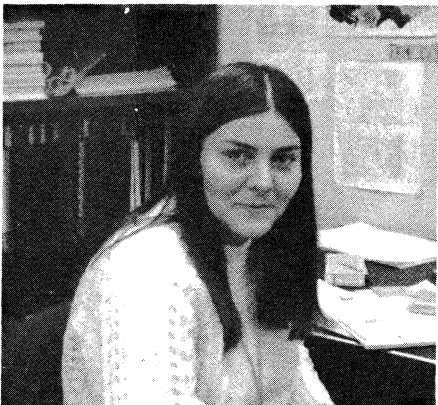
Donald K. Poillon  
Business Officer  
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Gail D. Browning  
Receptionist/Tel. Operator  
CV



Virginia A. Hull  
Secretary  
CV



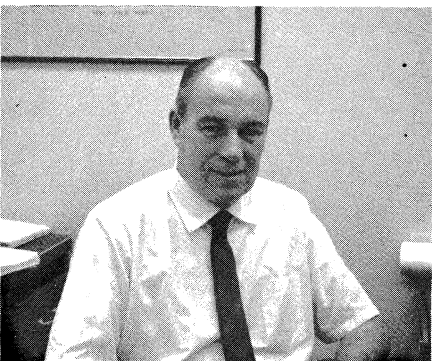
Rosemary L. Heckard  
Scientific Associate  
Basic Research - CV



Henry P. Palmer  
Visiting Scientist  
Basic Research - CV



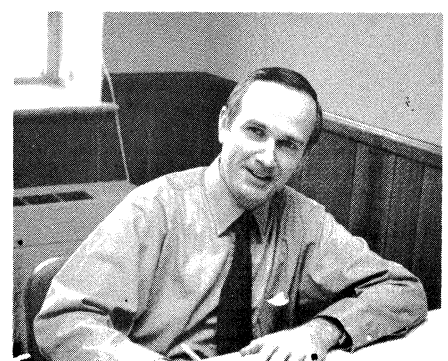
Sharon L. Spooner  
Computer Operator  
Computer Division - CV



John H. Lancaster  
Asst. Dir./ VLA Project Mgr.  
VLA Project - CV

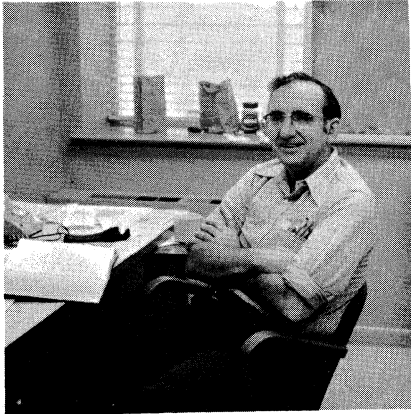


Bertha M. Allenson  
Executive Secretary  
VLA Project - CV



Anthony R. Thompson  
VLA Project Engineer  
VLA Project - CV

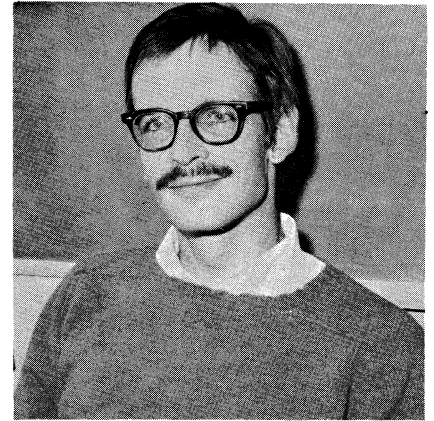
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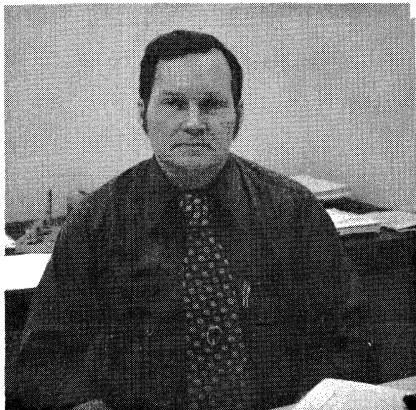
Harry L. Beazell, Jr.  
Electronic Engineer  
VLA Project - CV



Sharlene I. Wiley  
Technical Typist  
Director's Office



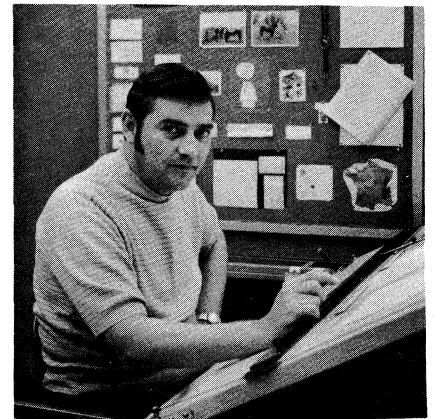
Alan DeS. Parrish  
Electronic Engineer  
VLA Project - GB



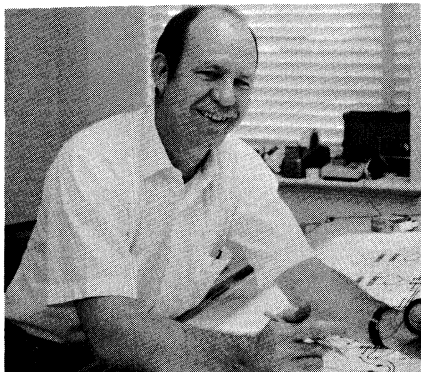
Forrest H. Wells  
VLA Site & Wye Manager  
New Mexico



