
the OBSERVER

THE COVER

Our cover is a montage of the NRAO Green Bank summer picnic. The photographs were taken by Ken Kellermann.

RICK FISHER NEW GREEN BANK MANAGER

Dr. J. Richard (Rick) Fisher is the new assistant director for Green Bank operations. His appointment, announced by Dr. Morton Roberts, director of NRAO, on August 14, became effective on August 18. Dr. Fisher replaces Dr. Robert L. Brown who rejoined the NRAO scientific staff in Charlottesville.

Dr. Fisher recently returned from a two years leave of absence during which time he served with Commonwealth Scientific and Industrial Research Organization in Australia. His research interests include distance determination of nearby galaxies, antenna feed designs, and problems related to the defraction of radio waves.

Dr. Fisher grew up and attended high school in Reynoldsville, Pennsylvania. He received his B.S. in Physics from Pennsylvania State University in 1965 and his Ph.D. in Astronomy from the University of Maryland in 1972. After graduating from the University of Maryland, he joined the NRAO in March of 1972 as a Research Associate. Since then he has also served as Assistant Scientist, Electronics Engineer and as Associate Division Head of Green Bank Electronics.

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(we hope)

Articles to Editor	Distribution
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A special thanks to all the people who contributed articles and who helped with *The Observer*.

A NEW INTERFEROMETER FOR GREEN BANK?

John Dickey

For ten days last July a new spectral-line interferometer operated in Green Bank. It didn't attract much attention, because the antennas used were the familiar 140-foot and 300-foot telescopes, but the results were far more sensitive than either instrument could have obtained alone. In this unusual project, dubbed "Not Really Very-Long-Baseline Interferometry", the two antennas tracked the same sources while MK II VLB recorders simultaneously recorded the signals received by both telescopes. To complete the interferometer, the video tapes from the two telescopes were played back with the spectral-line VLB processor in Charlottesville, which correlated the two signals and produced fringe amplitudes and phases as functions of frequency and time. The IBM 360 did further processing on the data, using a labyrinth of programs called the spectral-line VLB package. Fortunately my collaborator, John Benson, is one of the few people who understands the VLB processor and computer system, so the data reduction has been tractable. All in all, the 300-foot - 140-foot combination is an amazingly simple interferometer to use, considering its power. But why would anyone want to do VLBI with a baseline of only 1.5 kilometers?

Green Bank is unique in that it is the only place in the world where there are two telescopes as large as the 140-foot and the 300-foot as close together as 1.5 km. Of course, the VLA, Westerbork, and other synthesis instruments, including the Green Bank three-element interferometer, offer comparable baselines. The VLA with its 27 (smaller) antennas is more sensitive than the 300-foot - 140-foot and can track a source all day rather than the four minutes possible with the 300-foot. To undertake any spectral-line program on the VLA, one must be ready to bury oneself in tapes and data processing for months. But some astrophysical problems do not require the power and complexity of the VLA. A survey of the absorption by galactic neutral hydrogen against continuum radio sources is one such problem. The sensitivity of the 300-foot - 140-foot is adequate and the limitation of four minutes per day per source is not serious because there are many sources to observe.

Spectral-line absorption can be observed when a cool cloud of gas intervenes between the earth and a strong continuum radio source like a quasar or supernova remnant. Most of the radiation from the source passes through the cloud and is received at the earth, but at certain frequencies the radiation is absorbed by the atoms in the gas cloud. Since atomic hydrogen is the most abundant atom in the interstellar medium, the hydrogen line at 21 cm wavelength is the easiest to detect in absorption. The big problem for observing absorption is that the cloud generally emits radiation at the same frequency that it absorbs. To measure the absorption the observer must somehow guess how much emission is in the telescope beam, then subtract it from the spectrum of the background source. For galactic hydrogen this is only possible if the cloud is large and smoothly spread over the sky, so moving the telescope a little way off source and observing the emission gives a good estimate of the emission that polluted the absorption spectrum. Unfortunately, most clouds aren't spread smoothly across the sky and even with a telescope like the 300-foot, the emission is very difficult to measure -- only a half-dozen or so convincing spectra have been obtained. The emission in the galactic plane is such a jumble that no single-dish telescope can measure absorption accurately, except toward one or two very bright sources.

The trouble is that low latitudes are where we really want to look; only there can we see gas more than a few hundred parsecs away. If we could observe a large number of low-latitude absorption spectra we might learn a lot about the interstellar hydrogen in our galaxy.

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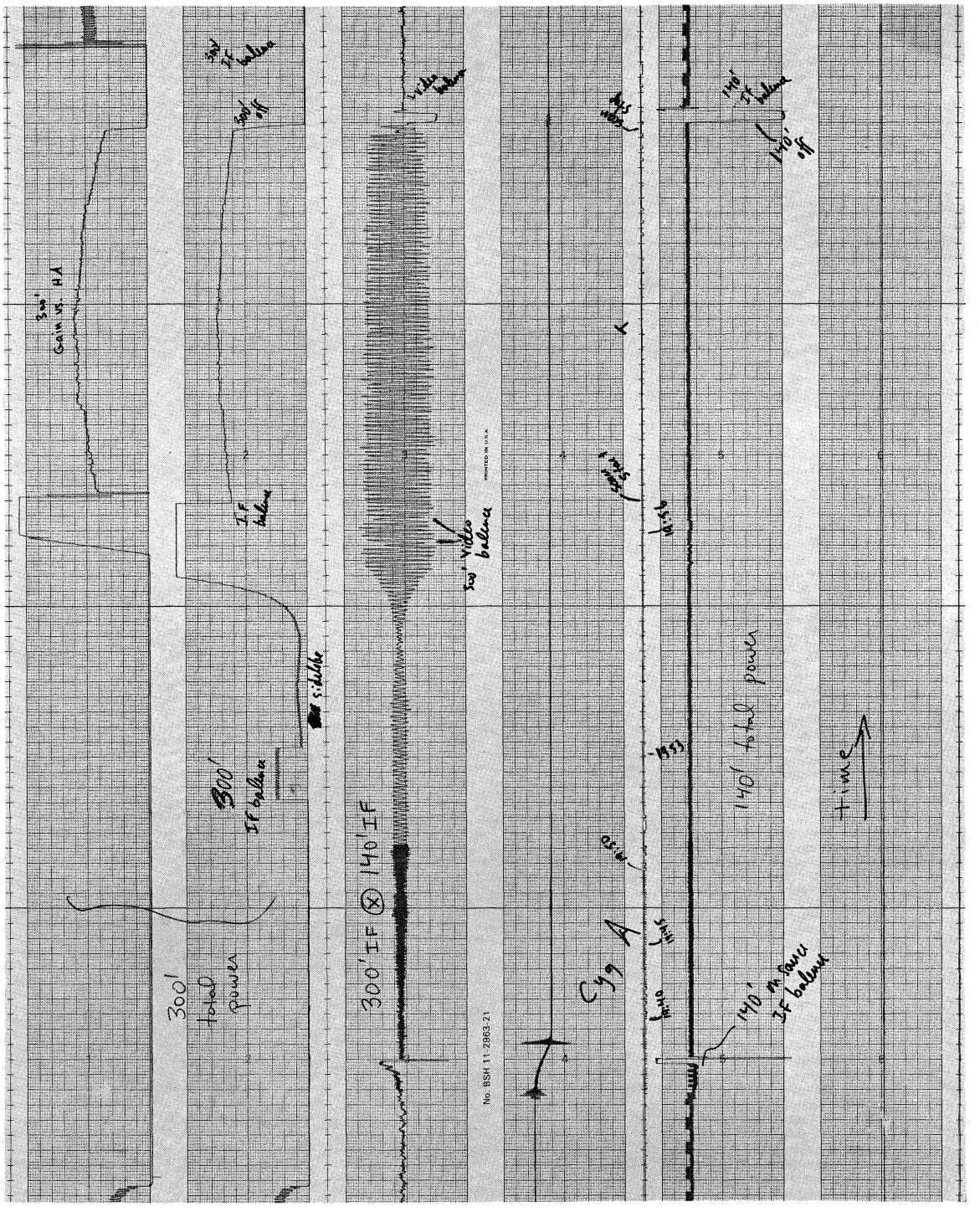

Figure 1. *The chart record from a scan on a strong source (Cyg A). The top two traces show the 300-foot total power (after IF balance), the fourth from the top is the 140-foot total power, and the third is the output of the "fringe checker", an on-line cross correlation receiver developed by Jim Coe. The 140-foot acquires the source long before the 300-foot, the IF is then balanced back to the center of the trace. When the 300-foot begins tracking its IF is also balanced. Well before the source gets to the 300-foot beam the fringes are already visible as the source moves through the sidelobes.*