C. Scott Donovan  
Accountant  
Fiscal Div. - GB



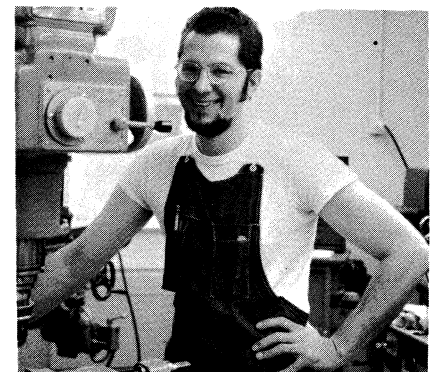
George L. Kessler  
Technical Illustrator  
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John D. Earnest  
Draftsman  
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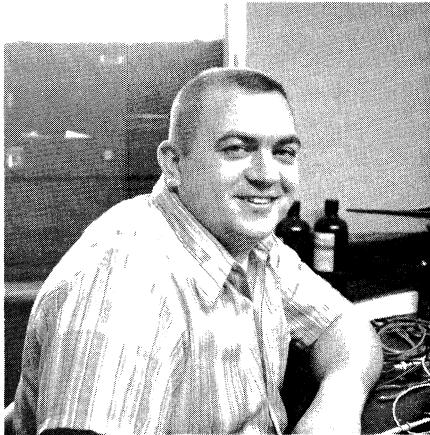


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Dylon N. Dillon  
Staff Shop Technician  
Shop - CV

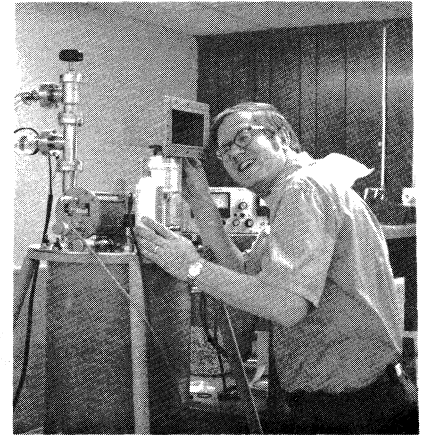
NEW EMPLOYEES (cont.)



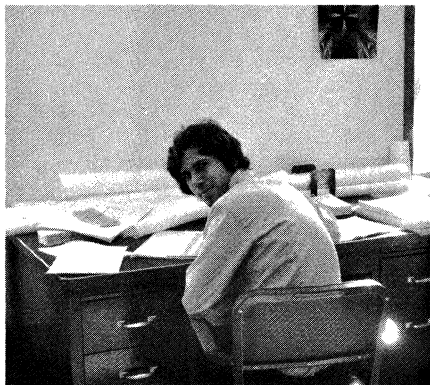
Ronald W. Harris  
Senior Technician  
Electronics - CV



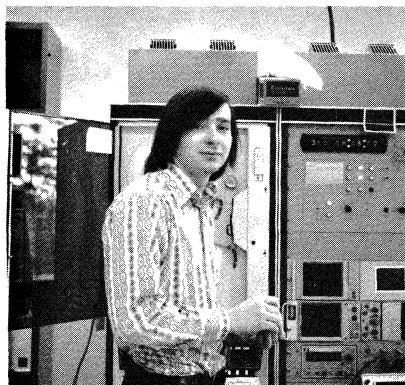
Joseph B. Burch  
Senior Technician  
Electronics - CV



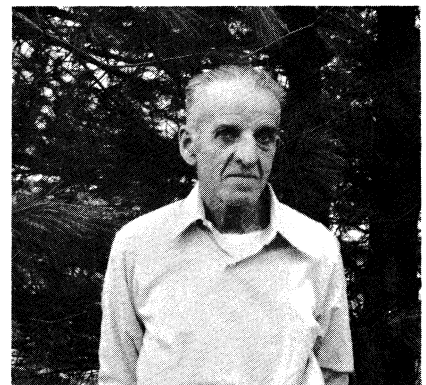
Gary K. Barrell  
Senior Technician  
Electronics - CV



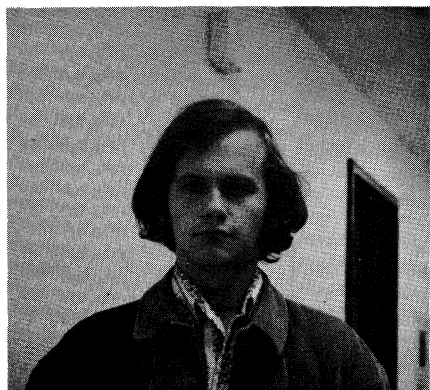
Donald Sauter  
Co-op Student  
Scientific Services - CV



Donald Gagnon  
Computer Operator-VLB Processor  
Electronics - CV



Elmo R. Turner  
Laborer  
Plant Maint. - GB



John A. Lichtenberger, Jr.  
Technical Specialist  
Electronics - CV



Werner W. G. Scharlach  
Technical Specialist  
Tucson

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National Science Foundation Employees
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Joan Perkins



Orville Stanton

Terminations

Franklin C. Willoughby	Electronics Div.
Jeffrey P. Warner	Plant Maintenance
Hrant M. Tovmassian	Basic Research
Janet P. Young	Business Manager's Office
Paul J. Mellick	Computer Division
Riccardo Giovanelli	Scientific Services
Istvan Fejes	Scientific Services
Carol A. Nodruff	Director's Office
Clarence D. Wright	Central Shops
Charles P. Kellejian, Jr.	Computer Division
Gerald E. Middleton	Tucson
John D. Smith	Tucson
Gregory D. Murray	Electronics Div.

Retired Employees

Lyle W. McPherson  
Adolphus T. Shears

Leave of Absence

Virginia Van Brunt

The OBSERVER is sorry to report the death of Jesse W. Tacy, who died on December 2, 1972.
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FITNESS THROUGH AEROBICS
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R. M. Hjellming

In an article in the December issue of the OBSERVER the relation between physical fitness and weight control (fitness and fatness) was discussed. The primary conclusion of this article was the key importance of aerobic exercise, that is, oxygen-using exercise. In this article we will briefly introduce what is involved for anyone taking up a program of aerobic exercise--which we will call by the word aerobics. It will mainly introduce and summarize some of the contents of three books (all available in Bantam paperbacks): "Aerobics" (which introduced important ideas but was aimed at young healthy men) and "The New Aerobics" (improved because it is aimed at men at all levels of health, fatness, age, etc., with graded programs) by K. H. Cooper, M.D.; and "Aerobics For Women" by Mildred and K. H. Cooper (wife and husband).

As discussed in the December OBSERVER, the most important part of physical fitness is the health of the cardio-vascular system. The most important thing is the extent to which this system can efficiently extract oxygen, from the air breathed into the lungs, and distri-

bute it to all parts of the body via the blood pumping and distribution system. There is a strict proportionality between the "work" the body can do, the energy required to do this work, and the rate at which oxygen is supplied to the body tissues (mainly muscles) to release this energy by oxidation of "food-stuff". The limiting factor in supplying needed energy is not the available "food-stuff", because there frequently is too much stored in the form of fat, but the capacity of the body to supply oxygen. That is why the maximum capacity an individual has for oxygen consumption is the best measure of fitness--this maximum capacity is called aerobic capacity. K. H. Cooper, a doctor specializing in exercise physiology, found that a person's aerobic capacity was the single best, but yet most easily measured, index of over-all physical fitness and health. He also found that individuals varied enormously. The following table gives the relationships he has established between the aerobic capacity (measured in terms of milliliters of oxygen consumed per minute per kilogram of body weight, (ml/min/kg) of men of different age ranges and their level of physical fitness (which he divided into five categories):

FITNESS CATEGORY	AEROBIC CAPACITY OF MEN (ml/min/kg)			
	AGE (IN YEARS)			
	<u>Under 30</u>	<u>30-39</u>	<u>40-49</u>	<u>50+</u>
I. VERY POOR	<25.0	<25.0	<25.0	
II. POOR	25.0-33.7	25.0-30.1	25.0-26.4	<25.0
III. FAIR	33.8-42.5	30.2-39.1	26.5-35.4	25.0-33.7
IV. GOOD	42.6-51.5	39.2-48.0	35.5-45.0	33.8-43.0
V. EXCELLENT	51.6+	48.1+	45.1+	43.1+

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A similar table could be made for women, with slightly smaller numbers, but the Coopers have not published it.

What does it mean to be in one of these categories?

I. VERY POOR. Dangerously low endurance capacity. Oxygen available for more than normal existence almost negligible. Exertion, such as climbing stairs, can over-tax system and induce heart attacks. People who feel and act ten, twenty, or thirty years older than they really are. No exercise at all.

II. POOR. The sporadic exerciser. Some golf, some walking, some exercise at play on picnics and vacations. Excessive exertion still dangerous. Feel ten years or so older than they should.

III. FAIR. The occasional, off and on exerciser. Not too un-healthy but you won't find these people feeling good (you know-- happy, joyous, bouncy) very often. These people usually have a long list of reasons why you shouldn't do strenuous exercise. They note, and quote to you, every new story about a person who has a heart attack

while jogging (these stories identify the joggers paying for stupid mistakes).

IV. GOOD. The word is self-explanatory. Regular exercisers.

V. EXCELLENT. Those who really enjoy and cultivate exercising and its benefits. Usually do most of their exercising in the form of running, swimming, or cycling. (Although the best of all, the 80 ml/min/kg or more people, are frequently found amongst the cross-country skiers.)

How do you measure aerobic capacity? Cooper's tables are based upon breath analysis of people running on treadmills in laboratories. Fortunately, Cooper was able to find something that anyone can measure easily that correlated excellently with the treadmill results: the distance an individual can walk and/or run, under conditions of maximum exertion (but without strain, aches, or getting out of breath), in 12 minutes. Cooper's results for both men and women can be expressed in the following relation between this distance and fitness category.

12-MINUTE TEST

(DISTANCE IN MILES A PERSON CAN COMFORTABLY COVER IN 12 MINUTES)

FITNESS CATEGORY		AGE (IN YEARS)			
		<u>Under 30</u>	<u>30-39</u>	<u>40-49</u>	<u>50+</u>
I. VERY POOR -	MEN	<1.0	<0.95	<0.85	<0.80
	(WOMEN)	(<0.95)	(<0.85)	(<0.75)	(<0.65)
II. POOR -	MEN	1.0-1.24	0.95-1.14	0.85-1.04	0.80-0.99
	(WOMEN)	(0.95-1.14)	(0.85-1.04)	(0.75-0.94)	(0.65-0.84)
III. FAIR -	MEN	1.25-1.49	1.15-1.39	1.05-1.29	1.00-1.24
	(WOMEN)	(1.15-1.34)	(1.05-1.24)	(0.95-1.14)	(0.85-1.04)
IV. GOOD -	MEN	1.50-1.74	1.40-1.64	1.30-1.54	1.25-1.49
	(WOMEN)	(1.35-1.64)	(1.25-1.54)	(1.15-1.44)	(1.05-1.34)
V. EXCELLENT -	MEN	1.75+	1.65+	1.55+	1.50+
	(WOMEN)	(1.65+)	(1.55+)	(1.45+)	(1.35+)

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If a person is in good health (ask your doctor), is not too much over-weight, and has done at least some exercising regularly, then they can put themselves to the 12-minute test and evaluate their fitness. Don't take it, except under conditions we will discuss shortly, if you are not in good shape. This is because of the inexorable fact that over-exertion beyond your capacity can kill you; and a person who is out of shape may make the stupid mistake of ignoring the signs of over-exertion, hurting or even killing, themselves. People in categories I and II are living dangerously because of this. Remember that heart attacks and heart failures can be brought on either because one's cardiovascular capacity falls below that needed to maintain life or because one exerts one's self to a level too far above one's maximum (aerobic) capacity and the cardiovascular system fails in the process of trying to meet this demand.

After reading this, your natural reaction might be that aerobic exercise can be dangerous. In fact, many other-wise intelligent people use this as an excuse to avoid getting the exercise they need. Having a low aerobic capacity is what is dangerous. Hence those for whom over-exertion could be dangerous need to exercise the most to improve their condition - but they must do it gradually and sensibly.