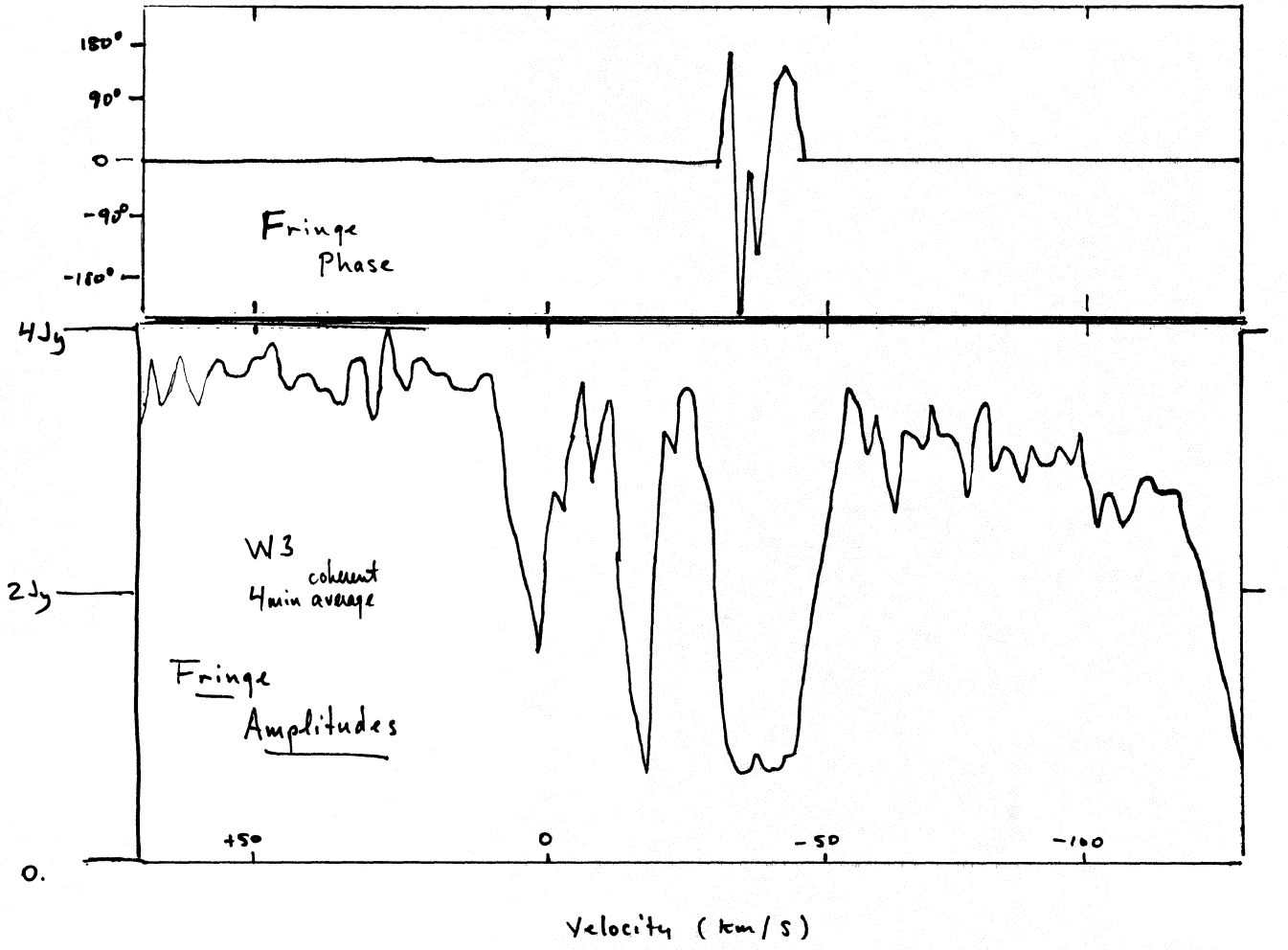

Figure 2. *One of the spectra obtained by John Benson only 24 hours after the first night of observing. Deep galactic hydrogen absorption lines show up at several velocities. The telescope is so sensitive that even a four minute scan (shown here) has fair signal to noise ratio. The continuum source (W3) has only about 4 Jy of correlated flux, typical of many other galactic and extragalactic background sources at low latitudes.*

For one thing, we don't know how much interstellar gas there is. Emission surveys, like the famous Maryland-Green Bank survey, measure the total amount of gas that we can see, but a lot more could be hidden from us behind cool absorbing clouds. A low-latitude absorption survey would show how abundant such obscuring clouds are, and give an indication of the fraction of our galaxy visible in emission.

For another thing, we might learn where the cool absorbing clouds are. When 21-cm radiation was first discovered there was hope that one could use this emission to trace out the spiral arms of our galaxy. Unfortunately, the spiral pattern is not clearly shown by 21-cm emission, probably because of non-circular motions and density and temperature variations. The cold dense interstellar clouds are thought to be confined to narrow regions like arms or perhaps a ring; this is indicated by CO data taken by the Kitt Peak 36-foot telescope. The colder a cloud is, the better it can absorb 21-cm radiation, so an absorption survey

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could show the distribution of cold interstellar hydrogen clouds. Comparing this with the CO distribution would tell us a lot about the structure of our galaxy and the role of interstellar clouds in it.

With all this in mind we began the test run in July to see if VLBI using the 300-foot and 140-foot would work for spectral-line measurements. We were scheduled for 12 hours per day, but priority at the telescopes went to Model IV autocorrelator development at the 140-foot and antenna painting at the 300-foot. The painters had an unfortunate habit of getting to work right on time, and the autocorrelator developers had the complementary virtue of staying long after quitting time to work out the bugs. We needed two 21-cm receivers, of course, and Green Bank has two good ones. But on our first day we found both had unexpected problems inside the cryogenic dewars and they had to be warmed up, repaired, and cooled down again. Thanks to some hard work by the mechanics and engineers we only lost a few hours to these problems, and soon we were ready to start.

VLBI sounds easy, but an experiment where a different source is observed every four minutes still keeps everybody busy. Not only do both telescopes have to track the same source at the same time, but LO frequencies, bandwidths and IF levels have to be the same as well. Since these change for almost every source, there are still many things that can go wrong. Fortunately, Jim Coe developed a "fringe checker" for us which used the existing video cable between the two telescopes and an old analogue delay line and correlator from the interferometer which he found in the basement of the Jansky Lab. So we could correlate the video data just as it went on the tapes and look at the fringes in real time on the chart recorder at the 300-foot. The gain of the system was so great that even without computer-controlled delays and other fancy stuff, the fringes showed up loud and clear even from sources as weak as one Jansky. That is, they did if everything was set up properly. If they didn't, the 300-foot operator could tell that something was wrong (or a lot of things). One night I got six calls from one or the other telescope between 3 a.m. and 8 a.m. After the first night was over we sleepily loaded the video tapes in John Benson's car, and he rushed with them to Charlottesville. By that evening he had correlated them on the processor and we knew we were seeing fringes. By the next morning he had further processed the data through the IBM 360 and obtained spectra. On stronger sources like W51 and W3, four minutes was all it took to see the lines. The interferometer was working!

Since then the real work has started. Some of the spectral-line VLBI post processing programs are not suitable for our data, ironically because the baseline is too short. Rewriting and debugging programs and the long grind of processing 100 hours of data have already taken twice as long as we spent at the telescopes. But there are no insurmountable problems, and it will surely be easier the next time.

Will there be a next time? That depends on the referees, of course, but we hope to have another observing session soon. There may be other experiments that could benefit from this system and if anyone has ideas, I would be interested to hear about them.

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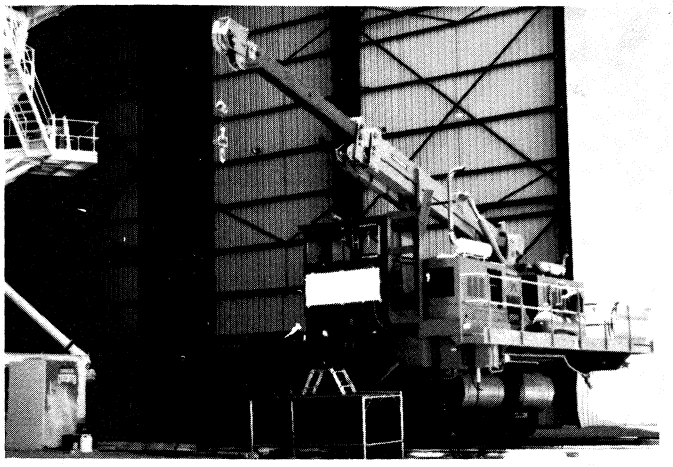
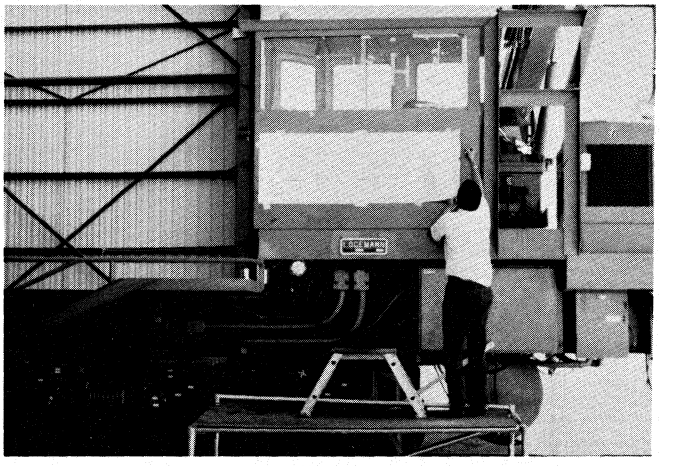
ENERGY

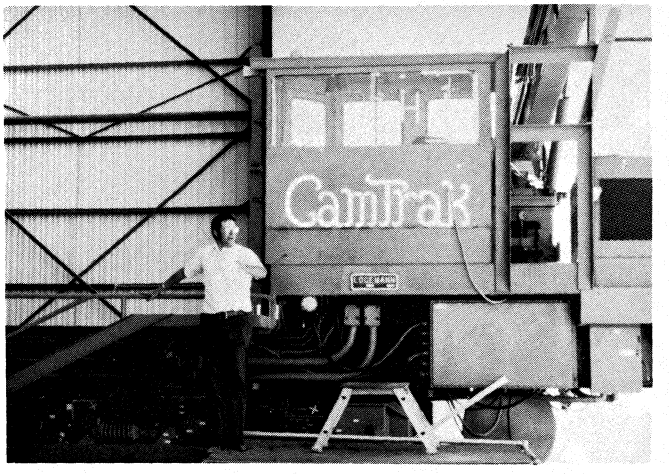
A cord of wood, 4'x 4'x 8' of hard wood like red maple produces the same amount of heat as:

144 gallons of fuel oil
23,300 cubic feet of natural gas or
1 ton of coal

A cord of green wood contains about 15 million BTU's. and air dried approximately 18.5 million BTU's.







NAME THE TRANSPORTER CONTEST RESULTS

Jon Spargo

Well, here it is folks, the results you've been anxiously waiting for!

From our photos its obvious the Transporter #2 has been named "Camtrack". The winning entry was submitted by Hein Hvatum and carries on the tradition of naming inanimate objects after animate people (in this case Cam Wade) who have labored long and hard for the cause here at the VLA. The christening took place on July 1980 with yours truly acting as master of ceremonies.

Actually the choice of a name was not all that easy as their were many good entries. The judges labored, over coffee, for a solid five minutes before the decision was made.