Anyone interested in taking up aerobic exercise should read either "The New Aerobics" or "Aerobics For Women" because they describe all the pitfalls, dangers, etc., and give a large amount of useful information, particularly about gradual conditioning programs suited to your age, condition, health, etc.. However, let us now give a brief description of what exercises are aerobic and also describe some important aspects of conditioning programs.

What are or are not aerobic exercises; and what are the "best" ones? Because of the critical importance of oxygen consumption capacity in relation to over-all fitness, the best exercises at first look are those with relatively high steady levels of oxygen consumption. At second look, a person's health may dictate one of the less strenuous forms. Fortunately, simple, brisk walking is one of the better and hence, is the mainstay of those who should be very careful of over-exertion. The best aerobic exercises, in decreasing order of effectiveness: running, swimming, cycling, stationary running, walking,

handball, basketball, and squash. The worst are isometric exercises, weight-lifting, and calisthenics (even though they are all good for developing muscles) because they involve negligible increased oxygen consumption. Participant sports like golf (because of the walking), tennis, and volleyball fall somewhere in between, not as good as the first group, but much better than the second.

What should be done by someone who has not been exercising regularly, perhaps is even overweight, or is not sure about his or her capabilities? The first thing is to ask your doctor if there are reasons why you should limit your exercising or should take it particularly easy with increases in the level of exertion. It can be done, even by cardiac patients, but in such cases the doctor's advice is critically important. It is very important to build up your exercise level slowly and systematically; this is because people tend to either over-do or under-do things, and in the case of the former, strenuous exercise can be dangerous.

O.K., your doctor has told you to go ahead, and has informed you about your limitations. What next? The best idea is to closely follow one of the gradual conditioning plans developed by Cooper.

The key to any exercise plan is to know exactly the level you are exercising at at each stage, and to slowly increase this level. Any exercise involves a particular level of energy expenditure and oxygen consumption. Cooper has measured virtually every exercise in terms of its oxygen consumption and an associated point system. For example, walking and/or running a mile has the following relationship between the time it takes, the oxygen consumption rate, and the point system devised by Cooper:

Time To Go A Mile (Minutes)	Oxygen Consumption (ml/min/kg)	Points
20:00 to 14:30	7	1
14:30 to 12:00	14	2
12:00 to 10:00	21	3
10:00 to 8:00	28	4
8:00 to 6:30	35	5
6:30 or less	42	6

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As can be seen, each point is associated with an extra 7 ml/min/kg oxygen consumption rate. By relating the oxygen consumption rate for any level of effort for any exercise the equivalent benefit can then be measured in terms of points. For example, the following are equivalent ways to earn 5 points:

run	1 mile	in	8 min.
swim	800 yards	in	15 min.
bicycle	5 miles	in	20 min.
do stationary running at	80 steps/min.	for	15 min.
walk	2 1/2 miles	in	36 min.

Note that if the exercise requires less energy per unit, the equivalent aerobic benefits are obtained by doing it for longer times. This is very important because it also means that brisk walking is just as good as fast running - you just have to take longer to get the same benefits. That is obviously how the exercise plans of the unhealthy over-weight will differ from those of the young, healthy, and slim.

How much exercise does one need? Cooper has determined empirically that men attaining and maintaining a level of 30 points per week will reach and remain in the category IV (Good) level. For women the level is 24 points per week. Although the Cooper books contain many different conditioning plans, let me give one involving only walking - anyone can do it. Anyone wanting to do it faster can try one of the running, swimming, cycling, etc., plans.

WALKING EXERCISE PROGRAM

(Men 30-39 years of age)

WEEK	DISTANCE (miles)	TIME (minutes)	FREQ/WK	POINTS/WK
1	1.0	17:30	5	5
2	1.0	15:30	5	5
3	1.0	14:15	5	10
4	1.0	14:00	5	10
5	1.5	21:40	5	10
6	1.5	21:15	5	15
7	1.5	21:00	5	15
8	2.0	28:45	5	20
9	2.0	28:30	5	20
10	2.0	28:00	5	20
11	2.0	28:00	3	22
	and	2.5	35:30	2
12	2.5	35:00	3	27
	and	3.0	43:15	2
13	2.5	34:45	3	27
	and	3.0	43:00	2
14	2.5	34:30	3	27
	and	3.0	42:30	2
15	3.0	42:30	5	30
16	4.0	56:30	3	33

Then continue getting 30 points/wk in any way.

In doing any such program do not exceed the paces given! For those who choose other programs it can take as little as 6 to 10 weeks to get up to 30 points. For those who can do it, the running, swimming, stationary running, or cycling programs accomplish the most in the least amount of time (typically 15 to 20 minutes per day, five days a week).

I could continue to give cautionary rules: see your doctor, don't over-exert, warm up first, keep to a comfortable pace, stick to it, etc., but this has already gone on rather long. If you are interested, read the books by Dr. Cooper (and his wife) and follow that advice. There are other books, and other programs, all of them of some benefit, but none have made more sense to me than "The Aerobics Program".

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ALL TREES ARE NOT THE SAME

Weepy Meringue

I know what I am about to tell you is going to be hard to swallow. Mainly because it's an incredible tale and if there wasn't a picture to prove my story, I wouldn't tell anybody. I know there are a lot of skeptical people in this world and I know that NRAO has its share. Be as it may, this is my story.

About a year ago I was tramping through some pretty remote country in Pocahontas County (I won't tell you exactly where) and came upon a tree with two glass jugs hanging from it. When I came closer I could see some crystal clear liquid in the jugs. Since the tree looked a whole lot like a Maple tree, I immediately assumed that the liquid was sap water. The only strange part about it all, I thought, was the use of jugs instead of buckets or tin cans. Nobody in this country uses jugs to catch sugar water. I looked around to see if there were any more trees like this one with jugs hanging from them. I looked hard all around but I didn't see another one.