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The following is a complete list of all entries (un-edited) with the names of the 1st, 2nd and 3rd place winners.

1st Prize	Camtrak	Hein Hvatum
2nd Prize	Andromeda Train	Ray Escoffier
3rd Prize	Antenna Toter Two	Paul Riehle

High Plains Lifter
The Train of St. Augustin
Hain's Train
Hvatum's Hvehicle
Mort's transPORT
Barry's Ferry
Skyjacker
Dish Witch
Plains Train
JEINS' TREIN
Dickey Switcher
Transylvania Trolley
Tonka Toy Co.
Cactus Flower Limited
Sagebrush Special
Atcheson-Topeka & the VLA
St. Augie's Taxi
Little Johnnies Choo Choo
Napier's Rapier
Wheelie Dealie
Arial Plain
Hydra-Liftus-Erectus
Mopy Dick
Carry It Chariot
Paul's Lillie
Pat's Temple
Transpoamundo (AAAY!)
Star Tracker
Augustine Jackass
ANT-TRANS
Ve-Loc-Aporter
Prairie Ferry
El Loco Loco
Datillac
King Kong's Skateboard
Trundling Tillie
Hydratranspoliftus
SKYHORSE
WYE TUG
Tel-A-Tram
Desert Fox
Heinee Batum
Tracker Jacks
Jack's Hack
Jack's Track Hack
Cam's Tram
Ear Gear
Mort's Torte

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EYEWITNESS REPORT
(A Letter From Bruce Balick, 22 July)

Mt. St. Helen's continues its version of intestinal flu. Yesterday was its fourth major eruption induced, no doubt, by the alignment of Mars, Jupiter, Saturn and Venus near the sun (lunar tides appear to be ignored by the mountain). Geologists near Portland claim to be able to induce vomiting by the mountain by feeding themselves Chinese food for lunch the day before the event. So far those of us in the Puget Sound region have been able to enjoy the eruptions without getting involved. As many local bumper stickers proclaim, "Washington State: Don't Come To Us, We'll Come To You" refers to you sweaty folks out there in the East (here it's broken 80 degrees only once so far this year).

Anyway, yesterday's eruption consisted of 4 explosions each separated by about an hour. Because our usual (ahem!) summertime visibility along the horizon is 150 miles we could see the steam and ash cloud climb into view from Seattle like a big thunderhead in the distance. Unlike the thunderheads, however, these clouds rose to 50,000 feet within 10 minutes (that's 50 miles per hour) and then broke up in the high altitude winds. There's enough energy in one of those explosions to cook alot of salmon.

The biggest effect of Mt. St. Helen's activity so far has been felt by the tourist industry. For once we can drive to a trailhead or the ocean and not see a single van with California plates or somebody's poodle. We love it. There are a few Texans around; we presume they got lost looking for Colorado and have never heard of Mt. St. Helen's anyway.

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The Indians claim that Mt. St. Helen's (or as they know the mountain, Fire Throat) is angry at all the civilization that has moved into the area. The Yakima Indians (or, at least, an old man who enjoys the publicity) claims the geologic activity in the mountain results from all of the logging activity on its flanks. Weyerhouser has too much dignity to deny this story, but I'll bet they own most of the Yakima Indian reservation other than the pickups and will move to quell the insurrection. Burlington-Northern, owners of the former peak of Mt. St. Helen's were once planning to build a geothermal energy plant at the summit. Imagine what old Fire Throat might have done about that.

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HOW TO SAVE ENERGY WITHOUT SPENDING MONEY

Reprinted from the Energy Insider, 2/18/80

As the winter winds grow colder, the cost of heating a home grows even higher. To help ease the burden of soaring fuel costs, the Department of Energy suggests steps to take at little or no cost that can lower home energy costs by about 25 percent. Half of the suggestions cost little or nothing. The others require an investment of less than $100.

The estimate of savings is based on costs of five cents per kilowatt for electricity, 37 cents per therm for gas and 80 cents per gallon for oil.

Even if you have insulated attics and walls and have caulked and weatherstripped around doors and windows, gaps you may have overlooked will continue to cost you dollars and heat. Some of these gaps can be closed at small expense and for a substantial return. Here are two areas that are commonly ignored.

Escape up the chimney. It is not unusual to find a gap of an inch or wider in a fireplace which is not in use, because the chimney itself encourages a strong flow of air.

One way to stop the leak is to stuff the gap with insulation, or, if it is too large to insulate, to cover it with a board. The stuffing or covering obviously must be removed before the fireplace is used. In a cold climate, you can plug the damper and save $45 a year with electric resistance heat, $20 with gas heat and $30 with oil heat, depending on where you set the thermostat and the size of the gap.

Holes in your attic. Step into your attic some winter night. Even if it is insulated at floor level, you may be surprised to find the attic is much warmer than the outside air. That means that some of the expensive heat you need downstairs has escaped up to where it won't do you any good.

It is common to find large openings where pipes, ducts or exhaust fans are cut through the attic floor. But they can be stuffed with foil-backed insulation or scrap plastic such as dry cleaner bags taped in place. Stopping attic bypasses can save from $25 to $80 a year in heating costs.

All the obvious holes and gaps can be plugged with the exception of gaps around recessed light fixtures and the vents in the attic. Do not cover light fixtures directly with insulation as this may cause a fire. Also, the vents must be able to breathe so that they can prevent moisture accumulation in the attic.

Another major attic bypass is the gap where the furnace stack or chimney meets the wood framing of the house. This gap is very important, because it often creates a kind of mini-chimney effect, carrying air all the way from the basement to the attic and making a river of heat loss. Fireproof insulation can be stuffed between the wood frame and the wall of the chimney. Do not use cellulose here, as it may burn.

Another good candidate for a little insulation is the attic door. It should be covered with a batt of foil-backed insulation. The edges of the door should be weatherstripped so that air cannot escape

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around the sides. This measure alone can save $20 if you have electric heat, $8 for gas heat and $12 for oil heat. It will also save on air-conditioning costs.

Holes in your pocket. When people think of caulking and weatherstripping, they generally think of windows and doors. But most energy studies find that only 20 percent gets in underneath the baseboards, through wall outlets, through holes where plumbing pipes and telephone wires enter the house, through holes around exhaust fans, around dryer vents, and around sink and bathtub drain pipes as they exit from the house.

These gaps and holes should all be caulked or stuffed with insulation. The electrical outlets can be sealed with inexpensive gaskets that can be purchased at hardware stores. Turn off the electrical current switch for the outlets in question, remove the plastic cover plates with a screwdriver, insert the gaskets, reattach the plates and turn the current back on.

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THE USES OF FALLACY

Originally published in New Zealand Mathematics Magazine, 7/15/70 by Paul V. Dunmore

In the last hundred years or so, mathematics has undergone a tremendous grouwth in size and complexity and subtlety. This growth has given rise to a demand for more flexible methods of proving theorems than the laborious, difficult, pedantic, 'rigorous' methods previously in favour. This demand has been met by what is now a well-developed branch of mathematics known as Generalized Logic. I don't want to develop the theory of Generalized Logic in detail, but I must introduce some necessary terms. In Classical Logic, a Theorem consists of a True Statement for which there exists a Classical Proof. In Generalized Logic, we relax both of these restrictions: a Generalized Theorem consists of a Statement for which there exists a Generalized Proof. I think that the meaning of these terms should be sufficiently clear without the need for elaborate definitions.

The applications of Generalized Proofs will be obvious. Professional authors of text-books use them freely, especially when proving mathematical results in Physics texts. Teachers and lecturers find that the use of Generalized Proofs enables them to make complex ideas readily accessible to students at an elementary level (without the necessity for the tutor to understand them himself). Research workers in a hurry to claim priority for a new result, or who lack the time and inclination to be pedantic, find Generalized Proofs useful in writing papers. In this application, Generalized Proofs have the further advantage that the result is not required to be true, thus eliminating a tiresome (and now superfluous) restriction on the growth of mathematics.

I want now to consider some of the proof techniques which Generalized Logic has made available. I will be concerned mostly with the ways in which these methods can be applied in lecture courses -- they require only trivial modifications to be used in text books and research papers.

The *reductio* methods are particularly worthy of note. There are, as everyone knows, two *reductio* methods available: *reductio ad nauseam* and *reductio ad erratum*. Both methods begin in the same way: the mathematician denies the result he is trying to prove, and writes down all the consequences of this denial that he can think of. The methods are most effective if these consequences are written down at random, preferably in odd vacant corners of the blackboard.

Although the methods begin in the same way, their aims are completely different. In *reductio ad nauseam* the lecturer's aim is to get everyone in the class asleep and not taking notes. (The latter is a much stronger condition.) The lecturer then has only to clean the blackboard and announce, 'Thus we arrive at a contradiction and the result is established'. There is no need to

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shout this -- it is the signal for which everyone's subconscious has been waiting. The entire class will awaken, stretch, and decide to get the last part of the proof from someone else. If everyone had stopped taking notes, therefore, there is no 'someone else', and the result is established.

In *reductio ad erratum* the aim is more subtle. If the working is complicated and pointless enough, an error is bound to occur. The first few such mistakes may well be picked up by an attentive class, but sooner or later one will get through. For a while, the error will lie dormant, buried deep in the working, but eventually it will come to the surface and announce its presence by contradicting something which has gone before. The theorem is then proved.

It should be noted that in *reductio ad erratum* the lecturer need not be aware of this random error or of the use he has made of it. The best practitioners of this method can produce deep and subtle errors within two or three lines and surface them within minutes all by an instinctive process of which they are never aware. The subconscious artistry displayed by a really virtuoso master to a connoisseur who knows what to look for can be breathtaking.

There is a whole class of methods which can be applied when a lecturer can get from his premisses P to a statement A, and from another statement B to the desired conclusion C, but he cannot bridge the gap from A to B. A number of techniques are available to the aggressive lecturer in this emergency. He can write down A, and without any hesitation and put 'therefore B'. If the theorem is dull enough, it is unlikely that anyone will question the 'therefore'. This is the method of Proof by Omission, and is remarkably easy to get away with (sorry, 'remarkably easy to apply with success').

Alternatively, there is the Proof by Misdirection, where some statement that looks rather like 'A, therefore B' is proved. A good bet is to prove the converse 'B, therefore A': this will always satisfy a first-year class. The Proof by Misdirection has a countably infinite analogue, if the lecturer is not pressed for time, in the method of Proof by Convergent Irrelevancies.

Proof by Definition can sometimes be used: the lecturer defines a set S of whatever entities he is considering for which B is true and announces that in future he will be concerned only with
Even an Honours class will probably take this at face value, without enquiring whether the set S might not be empty.

Proof by Assertion is unanswerable. If some vague waffle about why B is true does not satisfy the class, the lecturer simply says, 'This point should be intuitively obvious. I've explained it as clearly as I can. If you still cannot see it, you will just have to think very carefully about it yourselves, and then you will see how trivial and obvious it is.'

The hallmark of a Proof by Admission of Ignorance is the statement, 'None of the text-books makes this point clear. The result is certainly true, but I don't know why. We shall just have to accept it as it stands.' This otherwise satisfactory method has the potential disadvantage that somebody in the class may know why the result is true (or, worse, know why it is false) and be prepared to say so.

A Proof by Non-Existent Reference will silence all but the most determined troublemaker. 'You will find a proof of this given in Copson on page 445', which is in the middle of the index. An important variant of this technique can be used by lecturers in pairs. Dr. Jones assumes a result which Professor Smith will be proving later in the year -- but Professor Smith, finding himself short of time, omits that theorem, since the class has already done it with Dr. Jones ...

Proof by Physical Reasoning provides uniqueness theorems for many difficult systems of differential equations, but it has other important applications besides. The cosine formula for a triangle, for example,

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can be obtained by considering the equilibrium of a mechanical system. (Physicists then reverse the procedure, obtaining the conditions for equilibrium of the system from the cosine rule rather than from experiment.)

The ultimate and irrefutable standby, of course, is the self-explanatory technique of Proof by Assignment. In a text-book, this can be recognized by the typical expressions 'It can readily be shown that ...' or 'We leave as a trivial exercise for the reader the proof that ...' (The words 'readily' and 'trivial' are an essential part of the technique.)

An obvious and fruitful ploy when confronted with the difficult problem of showing that *B* follows from *A* is the Delayed Lemma. "We assert as a lemma, the proof of which we postpone ...'. This is by no means idle procrastination: there are two possible denouements. In the first place, the lemma may actually be proved later on, using the original theorem in the argument. This Proof by Circular Cross-Reference has an obvious inductive generalization to chains of three or more theorems, and some very elegant results arise when this chain of interdependent theorems becomes infinite.

The other possible fate of a Delayed Lemma is the Proof by Infinite Neglect, in which the lecture course terminates before the lemma has been proved. The lemma, and the theorem of which it is a part, will naturally be assumed without comment in future courses.

A very subtle method of proving a theorem is the method of Proof by Osmosis. Here the theorem is never stated, and no hint of its proof is given, but by the end of the course it is tacitly assumed to be known. The theorem floats about in the air during the entire course and the mechanism by which the class absorbs it is the well-known biological phenomenon of osmosis.

A method of proof which is regrettably little used in undergraduate mathematics is the Proof by Aesthetics ("This result is too beautiful to be false'). Physicists will be aware that Dirac uses this method to establish the validity of several of his theories, the evidence for which is otherwise fairly slender. His remark 'It is more important to have beauty in one's equations than to have them fit experiment'[1] has achieved a certain fame.

I want to discuss finally the Proof of Oral Tradition. This method gives rise to the celebrated Folk Theorems, of which Fermat's Last Theorem is an imperfect example. The classical type exists only as a footnote in a text-book, to the effect that it can be proved (see unpublished lecture notes of the late Professor Green) that ... Reference to the late Professor Green's lecture notes reveals that he had never actually seen the proof, but had been assured of its validity in a personal communication, since destroyed, from the great Sir Ernest White. If one could still track it back from here, one would find that Sir Ernest heard of it over coffee one morning from one of his research students, who had seen a proof of the result, in Swedish, in the first issue of a mathematical magazine which never produced a second issue and is not available in the libraries. And so on. Not very surprisingly, it is common for the contents of a Folk Theorem to change dramatically as its history is investigated.

I have made no mention of Special Methods such as division by zero, taking wrong square roots, manipulating divergent series, and so forth. These methods, while very powerful, are adequately described in the standard literature. Nor have I discussed the little-known Fundamental Theorem of All Mathematics, which states that every number is zero (and whose proof will give the interested reader many hours of enjoyment, and excellent practise in the use of the methods outlined above.) However, it will have become apparent what riches there are in the study of Generalized Logic, and I appeal to Mathematics Departments to institute formal courses in this discipline. This should be done preferably at undergraduate level, so that those who go teaching with only a Bachelor's degree should be familiar with the subject. It is certain

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that in the future nobody will be able to claim a mathematical education without a firm grounding in at least the practical applications of Generalized Logic.

[1] P A M Dirac, '*The Evolution of the Physicist's Picture of Nature*', Scientific American, May 1963, p. 47

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SUMMER FUN - NEW MEXICO STYLE!

Jon Spargo

You say your kids are bored by summer activities or inactivity as the case may be?

Six year old Shane and 4 year old April Guin of Magdalena, New Mexico don't have that problem. For them summer means Rodeo!

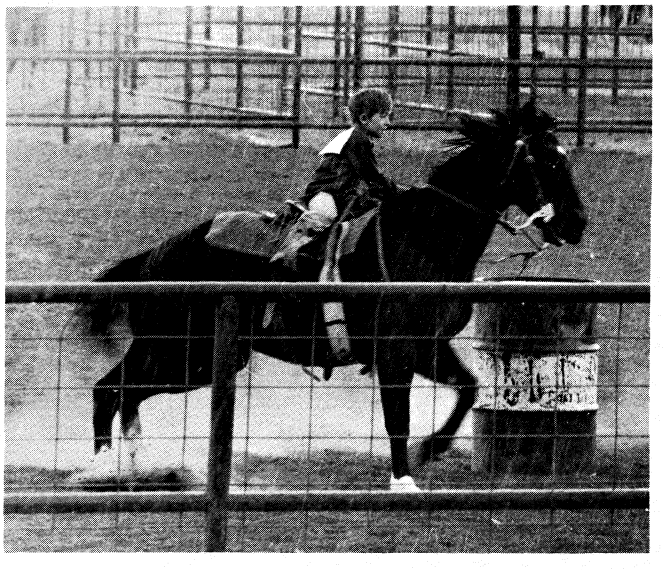

Figure 1.

Shane, in his 3rd year of Junior Rodeo competition, is shown here competing in a barrel race (in the rain) at the Magdalena Junior Rodeo on July 19, 1980. (Figure 1)

April, in her first year of competition, is shown in the barrel race at the Magdalena Rodeo (Figure 2) and the flag race at the Datil Rodeo (Figure 3).

Neither won any prizes, I'm told, but for both the fun of competing makes up for that. In fact April's pony Thunderbolt, who is not known for his binding speed, decided to take a relaxing roll in the dirt shortly after rounding a barrel at the Datil Rodeo. Fortunately April escaped that little episode without a scratch much to the relief of her parents, James and Mayra Guin of Magdalena. Jim is a technician with the Waveguide Group at the VLA.

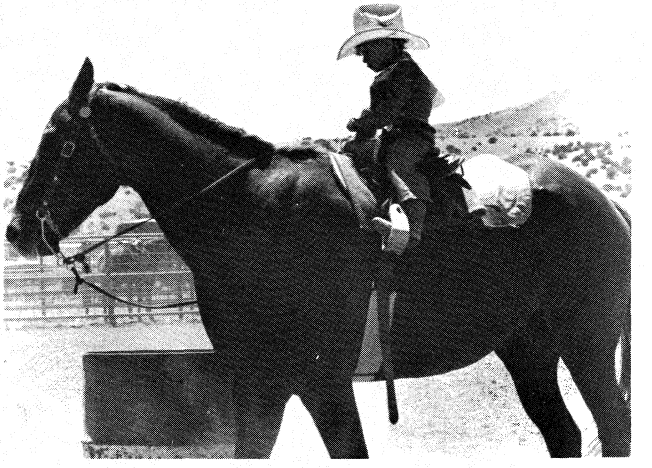

Figure 2.

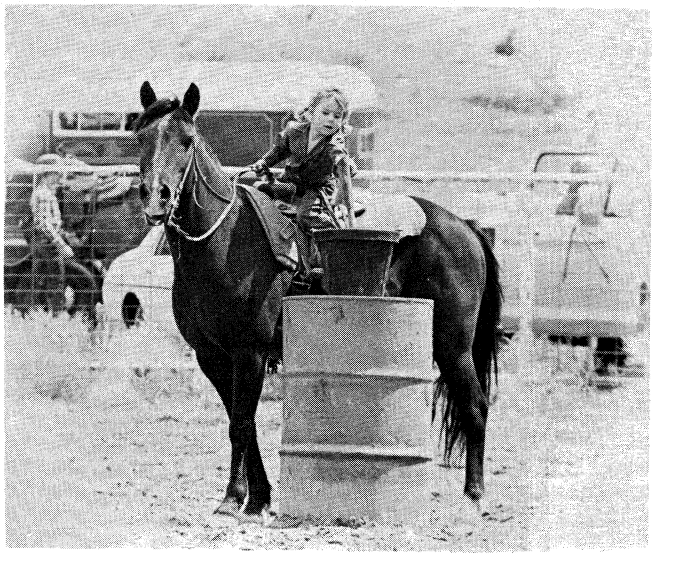

Figure 3.