I don't know why, curiosity I guess, but I took one of the jugs off its nail and looked down through its neck. Only then did I see the ever so faint, bluish-white whisp of smoke about the liquid. Boy, I thought that was really strange. Still I was pretty sure it was nothing more than sugar water. Just for the heck of

it though, I put a little on the end of my finger and touched it to the tip of my tongue. Zoweee....it tasted like alcohol. It couldn't be. It must be my taster. I raised the jug to my lips and took a little sip. Ho, man, it was smooth---it warmed me all the way down. I took another sip and another and another. Each sip was better than the last. I couldn't believe it. I had come upon a genuine West Virginia Moonshine Tree. Just as I was about to take another swig, a shot rang out and a bullet hit me between the eyes. As my whole life flashed by I thought.....never be the second discoverer of a West Virginia Moonshine Tree.



This picture of the Moonshine Tree was developed from film found in a camera on the body.

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REBER DISH IS AN HISTORIC PROPERTY

The director of the National Park Services, George B. Hartzok, Jr., announced that the Reber Radio Telescope, an historic property, was entered in the National Register of Historic Places on November 9, 1972.

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Human improvement is from within outward.

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**TEST YOUR SAVVY OF THINGS HILLBILLY**

contributed by Carolyn Dunkle

- \_\_\_ 1. An air-tite is a (a) trapeze costume, (b) rubber overshoe, (c) store-bought coffin, or (d) jar lid.
- \_\_\_ 2. A blue tick is (a) an insect, (b) a food stamp, (c) a hound dog, (d) an NRA sticker.
- \_\_\_ 3. Before it is fit to drink, moonshine must be (a) aged three months, (b) aged three weeks, (c) aged three days, or (d) cool.
- \_\_\_ 4. The most successful method for catching catfish is (a) gigging, (b) setting a trot line, (c) dynamiting, or (d) creating electric shock with two pokers and a car battery.
- \_\_\_ 5. "Red Rover Come Over" refers to a (a) Communist turned Republican, (b) children's game, (c) neighbor's dog, or (d) quilt pattern.
- \_\_\_ 6. Little Jimmy Dickens is famous for (a) "Take an Old Cold Tater and Wait", (b) "There Stands the Glass", (c) "Blue-Eyed Elaine You're the Sweetest Thing", or (d) "Honky Tonk Angel".
- \_\_\_ 7. A gee-haw-whimmy-diddle is a (a) good time, (b) harness for a work horse, (c) toy, or (d) type of persimmon.
- \_\_\_ 8. A happy-pappy is (a) a paw-paw, (b) the father of twins, (c) a good govenor, or (d) working for AFDC-WE&T.
- \_\_\_ 9. Before cooking a three-year-old groundhog, it is first necessary to (a) remove his armpit kernels, (b) soak him for 24 hours, changing the water three times, (c) lay him out on a pine plank, or (d) prepare a mess of sweet-breads.
- \_\_\_ 10. Poke is in a class with (a) ramps, (b) yellow-root, (c) sassafras, or (d) watercress.
- \_\_\_ 11. A poke store is where you get (a) poke, (b) molly-grub, (c) government whiskey, or (d) ginseng bags.
- \_\_\_ 12. An asafetida bag is a (a) style of asafetida, (b) nostrum for colds, (c) strainer for blinky milk, or (d) stocking cap.
- \_\_\_ 13. In the song, John Henry drove (a) like sixty, (b) like the wind, (c) a herd of rhyby cattle, or (d) til his pore horte broke.
- \_\_\_ 14. Never put new wood shingles on a roof (a) by moonlight, (b) in April, (c) if you can help it, or (d) at all.
- \_\_\_ 15. A pig-twist auger is (a) a Joy cutting machine, (b) chewing tobacco, (c) a bit supported by the chest, or (d) a bad sign.

Turn page upside down for answers.

If you were right on 10 or more, this qualifies you to status as a dyed-in-the-wool mountaineer; 5 to 10 correct, chances are you live in Ohio or other neighboring state and will be entitled to think of yourself as a part-time mountaineer; less than 5 correct, you had better head back to the city.

1d, 2c, 3d, 4c, 5b, 6a, 7c, 8d, 9a, 10d, 11c, 12b, 13d, 14a, 15c.

**BASKETBALL**

Dave Williams

Basketball season is well underway at NRAO-Green Bank. Eight games have thus far been played, although we only have statistics for five games. Therefore the accompanying statistics are not a true picture of everybody's accomplishments. As can be noted, Russ Poling has a comfortable lead in both total points and average, although Ronnie Monk could overtake him with a couple of good nights. Brown Cassell has proved to be the best foul shooter of those who have attempted 10 or more free throws with a 90% accuracy.

The race for the dirty player award has found a new leader this year. Since there is a great difference in the number of games played, the personal fouls were averaged. This found Basil Gum and Ed Fomalont in a deadlock, but since Basil has played more games we shall declare him the leader at this time. The perennial leader for this honor finds himself down the

list several notches. This could either indicate a slowing down because of age or possibly poorer officiating or maybe both??

Mike Kane and sometimes Lynn Peck are our officials this year and have done a very good job, except for a few fouls that are obviously missing in the statistics.

As can be noted we have had an excellent turnout this year - 26 to be exact. We can always handle more if anyone else is interested in playing.

We hope to play CV sometime later on; perhaps play them two games - home and away.

Jim "Silver Fish" Oliver and myself have consented to be commissioners this year and have done a good job of course.

As always, anyone wishing to witness basketball at its finest should try somewhere else besides the Green Bank Grade School gym on Wednesday nights at 7:00 PM. We may not have the best basketball players, but you wouldn't know it to hear them talk. So you will have to come witness the action for yourself!

Player	Games	Personal Fouls	Personal Foul Avg.	3-Point Goal	2-Point Goal	Fouls		Points	Average
						Tempt.	Made		
R. Poling	5	10	2.0	0	51	34	25	137	27.4
R. Monk	5	15	3.0	0	35	28	17	87	17.4
L. Howell	1	0	0.0	0	8	2	1	17	17.0
J. Spargo	1	1	1.0	0	6	2	2	14	14.0
W. Monk	3	10	3.3	0	14	10	8	38	12.7
B. Cassell	2	7	3.5	3	3	10	9	24	12.0
J. Shears	4	14	3.5	7	11	8	2	45	11.3
R. Jeffries	3	9	3.0	1	14	9	3	34	11.3
W. Shuman	2	2	1.0	2	7	1	1	21	10.5
B. Vrable	5	9	1.8	0	20	11	6	46	9.2
B. Brundage	4	7	1.8	0	16	13	3	35	8.8
B. Gum	3	12	4.0	3	6	12	5	26	8.7
S. Smith	4	4	1.0	0	17	7	2	36	8.5
R. Gordon	2	6	3.0	0	8	1	1	17	8.5
C. Davis	5	13	2.6	1	12	19	11	38	7.6
B. Vance	2	4	2.0	0	6	0	0	12	6.0
B. Cate	1	2	2.0	0	3	1	0	6	6.0
F. Crews	1	2	2.0	0	3	1	0	6	6.0
P. Coleman	2	3	1.5	0	4	12	3	11	5.5
K. Friel	5	5	1.0	0	10	14	7	27	5.4
B. Shank	3	11	3.7	0	7	6	0	14	4.7
M. Hersman	2	5	2.5	0	3	5	3	9	4.5
B. Ervine	4	10	2.5	0	5	1	1	11	2.8
E. Fomalont	1	4	4.0	0	1	2	0	2	2.0
D. Gordon	1	1	1.0	0	1	0	0	2	2.0
B. Radcliff	1	0	0.0	0	1	0	0	2	2.0

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## HOW TO MAKE HOMEMADE BEER

Al Braun

Do you like beer? Are you tired of shell-ing out over a buck for a six-pack? Does it all taste the same? Put some life in your beer. Make it yourself. It's fun. It's interesting, and it's inexpensive. How would you like ten or fifteen gallons of brew for under \$5? That's about 18¢ for a six-pack of 12 oz. bottles.

Is it legal you ask? I don't know. Rumor has it that federal laws prohibit home brewing, but when you consider that there is an open market for home winemaking and brewing supplies, I don't think you will find a revenue in your bath tub. As one forgotten source put it, the fact that these laws still exist gives evidence only to the tenacity of the bureaucracy. For those of you in Virginia, here is a comforting quotation from the Virginia Code under Alcoholic Beverages:

§ 4-89. Wines and beer for home consumption;...--The provisions of this chapter shall not be construed to prevent:

(a) Any person from manufacturing at his residence, but not to be sold, dispensed or given away, except as herein-after provided, wine or beer or both;

Equipment - The most important item of equipment for the home brewer should be a good hydrometer. This may also be the most difficult item to obtain locally. One place to order one from is Jim's Home Beverage Supply, N. 2613 Division, Spokane, Washington 99207. Write for a catalog. You might also try Sears in Charlottesville which has recently begun selling winemaking equipment. There used to be and still may be a small winemaking shop in that bomb shelter off of route 250 called the Galleries Mall where one might also find a hydrometer. They come in several varieties with different scales. Yours should have a specific gravity scale. Another useful scale to have is the one which indicates potential alcohol of your brew before you add the yeast. This scale usually reads percent alcohol by volume and allows you to adjust the potency of your brew.

You will need something to brew your beer in. Most any vessel large enough to quench your thirst will do. Let me put some restrain-

ments on that. Don't use anything that leaks or would leach out any poisonous substance while holding alcohol or acids. This vessel should have a cover that fits snugly but not so tight that the carbon dioxide generated by the fermentation cannot escape. A sheet of plastic window material held in place with an elastic band will do nicely. I find that a fifteen gallon plastic garbage can (unused) with a snug fitting lid does very well.

The next item is the siphon. Plastic tubing commonly found in aquarium shops will do. Better use the 1/4" tubing or you will be waiting a long time for the bottles to fill.

Bottles. This is where home brewers can get themselves into some messy troubles. Do not use bottles that are not made to hold a carbonated beverage. Most bottles cannot take the pressures generated in the final stages of brewing. Soft drink bottles such as quart ginger ale bottles are excellent. Save the screw on caps; they can be reused several times before they begin to leak. Returnable beer bottles and champagne splits are also good but they require crown caps and some sort of capping device.

Cleanliness - Before continuing, a word about cleanliness is in order and something about the disasters that befall those who are not careful. Fermentation is the process of converting sugar to alcohol and carbon dioxide. This is carried out by a one-celled plant called yeast. The yeasts used in brewing and winemaking have been cultured for just this purpose. There are however, wild yeasts and bacteria in the air everywhere. Some of these may make a good beer or wine, but chances are that they will ruin your brew or even turn your alcohol to vinegar. To minimize the possibility of contamination, all utensils and vessels should be clean and biologically sterile. Wash everything thoroughly and then sterilize with a solution of either sodium or potassium metabisulphite. The sulphur dioxide gas released by the solution kills all bacteria and stray yeasts on contact. The odor of sulphur dioxide gas is pungent and very penetrating, so be careful about breathing the fumes.

Ingredients - Brewing beer is an art.

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Each brewer will have his own favorite recipe with his own special ingredients and proportions. Each one will have its own flavors and characteristics, and none will taste like store-bought beer. If the description that follows sounds somewhat haphazard, it is because you are encouraged to experiment with the recipe to find the right combination that suits your taste. In one way or another, I have tried all ingredients listed here and in no case has it resulted in a really bad beer.

Since I usually make beer in 15 gallon batches, the following description reflects those proportions. If you wish to work in smaller quantities (I suggest five gallons for beginners) you can cut the recipe proportionally.

3 - 6 pounds malt extract (hop flavored)  
10 - 15 pounds sugar  
salt, citric acid, nutrients, yeast,  
molasses, water

The malt extract comes as a heavy syrup in three pound cans and can be found in some of the local supermarkets. In Charlottesville we find Blue Ribbon brand. It comes in a can with a yellow label and is usually found with syrups. There are three grades--pale dry, light, and dark. This indicates the degree of roasting done on the grain. The darker malts have a heavier more malty flavor. The color and flavor are also affected by the amount of malt used. The more malt used, the heavier the beer. In West Virginia, the only brand that I have seen is Red Top. It comes in a white can with a red spinning top on the label.