WHAT'S ALL THAT NOISE IN THE LIBRARY

Sarah Martin

There are two major sources of noise in the CV library these days. One is the usual scientific staff mumblings, some of which are appended to the end of this article for your amusement. The other noise maker is the Texas Instruments data terminal that the librarians are using to communicate with OCLC. OCLC? "What's an OCLC?" I hear you cry. Well, OCLC is an acronym for the Ohio College Library Center, which has designed and operates a bibliographic computer and telecommunications system used by librarians to catalog books, serials, and various other library materials, and to facilitate interlibrary lending. To use the system, one merely calls the computer in Ohio, attaches the telephone to the TI, types in simple search instructions and the desired record, containing bibliographical information similar to catalog cards, is printed out. This record is edited to conform to local cataloging practices and holding information is entered. A "produce" key is then hit, which instructs the computer to send us catalog cards for that particular title and to enter that title onto magnetic tapes, which we receive quarterly. The tapes will be used to prepare "book catalogs" -- i.e., a card catalog with author, title, and subject access printed in book format for the libraries in Tucson, Socorro, and Charlottesville electronics. The major difference under the new system for library users in Charlottesville and Green Bank is that the catalog cards look a bit different and under the call number on each card is a list of all of our libraries that have copies of that particular title. Eventually, we may do away with the card catalog entirely and use only the tapes, either online through our computer or by means of print-outs, like those in Tucson, Socorro, and Electronics.

Although there are over 6 million records in the OCLC computer, which have been input by some 2,200 member libraries, we still don't find everything the library acquires in the database. This is because the specialized nature of our collection means we acquire items that most other libraries don't buy. (Surprisingly, not many libraries outside of our own are interested in the proceedings of the Asian-South Pacific Regional Meeting in Astronomy published in the New Zealand Journal of Science, to cite one recent example.) In such cases, we input the record into the system from scratch for the benefit of the other libraries.

Another useful feature of the system is that for each of the 6 million titles online, there is a list of holding libraries. This means that when one of the NRAO staff wants a copy of an article in an obscure publication, like the International Symposium on Soil Structure Interaction at the University of Roorkee, India (one recent request), we can find a library quickly that owns that volume and obtain a copy of the article. Given the esoteric nature of most of the requests we receive, this capability saves a lot of librarian time.

So, before you complain about the noise from the terminal or that the telephone line is busy when you call, remember that we're doing great things for you via computer and be thankful. Now, if you've read this far, you deserve a bit of a reward, so I present herewith recent comments overheard in the CV library. I've made no attempt to interpret them meaningfully (I believe in most cases one is better off not trying to understand) and I have refrained from identifying the speaker in order to protect the guilty.

"Under that preppy exterior beats the heart of a flaming liberal."
"Nobody loves a fat fawn."
"All you get from keeping your nose to the grindstone is a flat nose."
"Enrico Fermi came to me in a dream last night and said 'Watch it, mate.'"
"Fruit flies are not renowned for their brains."

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"We're talking about NRAO as an existential beast."
"A daily shower is really important to an observer."
"Botticelli's Venus is essentially a surf bunny."
"There is nothing more real than a supermarket."
"No canoodling in the library."
"There are other ways to do poofs, too."
"Floppies are nice and fast, but they don't have much storage."
"If I don't know it, it can't be in the OED."
"That's the last craving I have to get rid of -- for pastry."
"For pizza and beer, I'll sell out."
"A little decorum is a dangerous thing."
"You can play life here, but it's a pain."
"You may think it's bad having the waters muddied around you, but I'm the one who gets gunk between the toes."

And finally, one of my favorites, proportedly said by President Milliken of Caltech:

"I don't give a damn what his name is, no one is worth $3,000 a year."

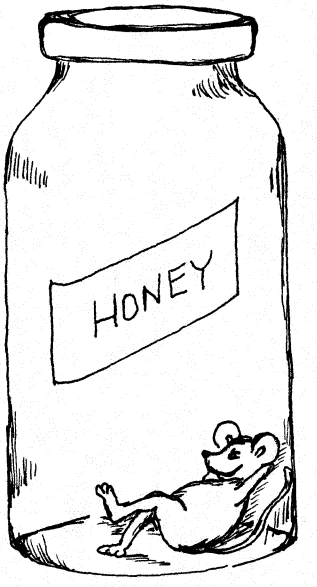
At which point Albert Einstein packed up his bags and bicycle and moved to Princeton ....

* * * * *

A BETTER MOUSETRAP, PART II

Marc Damashek

Up here in the mountains of West Virginia, the weather usually turns cold early in September, and the field mice are among the first to know. Just as often as not, one of them will come seeking out a nice cozy spot in our pantry as a prospective winter home, so I wasn't surprised one chilly night this fall to find that



I had some late-night company in the kitchen. Well... time to find the trap.

The trap is a handy little wind-up gadget that mice like to crawl into, and it leaves them alive and ready to accompany me to work, where I can release them the next morning. Unfortunately, when mouse number one arrived this year, I couldn't find our carefully stored trap. With regrets, I decided to pick up some conventional ones, and turned in for the night.

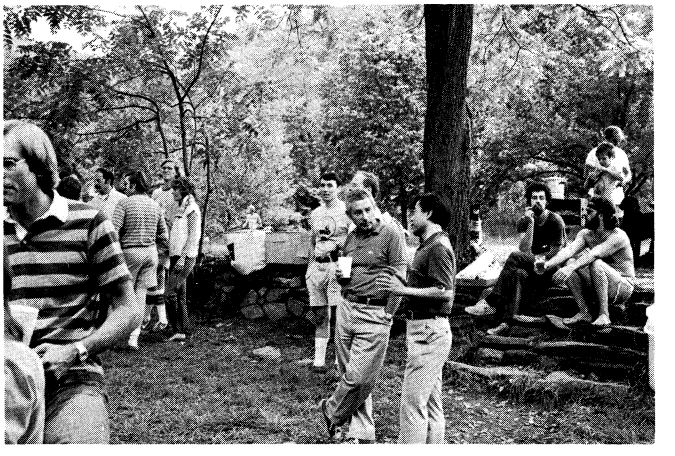
Early the next morning, as I sleepily prepared some breakfast, I was jarred out of my senses by something suddenly moving on the stove-top. My little furry compatriot, sensing perhaps that the end was nigh, had invited himself to a last snack at the bottom of an all-but-empty honey jar, and was now politely waiting to be helped back out!

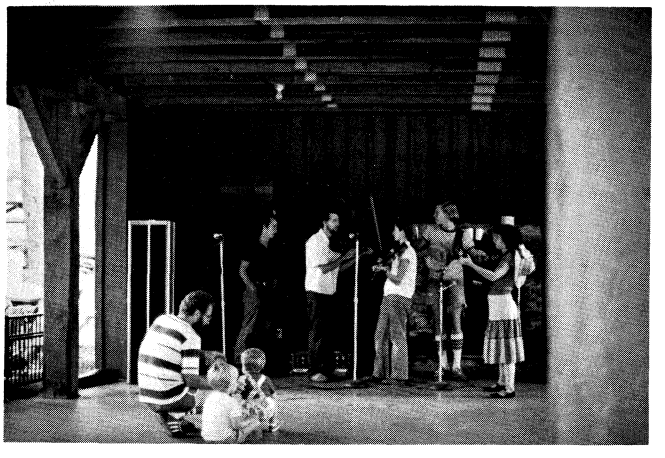
CHARLOTTESVILLE SUMMER PICNIC - 1980

Ed Fomalont

The second Annual Charlottesville Summer Picnic was held at Mint Springs Lake Park in the cool Blue Ridge, on August 23. While the lake and strand beckoned some NRAO'ers and the volleyball court excited others, one hundred and fifty-pounds of ribs were sizzling on the grill. Along with homemade applesauce, baked beans and Rufus' potato salad, the repast was enjoyed by all.

Jay Lockman and his group lightened the evening spirit with music and square dancing; others passed the night in conversation over the last dregs of beer; and a few hearty souls sneaked away in the darkness to the lake. A few photos taken during the day are shown below.





VLBI WORKSHOP

Ken Kellermann

On September 15, 16, and 17 the VLB Network Users Group met in Green Bank for its annual meeting. Approximately 60 people participated including representatives from Germany, Holland, Italy, and England. The group met to discuss the organization of VLB observations, and the design of the proposed Very Long Baseline Array with antennas located throughout the United States including Alaska and Hawaii. This array will be able to form pictures of distant radio sources with a resolution equivalent to a single antenna about 5 thousand kilometers across.

The group also discussed the possibility of adding a single element in space which would give a resolution somewhat better than an antenna the diameter of the earth.

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NATIONAL RADIO ASTRONOMY OBSERVATORY
QUARTERLY REPORT
April 1, 1980 - June 30, 1980

ELECTRONICS DIVISION

Green Bank

An IF patch panel is being constructed for use at the 140-foot telescope. Included in this panel are equalizing filters to compensate for cable attenuation, power monitors, and multiple outputs. Two IF's will be accommodated by this panel.

Samplers on the digital delay at the interferometer have been shielded and power lines filtered to give approximately 20 dB improvement in radiated noise between 1 and 2 GHz.

Lab testing of the 5 to 25 GHz upconverter/maser receiver is complete. Presently the receiver is being installed in the 140-foot telescope's Cassegrain house.

The 300 to 1000 MHz cooled-upconverter/GASFET-amplifier receiver is as complete as available parts permit and is now being tested. Some upconverters and GASFET-amplifiers are still lacking, but should be ready by late summer. Variations in required pump power in the upconverters has been decreased by changing the diode mounting.

Hardware check-out of the Jansky Lab MODCOMP computer is complete with the exception of the card punch.

The servo control for the focal plane measurement receiver is complete. A software package to interface the digital standard receiver to this receiver is also complete, with minor exceptions. New feeds are being installed on this receiver. Once they are installed and matched to the receiver, mechanical testing and calibration will be done to assure that it is ready to go to the 140-foot in August.

Prototype upconverters for the 1 to 5 GHz range have been constructed with encouraging results. Bandwidths of about 50% have been achieved, as well as 2 to 3 dB of gain. Future work will include improving of the devices' impedance match and increasing their gain.

Final testing of the spectrum expander for the 256-channel, 100 kHz/channel filter receiver in Tucson is nearly complete. Expansion factors of 4, 8, and 16 are switch or remotely selectable. Provisions are also included for external expansion selection.

Cooled FET L and C band receivers are being built for Caltech and Ft. Davis. At present, the dewar for the Ft. Davis receiver is being tested while the dewar for the Caltech receiver is being modified.

A thermal calibrator is being constructed for use in calibrating receivers to 18 GHz.

Tucson

During this quarter the performance of the 170-170 GHz receiver has been improved, and we now have a noise temperature of 600 K to 700 K across the band. A Fabry Perot filter has been constructed for this receiver and tests show that the receiver sideband ratio is close to unity across the band.

The ^{3}He bolometer system is completed but the hold times of both the ^{3}He and ^{4}He stages need improvement. A calibration system for the bolometer has been developed during this quarter. Tests of the bolometer will be completed during July.

Work continues on the 190-290 GHz cooled mixer receiver. Due to the difficulty of obtaining LO power at these high frequencies, we have decided to make the initial receiver single channel.

Charlottesville

A millimeter wave frequency doubler giving > 5 mW output power and > 10% efficiency over the 127-170 GHz frequency range has been completed and is in use in the 2 mm receiver at the 36-foot telescope. This device replaces klystrons which have been very unreliable and expensive in this frequency range. Work is continuing on the study of noise in 70-115 GHz mixers and on the design of a 190-290 GHz mixer.

Twenty-six 4.5-5 GHz FET amplifiers have been completed and shipped to the VLA site. Three two-stage amplifiers, each having

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noise temperature < 20 K over a 500 MHz bandwidth, have been shipped to Tucson to replace parametric I.F. amplifiers now in use. Two 5 GHz amplifiers and a 1.4 to 1.7 GHz amplifier have been completed for use in the Ft. Davis VLBI front-end.

The Mark IV 1024 channel autocorrelator has been completed and shipped to Green Bank. Construction of a second VLBI Mark III terminal and expansion of the VLBI Mark II processor are continuing.

COMPUTER DIVISION

VLBI

A gradual transition to video cassette recorders is underway. The long-term effects are as yet unknown. Cassette recording is economical due to lower priced tape recorders, lower priced tape, and lower shipping costs of cassettes.

VLA Post processing

On April 30 a meeting was held in Charlottesville to discuss export problems associated with the VLA post processing system. Seminars and additional meetings will be held periodically, and we expect to begin exporting software at the end of 1980.

The ground work for the post processing system is nearly finished. The POPS' communication software is being used; file management routines are settled; ModComp and VAX computer systems are compatible; display routines for the I^2S image processor are being developed; and basic application programs are being coded.

Green Bank

The remote job entry (RJE) station at Green Bank has been downgraded to a card entry station and a line printer. The present 50 card per minute reader will be replaced with a 300 card per minute reader. A PANDORA terminal has been installed in the Green Bank lab building and a second dedicated telephone line has been ordered for a second PANDORA terminal.

ENGINEERING DIVISION

Shop and field work was completed repositioning the automated feed mount in the focal point structure of the 140-foot telescope. Design, shop and field work were completed in the modification of the Cassegrain house on the 140-foot. Fabrication, modification in design, operation checks and preparation for installation continued for a new traveling feed on the 300-foot. Fabrication, testing and modifications in design on the first stage of a prototype reflector plate measuring instrument were completed. A report and three composite carbon fiber sandwich-type construction prototype reflector plates for the proposed 25 meter millimeter wave telescope were received and are being reviewed. A storage and test building was designed and the drawings turned over to maintenance for construction at the 140-foot. Limited research and studies continued for the proposed 25 meter millimeter wave telescope. Specifications and requests for proposals were prepared for painting sections of the 300-foot structure. Assistance was provided in supervision and progress checks of AUI Contract 191 for a new covering on the 36-foot telescope dome. Routine engineering assistance was provided maintenance and operations at Charlottesville, Green Bank, and Tucson.

VERY LARGE ARRAY PROGRAM

The array was scheduled for observations and tests for approximately 60% of the time during the second quarter. The maximum number of antennas used for observing was 24. The longest usable baseline is 24 km.

The Electronics Division received the last stainless steel dewar and installed it on Antenna No. 28. This completes the procurement of cryogenics equipment for the program.

In the waveguide area, installation of waveguide on Antenna No. 28 was completed.

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Loss measurement of the buried 60 mm waveguide from station AN6 to AN8 (a distance of 06.02 km) was completed with a measured loss of 1.04 dB/km at 50 GHz. The performance of this waveguide system is much better than specified.

The prototype for a new and improved subreflector focus-rotation control system was completed and installed on antenna No. 27.

During this period the software development of the "pipeline" data processor was accelerated and put on a step-by-step schedule plan. According to this plan the processor should be operational the second quarter of 1981. Other developments included a number of improvements to the present observing and data reduction system.

The second transporter was received and assembled during the second quarter and check-out begun. Phase I of the wye track construction was 100% complete and Phase V construction for the balance of track construction is 94% complete. VSQ No. 3 and the VAX addition to the library office building were delivered to the site during June and placed on their foundations. Finish work was progressing at the end of the month.

* * * * *

HOW'S THE TOUR BUSINESS THIS YEAR?

Wally Oref

The other day a fellow employee asked me if the number of visitors to NRAO increased this year. I told him yes, but only by a few per cent over last year (comparisons based on the number of registered guests through Labor Day) and 37 per cent less than in 1976, 1977, 1978. Having answered thusly, I knew the next question to follow would be: How do you explain the drop in tourists?

I'm not sure I know the answer but here's my opinion: Simply stated, people are staying away from this part of West Virginia. For the past two tourist seasons, traffic on Route 92 has dropped considerably. Local motels report business is way down. The Visitor's Center at Cranberry Glades say their tourist activity is similar to NRAO's this year. Our best drawing local attraction, the Cass Scenic Railroad, had only a few per cent more riders than in 1979 and a lot less than in 1976, 1977, 1978 (same as NRAO's). Not only has traffic dropped on Route 92 but, recreational vehicles are noticeably scarce. This has happened only since the gasoline crisis. Campers and trailer traffic has dropped off to a trickle.

I think out-of-county visitors believe gasoline in our area is scarce normally and practically unobtainable on weekends. It's not money. Vacationers always have plenty of gas money (even those that don't work for NRAO?). The fact is gas in Pocahontas County is in ample supply. I don't know any other reason why people are staying away from Pocahontas County tourist oriented facilities in such large numbers and from NRAO tours in particular -- they're free. What makes things even more painful is that this spring, the West Virginia Department of Commerce predicted that 1980 would be a superb year for tourism in West Virginia. On the other hand 44 miles northeast of NRAO at Seneca Rocks, they are jumping with people. So good, in fact, that instead of changing over after Labor Day to their regular weekend-only schedule, they are going to stay open Wednesdays through Saturdays for a while and perhaps even through the winter! I wonder if offering a prize sweepstakes next year would bring us more visitors?

RECAP

Total number of visitors, 1976-1980
daily tour

1980	13,041
1979	12,130
1978	17,700
1977	18,027
1976	17,602

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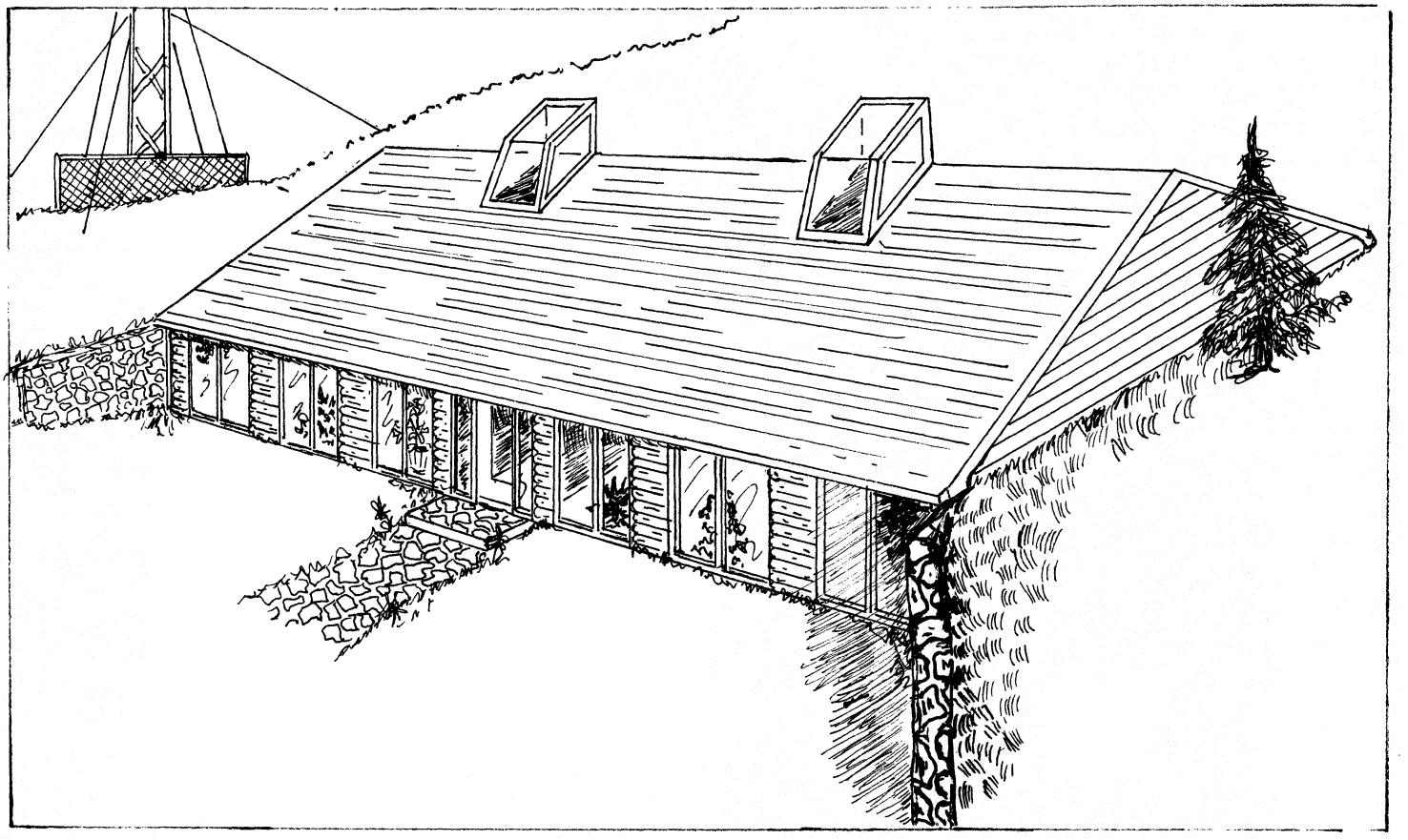

Figure 1

RADIO POCAHONTAS

Omar Bowyer

Local radio for the residents of Pocahontas County will be a new and exciting experience. It will be programmed to the local needs with heavy emphasis on community news, interests, and music. (A survey revealed that bluegrass and country music will probably hold the most musical interest.) National and state news as well as many other special programs will come from the National Public Radio network. National Public Radio (NPR) is a private non-profit membership corporation established in 1970 specially to provide a national program service for the Nation's public radio stations. This complete package, we hope, will come to you in the summer of 1981.