It is the sugar that controls the amount of alcohol and the resulting potency of your brew. About one pound of sugar per gallon will give a beer with 7% to 8% alcohol by volume. This is a powerful brew and can floor an unsuspecting drinker before he realizes that it is sneaking up on him. It is not recommended for regular drinking. I have cut mine back to about 5% where it can be enjoyed without making a sot of myself.

While the amount of sugar affects the alcohol content of the brew, the type of sugar affects the flavor. The safest to use is pure white cane sugar. As far as I can tell, this does not affect the flavor or color of the beer at all. If you substitute some

brown sugar, say about 25% of the total you will see a darkening in the color of the finished beer and notice it in the flavor. Some of the literature recommends using corn sugar. I regret that I haven't tried this yet, but will as soon as I can lay my hands on some.

Salt. Sometimes I just pour some in the palm of my hand and dump it in. Sometimes I measure out one or two tablespoons. Sometimes I forget it altogether.

Citric Acid. This is supposed to help the yeast do its work and is not supposed to affect the flavor of the finished beer. Pure citric acid comes as a powder of which I use about 1/2 tsp. Before I managed to come by that I used one or two jiggers of either lemon or lime juice. If that turns you off, squeeze an orange into the brew or throw in a grapefruit. It's not normal but has been done with some interesting results.

Nutrients and yeasts. As I said earlier, the yeast is a one-celled plant that converts all that sugar to alcohol and carbon dioxide. It is important that you use a good cultured brewing yeast and not bakers yeast. Bakers yeast will impart a yeasty flavor to the beer. Also as the yeast settles to the bottom of the bottle, it does not cake as well as brewing yeast, thus making it more difficult to pour the beer without stirring up the yeast. Finally, the spent yeast in the bottom of the bottle will begin to decompose giving the beer a further off-flavor. The nutrients are little more than fertilizer for the yeast plant. They are mostly phosphates and vitamins, and help make up some of the deficiencies in the rest of the ingredients. I have made beer with and without using nutrients and quite frankly can't tell the difference.

A final word about yeast. When you make your second batch of beer, look in the bottom of a bottle from the first batch. That scum on the bottom isn't all dead yeast. A lot of it is just dormant. When it used up all the sugar in the bottle it just sank to the bottom waiting for more. Drink the beer and use the scum to start your second batch. I have carried this on for four or five successive batches before using fresh yeast again.

Molasses may sound like a strange

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ingredient for beer. It is, but it shows what you can do to make interesting variations in flavor. Maybe maple syrup sounds better, or honey, or nothing.

Putting it all together - First and most important, clean and sterilize everything. Using dirty equipment is calling for disaster.

Pour ten to fifteen pounds of sugar into your brewing vessel. Over this pour three to six pounds of hop flavored malt extract. Start adding hot water to this muck and stir until it dissolves into an ugly brown muddy solution. Now add cooler water until it reaches fifteen gallons and is about room temperature. Be sure to leave at least two or three inches between the top of the liquid and the rim of the vessel. While filling the vessel, toss in the salt, citric acid, and anything else desired. Last of all, add the yeast. Now cover the vessel with a snug but not air tight cover and leave the yeast to do their work.

Initially there is not much visible activity. During this time the yeast multiplies, and in doing so uses up the oxygen and some of the sugar in the solution. After twelve hours to two days or so, the oxygen is used up. The yeast then stops multiplying and begins the serious task of converting sugar to alcohol and carbon dioxide. At first this fermentation is so violent that an inch or two of foam will form on the surface of the brew. After a day or so the concentration of sugar is decreased and the fermentation settles down to a steady bubbling similar to freshly poured champagne. Don't be too alarmed if it smells like someone threw up in the vat, but if you detect the odor of vinegar, you're lost.

Now the hydrometer starts earning its keep. Periodically test the specific gravity. When the reading drops to 1.005 it's bottling time. Siphon the beer into bottles leaving an inch or so of air in the neck to cushion the pressure. Cap the bottles tightly and place in storage.

When the beer is bottled it still looks like mud and tastes like hell. The final fermentation and aging processes take place in the capped bottle. As the yeast ferments the last of the sugar, it settles to the bottom of the bottle forming a cake deposit there. The carbon dioxide generated gives the finished beer its gas. Although it may look like beer at this point, it still tastes awful. If you sampled the beer after ten days, you would

find the green beer rather harsh and acid tasting. After four weeks the beer has mellowed considerably and is ready for drinking. It will still mellow with further aging but will soon reach a point of diminishing returns.

Finally a note on getting your beer from the bottle into a glass gracefully. Before pouring the beer, chill it as cold as possible to reduce the pressure of the gas. Uncap the bottle and carefully pour into a glass or pitcher. Stop as soon as you notice the yeast rising from the bottom. In this way you should be able to pour a crystal clear, sparkling glass of beer. The idea is not to stir up the dormant yeast from the bottom of the bottle. Should you happen to get a quantity of it into your system, you will be happy to know that it is very nutritious. However, it can make you as popular as a ramp eater. Live yeast in your system goes right on about its business of making alcohol and generating gas.

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### GREEN BANK BOWLING

Don Hovatter

The first half of the 1972-73 season was completed in early January. The records and other statistics of the two Green Bank teams were as follows:

Green Bank #1, Captain - Leroy Webb

Games Won	<u>30</u>	Lost	<u>42</u>
Position (12 team league)		Eighth	
High team game		1089	
High team series		3048	
High game - Bill Vrable		250	
High series - Bill Vrable		595	

Green Bank #2, Captain - Don Hovatter

Games Won	<u>44</u>	Lost	<u>28</u>
Position (12 team league)		Third	
High team game		1046	
High team series		3092	
High game - Howard Brown		244	
High series - Jon Spargo		584	

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THE NRAO TEXTBOOK ON RADIO ASTRONOMY

Gerrit Verschuur

In November of 1972 we sent to the publishers (Springer-Verlag) the manuscript of a textbook on Radio Astronomy which was edited by Gerrit Verschuur and Ken Kellermann. The book is entitled "Galactic and Extra-galactic Radio Astronomy" and grew out of an idea that perhaps the summer student lectures could be gathered together and published. However, the final list of chapters and authors bears very little resemblance to any of the summer lecture series.