Many people have discussed many different ways and means on how to build a radio station in Pocahontas County. Our station will be AM with 2,500 watts of radio power at 1370 on your dial. AM broadcast carries better than FM in mountainous country and will give good coverage to the entire county and surrounding areas. In the beginning, it will be a daytime-only station. Sign on will be one hour before sunrise and we will sign-off at sunset. Later we would like to stay on the air after sunset.

The transmitter and studio building are being built on the Pocahontas County High School property just off route 92, near Seneca State Forest. It will be one of less than two dozen AM stations operating non-commercially in the USA and certainly the smallest. During full operation, probably five full-time employees will be required.

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The station's (being non-commercial) financial support will come from listeners, the County Commission and several different State and Federal agencies. Estimated start-up costs are $267,000 of which $50,000 is budgeted for the building. The Benedum Foundation contributed $25,000 toward building costs. Presently, the station is being funded under a grant from the Corporation of Public Radio. A second grant from the Appalachian Regional Commission will supply the necessary furnishings and less expensive equipment. Another grant from the Commerce Department will purchase the transmitter, tower, satellite earth station, control room and studio equipment. Every dollar raised locally will be matched with $4.56 from these outside sources.

The station building as shown in Figure 1 will be architecturally innovative. It will combine the best features of passive solar and earth shelter in a double envelope structure. (Details of this structure are discussed in Jim Dolan's article on this page.)

Although Radio Pocahontas will have a manager, a program director and an engineer to handle the day-to-day duties, a Board of nine Directors, elected and appointed from the County, will control the management of the station: 1) one member each appointed from the Board of Education, WVU County Extension Service and County Commission; 2) two members elected by the "friends of the radio", and 3) four members elected by the board. Each term on the board is for two years. Every effort will be made to insure that people from all walks of life have a voice in programming what goes on the air. Senior citizens, farmers, high school students, church groups -- everyone will have a chance to create and request programs suited to their needs. We invite you to become involved in Radio Pocahontas.

* * * * *

THE EARTH CONNECTION

Jim Dolan

Pocahontas Countians will soon see a radio station building constructed with energy conservation and ecological balance a primary consideration. The building which will be located just north of Pocahontas County High School, will house radio station WVMR. Although cost was also a prime building consideration, preliminary estimates indicated life-cycle costs of the new facility to be less than those for a conventional structure. The soon to be built station building is interesting because it includes three independent concepts in one package.

The building will be sheltered on the north, east and west by earth, making it by definition a partial earth sheltered building. Heavy masonry, insulated on the outside, will provide a long thermal time constant thereby smoothing out external temperature variations. In general, an earth sheltered structure will require 60 to 80 percent less energy than a conventional above the ground counterpart. Since the temperature a meter or two below the surface is within a few degrees of $13^{o}C$ ($55^{o}F$) year round, the advantages of earth contact are less heat required in the winter, and less cooling in the summer. Modern materials and techniques have solved the problem of excess moisture usually associated with underground space such as basements. A well designed earth contact home has as much or sometimes more natural light than a conventional frame home.

The WVMR building will also utilize a much publicized, new construction concept called the "envelope". In this construction technique, a shell is built within a shell, allowing air (preferably solar heated) to circulate around the living space. Although the thermal dynamics of this system are not well understood, elaborate tests show the efficiency of the envelope is higher than an ordinary, single shell structure.

The third component of the studio building is a south facing solarium that will help heat and cool the envelope. In summer a draft is set up by the sun, pulling cool air

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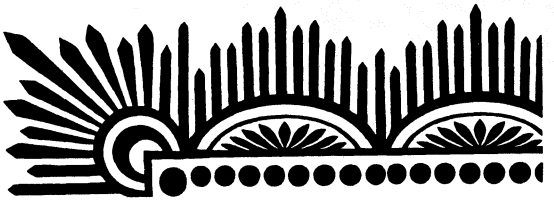
from buried tubes into the area around the envelope. In winter, the solar warmed air is made to flow around the envelope. Temperature control is maintained by thermostat operated vents.

Solar energy has many variations and each variation has its advocates. The argument that solar energy does or does not work has pretty much been settled. People who say flatly that "solar energy won't work" belong in the flat earth club. Solar energy systems do work, but whether solar energy is economically feasible depends on each individual application. In our building we will use a "passive solar" system which in an engineering sense is indeed beautiful because it's simple. In this system no moving components are involved. The mass of the building stores the sun's energy (heat) and slowly gives it up when the living space needs it.

Initially, I intended to write an article about underground housing in general, but instead I elaborated on a specific case where it will be used. The concept of earth shelter is not new. It's just the combination of earth shelter, modern material, and techniques that could be called "new". Some people think the combination of passive solar energy and earth sheltering is an almost perfect answer to our ongoing energy problems. But, unfortunately, it's only a partial answer because home heating and cooling uses only about 20 percent or so of our energy supplies. Solving "the energy problem" will require a combination of many technologies. Although we have plenty of problems and a lot more will arise, energy conscious people look forward to the eighties with anticipation. The solution to the energy problems we now face will herald a new era. The way we live, love and work will never be the same.



WHY DO ASTRONOMERS GROW BEARDS?

Galen Gisler

A piece which appeared in this journal a few months back by Lee J Rickard, distinguished and frequent contributor of many amusing and enlightening articles, began with a discussion of shaving as a means of attracting attention -- given a suitable length of time to prepare beforehand. Lee J then went on to describe the Kuiper Airborne Observatory, thus leaving unaddressed the interesting topic of the high frequency of beards among astronomers.

Lest anyone accuse me of blindness, ignorance, or male chauvinism, I must acknowledge that it is not true that all astronomers wear beards. The director of the NRAO does not wear a beard, neither does our former director, nor do the present or former directors of Kitt Peak National Observatory. In fact the data are consistent with the suggestion that not having a beard is prerequisite for becoming the director of a National Observatory. Be that as it may, a surprisingly large proportion of male astronomers do wear beards. A beard count at a recent Charlottesville Pizza Lunch revealed that 71 percent (ten out of fourteen) of the male astronomers present were bearded. Among the NRAO contingent at that lunch, the proportion was even higher: nine out of ten. The Thursday Pizza Lunch is not, of course, a representative sampling of astronomers, but the impression that beards are unusually common among astronomers is born out by comments to that effect made by members of the public who make acquaintance with a group of astronomers.

I admit there may be a sort of selection effect here in that I, being bearded, am rather more likely to hear such a comment made by an acquaintance of mine to whom I introduce my colleagues. The topic of bearded astronomers was often a matter for discussion among the summer students this year, and one of the female summer students in Charlottesville asked, at the end of her first week here, why most male astronomers grow beards, and it is that question that

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these musings.

First, do most male astronomers wear beards? A study of the staff pictures displayed outside the graphics department (updating for recent growth) shows that roughly 56 percent of the male scientists on the NRAO (Charlottesville) staff wear beards. In contrast, only about 13 percent of the other male employees are bearded. This phenomenon is not limited to the NRAO, either. Geoff Burbidge, director of Kitt Peak National Observatory, made a derisive remark at coffee on the patio in Tucson one morning to the effect that young astronomers were as uniform in their conventional ideas as in their unconventional appearance -- standing before him were four or five postdocs, all with beards, wire-rimmed glasses, cutoffs and teeshirts.

Beards certainly are more prevalent among the younger members of our profession: partly this is simply a reflection of the society-wide tendency towards beards among the men in my generation. But perhaps there is something in the nature of our vocation that inclines us toward the hirsute. Does having a beard to stroke make it easier to meditate upon the curvature of a homogeneous and isotropic universe? -- or to ponder the intricacies of neutral hydrogen velocity - longitude plots? Doubtful, somehow. Is it that beards keep astronomers warm during the long cold winter nights in the telescope dome? That's not it, since the optical astronomers at the University of Virginia sport less facial hair than the theorists and radio astronomers in Charlottesville.

I remember my first encounter with a bearded astronomer, more than ten years ago. It was absolutely classic. I was a beardless undergraduate at Yale at the time, just beginning to take an active interest in this vast and ancient science. I was taking an astronomy lab course which was being taught by several members of the Yale astronomy faculty (all beardless at the time, though some have developed since), led by Richard Larson (beardless then as now). A few weeks into the term the class made its first nighttime visit to the Yale observing station at Bethany, Connecticut. It was a bitterly cold night, and the observing conditions were marginal, at best. We sat huddled around an oil stove in the main building, drinking coffee with the graduate student T.A.'s hoping that the skies would clear so that we could get our first taste of real observing, yet praying that the clouds would thicken so we wouldn't have to spend the rest of the night out in the cold. Our prayers -- not our idle hopes -- were answered, and soon the graduate student who was using the 40-inch reflector (since moved to the Cerro Tololo Inter-American Observatory in Chile) walked in, having shut the telescope down for the night. He was dressed, head to toe, in a heavy government surplus cold suit, with thick boots, two or three heavy scarves and numerous sweaters underneath. He was tall and husky, and had a luxuriant beard. He was just the image of an Arctic explorer, a man who battles the elements for the sake of his devotion to science, mindful of the extra bit of insulation against the bitter cold provided by the air trapped in his beard. That night I decided to become a theoretical astronomer -- not an optical observer! (I have since dabbled in optical observing to the extent of spending almost 40 nights in an open dome at Kitt Peak, collecting a small mountain of data on the spectra of elliptical galaxies. But then Kitt Peak is not as cold as Bethany, and I had in the interim also grown a beard.)

Incidentally, I'm told by an experienced Arctic explorer -- our own bearded Craig Walker -- that a beard can sometimes become a distinct liability in fighting to keep warm. When the whole curly mass freezes solid against your cheeks it offers little in the way of insulation!

Perhaps it's a desire to conform to some idealistic image of an astronomer as a cross between a medieval philopher and the rugged Arctic explorer, with the bearded visage of Galileo in the background. I even know one young astronomer who claims, with

--*continued, next page*--

straight face, that he grew his beard in order to look like an astronomer! But the most frequent answer I get when I ask a colleague why he has chosen to be bearded is that he simply doesn't like to shave! Do you conclude, dear reader, that astronomers are simply lazier than the population at large? Maybe that's it. Vanity is seldom admitted as a motive, but I'll be honest enough to say that it plays a part in my own avoidance of the razor. I find it delightfully convenient that my vanity encourages me to sleep five minutes later in the mornings!

Some weeks ago I had the idea that we should have a "No Beard Day" when all of us who normally don't shave would do so, as Lee J did for his high altitude training. We would all have to do it the same day, of course, in order to give each other moral support for such a daring undertaking. Most of us would start growing our beards back immediately, of course, but some might even be pleased with the new look and decide to keep on shaving. It would be most interesting to watch the reactions around the observatory when 15 or 20 beardless strangers with familiar voices are wandering the halls! Somehow I doubt this will ever come to pass -- we're not gutsy enough, and there will always be the suspicion that someone would hold out and spoil the fun.

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WORTH REPEATING

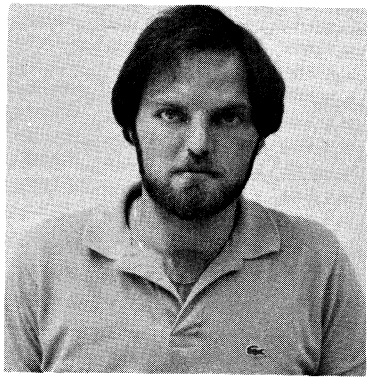
Excerpt from Attachment A, Report to AURA Board of Directors by Observatory Director, Kitt Peak National Observatory, 14 January 1976.

I have recently been reflecting on the mechanisms we have for the identification and solution of problems and this has led me to realize how delicate and complex is the system that we call a National Facility or Center. I have found a somewhat widespread impression that the principal requirements for a National Center are a Visiting Committee and a system of external proposal review. But these are only two of the essential features for a successful National Center.

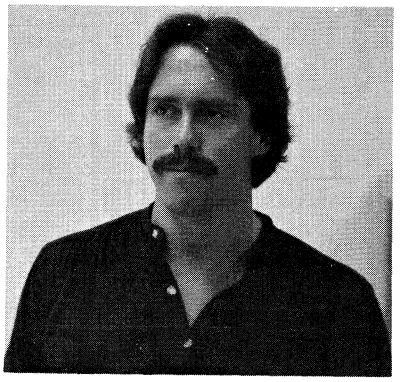
To elaborate, the first and most important requirement is that its mission be widely understood and supported by the astronomical community. Second, there must be a governing board that understands its obligations and responisbilities and ensures the excellence of the facility by its policies and appointments. Third, the staff of the Center must include an appropriate mix of scientists, engineers, technicians and administrators who are both dedicated to the purposes of the Center and responsive to the needs of the astronomical community. Experience has shown that visitors to a National Center are best served by instrumentation whose development and construction have been guided by a member of the local scientific staff in the expectation of using it for his or her own personal research. I also believe that technical and administrative support are essential to the proper functioning of a National Center and I reject the notion that these services can be traded for more science when funds are short. Four, the Center must have close ties with the community it serves, both through individual personal contacts and by the operation of various ad hoc and standing advisory groups -- all of whom support the concept of the National Center and work to improve it by providing constructive criticism in the assurance that the advice will be responded to and heeded. Fifth, the Center must have good lines of communication with the funding agencies on a number of different levels and must be able to respond quickly to requests for information which the agencies may need to fulfill their responsibilities to the OMB and the Congress. Finally, it is essential that the business of the National Center be transacted as openly as possible. No part of the operation should be free of scrutiny by the funding agency and by the advisory committees, and indeed, the Center should be prepared to discuss its policies, organizational structure and operating rules openly and freely with the astronomical public.

Leo Goldberg

PERSONNEL UPDATE



Jeffrey A. Carver
Technical Trainee
Computer - CV



Leonard M. Fulcher, Jr.
Technical Trainee
Computer - CV

John F. C. Wardle
Visiting Scientist
Basic Research - CV

Nancy A. Wiener
Secretary
Computer - CV

Joan M. Wrobel
Jr. Research Assistant
Student Support - CV

OTHER NEW EMPLOYEES - PHOTOS NOT AVAILABLE

Alan H. Bridle	Visiting Scientist	Basic Research - NM
Kerry W. Clark	Technical Specialist	Array Operations - NM
W. J. Cocke	Visiting Scientist	Basic Research - NM
Robert T. Duquet	Scientific Prog. Analyst	VLA Computer - NM
Ronald D. Ekers	Sr. Sci./Ass. Dir. VLA Opns.	Site Management - NM
Jerald C. Gainer	Technical Specialist	Array Operations - NM
Eva J. Rigby	Secretary	VLA Common Cost - NM
Fred L. Sanchez	Staff Shop Technician	Antenna Maintenance - NM

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PERSONNEL UPDATE
(Continued)

REHIRES

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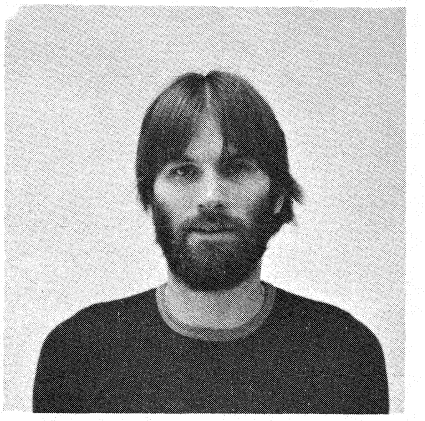
Not Available



Stephen T. Gottesman
Visiting Scientist
Basic Research - GB

Kenneth J. Mitchell
Jr. Research Assistant
Student Support - CV

TERMINATIONS

Garey K. Barrell
Rick J. Bearfield
John C. Bishop
Philip Bowers
Tom M. Brookes
Gail D. Browning
James B. Brunner
Jack O. Burns, Jr.
Cameron W. Coates
W. J. Cocke
Michael T. Duggan
Jean A. Eilek
Marcello Felli
John L. Guiliani
Stephanie J. Hanne
Tom J. Olney
Patrick E. Palmer
R. M. Price
Benno Rayhrer
Lee J Rickard
Thomas A. Royston
Blanche M. Wade
John F. Wardle
Richard A. White

TRANSFER

Frazer N. Owen from Charlottesville to New Mexico

RETURN FROM LEAVE OF ABSENCE

J. Richard Fisher

James M. Torson

* * * * *

WHAT'S COOKING?

Apple Sauce Cake

Beaty Sheets

1/2 cup butter or margarine
1-1/2 cups sugar
1 egg, well beaten
1-1/2 cups apple sauce (unsweetened, or with sweetened apple sauce, use 1/2 cup less sugar)
2 cups flour
1 tsp. vanilla
1 tsp. cinnamon
2 tsps, cocoa
1/2 tsp. cloves
1/4 tsp. salt
3/4 cups raisins
3/4 cups nuts (black walnuts are best)
1/4 cup hot water
2 tsps. soda

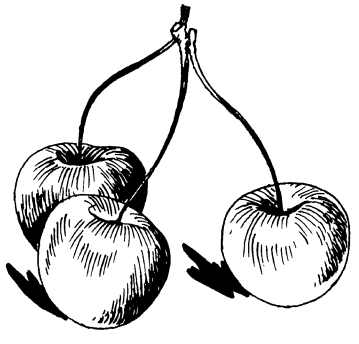
Cream butter well. Add sugar gradually, beating well. Add well-beaten egg, apple sauce and vanilla. Sift flour, spices, cocoa and salt and mix with raisins and nuts. Add alternately with hot water in which the soda is dissolved. Be sure that some of the flour is in the last addition. Beat well. Bake in a 9 x 13 cake pan for 40 minutes at 375 degrees F. (A somewhat smaller pan can be used with equally good results.)

While still warm ice with the following:
1 cup brown sugar
4 tablespoons cream (or milk)
1 tablespoon butter.
Bring to a boil and then add 1 cup coconut.

Brown under the broiler.

HOT SPICED CIDER

1 gal. sweet cider
3 Tablespoons honey
12 whole cloves
1 cinnamon stick
1/2 lemon, sliced
simmer 10 minutes, serve hot



Easy Spanish Barley

Pat Crane

1 lb. ground beef
1/2 cup chopped onion
1/2 cup chopped celery
1/4 cup chopped green pepper
3/4 cup Quaker Scotch Brand Pearled Barley
1 6 oz. can tomato paste
2 tsp. salt
1/8 tsp. pepper
3 cups hot water
chili powder
cayenne pepper
grated parmesan cheese

Brown ground beef in large fry pan. Add remaining ingredients, except cheese. Simmer over low heat about 1-1/2 hours, stirring occasionally. Spoon onto individual serving plates or large platter. Sprinkle with cheese. Makes 6 servings.

Sin Cake

Beaty Sheets

1 stick margarine
1 cup flour
1/4 cup brown sugar
(optional 1/4 cup nuts)

Mix well and pat into 9 x 13 cake pan
Bake 15 min. at 350 degrees. Cool

Mix together
8 oz. cream cheese
1 cup confectioners sugar
1 large container whipped topping and spread on crust

Blend - 2 large boxes butter pecan instant pudding (or any flavor) 3 cups milk.

Spread on top of cream cheese mixture and then sprinkle with graham cracker crumbs. Store in refrigerator.

HOBO

1964 - 1980