There is no modern textbook for graduate students on astronomy to inform them about the actual observations that have been, and are being, made in radio astronomy. Most textbooks deal with basic receiver and telescope technology but stop before they get too deep into the observations and discoveries made in our science. Some books deal mostly with theory. We tried to avoid both the detailed theory and equipment descriptions in favor of a comprehensive outline of the present state of radio astronomical knowledge of the Universe beyond our Solar System.

The list of chapters and authors looks as follows:

GALACTIC AND EXTRA-GALACTIC RADIO ASTRONOMY

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Introduction		
Chapter 1	Galactic Non-Thermal Emission	R. L. Brown
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Chapter 11	Neutral Hydrogen in External Galaxies	M. C. H. Wright
Chapter 12	Radio Galaxies and Quasars	K. I. Kellermann
Chapter 13	Radio Cosmology	S. von Hoerner

Editors: G. L. Verschuur and K. I. Kellermann

Asst. Editor: Virginia van Brunt

It is of interest that several of the publishers we originally approached would not touch an edited textbook because of the large mortality rate of such works. That is to say, in the initial phases everyone is enthusiastic, but then things begin to drag out over longer and longer times because one author is slow, and then another wants to revise, and a third changes his mind, etc., etc.. Apparently most multi-authored textbooks suffer from this and most are abandoned before completion.

It is true to say that we, too, had such problems, but it is to the credit of everyone that we succeeded in co-operating for long enough that the book was completed. There were times when I doubted that that would happen though.

Our book will cover pretty well everything in the field although not all chapters are equally up to date. For example, several were originally finished in the summer of 1971 (our first deadline) while some were only completed in October 1972.

The book will bring in some royalties but these will be very small unless it gets into the Book of the Month Club selections! It should cost \$18 to \$20.

We would like to express our gratitude to many who helped in the final preparation - in particular Donna Beemer, Beaty Sheets, Peggy Weems, Gene Crist, Ron Monk, and Brown Cassell.

We hope you all will buy copies. They make excellent Christmas gifts!

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TOOTHPASTE IS POISON?

R. U. Concerned

Now, I'm not going to try to make you believe that I'm an authority on toothpaste, but I have talked to people, and read articles by persons who think they are. Not on toothpaste itself, but on one of the wonder additives the world has come up with. This miraculous additive is called "Sodium Flouride".

Sodium Flouride, it is claimed, prevents cavities in your teeth. Does it now? The way I hear it, "Sodium Flouride", when added to the city water supply, 1 P. P. M. (Parts per Mil-

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lion), delays the onset of the second set of teeth in children. If this is the case, the children using Flouride didn't have the teeth to have the cavities in when compared to the children not using Flouride in their water.

"Sodium Flouride" is a by-product of Aluminium and is extremely poisonous.

Here is a solution for etching glass:

- Sodium Flouride . . . . . 1 oz.
- Potassium Sulfate . . . . . 90 grains
- Water to make . . . . . 8 fl. oz.

(Caution: Wear rubber gloves while handling the solution and do not breathe the vapors.)

This is a very effective Roach Powder:

- Sodium Flouride . . . . . 5 oz.
- Pyrethrum . . . . . 5 oz.
- Talc . . . . . 10 oz.

(Caution: Sodium Flouride is extremely poisonous. Wash all utensils carefully after mixing it. Keep the container out of the reach of children. Do not apply it where animals or children may accidentally come in contact with it.)

Research has proven that this wonder additive, when added to water 60 P. P. M., causes sterility in female rats.

One other point of information that is worth noting is that Sodium Flouride is accumulative; that is, your body does not get rid of it, so it builds up in your system.

You can do as you please, but I'll be danged if I will put that stuff in my mouth.

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R J E

Wade Davis

We now have a Remote Job Entry facility for Green Bank 360 users. The previously installed printer and reader/punch in Green Bank are now linked, via the telephone lines, with the 360 computer in Charlottesville.

The Green Bank user can now read his program into the reader in Green Bank and it will be sent directly to the 360 computer job stream in Charlottesville. After computation the output will be automatically routed to the printer

or punch in Green Bank. If the user desires, he may have the output printed or punched in Charlottesville, or have copies sent to both Charlottesville and Green Bank. He may also have the output from a Charlottesville-entered program routed to Green Bank.

The time it takes to enter a job and receive back the output will depend, of course, on the length of the program, and the number of previously entered programs awaiting execution. However, this still means that the 360 user in Green Bank will now get the same speedy turn around time that Charlottesville users have enjoyed for years.

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HALF WAY IS NOT ENOUGH

Fred Crews

The writer recently had a minor home accident that points out the necessity of not only recognizing safety hazards, but correcting them before the accident.

Dad and son were sled riding. On the way home, dad decided to demonstrate to son the method whereby one takes a run and gracefully lands tummy down on the moving sled in order to have more initial momentum ("belly busting" or "belly slamming" to some).

Sure, dad had told son that the pulling rope attached to the sled was a tripping hazard, but dad hadn't seen fit to correct the hazard.

Dad started his run, and as he tipped over to land on the sled, his foot caught in the rope, pulling his knee down onto the ice-covered pavement with a great deal of force. Result: pain, doctor consultation, x-rays, drawing of water from the knee and further treatment - not to mention the embarrassment. Solution after the fact: eliminate the rope as I did, or else find a good way to stow it.

This was a rather simple-minded episode, but the well learned lesson here is that recognizing the hazard is only half the job done. The job is not done until the hazard is corrected.

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