

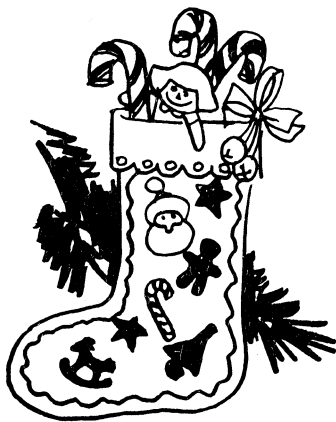


OBSERVER

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DECEMBER, 1973

COMET KOHOUTEK - PAGE 3



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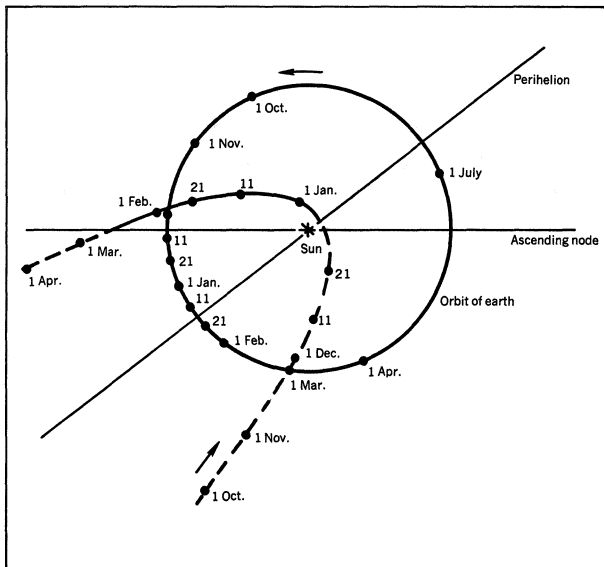
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A special thanks to all of those who helped assemble the OBSERVER.

COMET KOHOUTEK - A CELESTIAL SPECTACULAR

William Howard

All of us are about to be treated to a spectacular and comparatively rare celestial event. From the months of December (for hardy, pre-sunrise observers) through January (for the more leisurely dinner-time observers), Comet Kohoutek (Coe-hoe-tek) will swing inside the earth's orbit, coming closest to the sun on December 28, will swing around the sun, and cut across the earth's orbit again near the end of January as it starts its long journey outside the solar system. Comet Kohoutek promises to be the best observed comet,



if not the brightest comet, in recent years. A Czech astronomer, Lubos Kohoutek, discovered it at the Hamburg Observatory last March 7 while using a Schmidt telescope to search for an asteroid he had discovered in 1971. At that time the comet was slightly fainter than the planet Pluto. Inside of two weeks the comet had reached Pluto's magnitude and has been brightening slowly ever since.

Three fairly well-spaced photographic plates are necessary in order to determine an orbit of these interlopers from the edges of the solar system. Each observation yields two co-ordinates and the time at which the plate was taken. Once these six basic pieces of information (three positions and three times) are known, the orbit can be calculated and, knowing the orbit, one may predict the

future positions of the comet. Then, knowing the relative positions of the sun, the earth, and the comet, one can begin to make an intelligent estimate of the comet's probable brightness and the length of its tail. Shortly after the comet was found, its preliminary orbit showed that Comet Kohoutek was liable to be quite spectacular and preliminary estimates of its maximum brightness indicated that it might be as bright as the full moon! Because of the geometry of the orbit, and the position of the earth in its orbit around the sun, the comet was unobservable between May 5 and September 23 when it was behind the sun. It was rediscovered on September 23 by T. Seki, a Japanese astronomer. Quick calculations of the new orbit lowered our hopes about the maximum brightness, but the comet should still be quite a sight, rivaling Halley's Comet which is not due again until 1986. This comet, sometimes referred to as Comet 1973f, achieved naked-eye brightness on November 15 and will slowly brighten as it swings toward the sun in the morning sky. At the time when it is physically closest to the sun, it will be two and one-half degrees to the northeast of the sun, but, as seen from the earth, it will appear to pass about one solar diameter north of the sun's center 18 hours before the time of closest approach. At the time of closest solar approach, the comet will be approximately as bright as the planet Venus, but, contrary to our initial expectations, it will not be a spectacular object and one will be able to see it only through a telescope while it is close to the sun in the daytime sky, just after Christmas. The orbit of Comet Kohoutek is given in the accompanying figure which shows that orbit, the orbit of the earth, and the positions of both the earth and the comet in their respective orbits at the time of the apparition.

For the leisurely evening observer the best time to observe the comet will be between January 10 and 15. Full moon occurs on January 8 so the sky will be dark during that best observing period. During that five-day interval the brightness of the comet will be approximately as bright as the brightest stars in the sky and the tail of the comet should be about 20 degrees long, about four times longer than the "pointer" stars in the Big Dipper. Observers should look just above the southwestern horizon an hour after sunset to

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see the comet head, and the comet tail will extend away from the sun toward the north-east. The comet will pass slowly into the northern sky until, by the middle of February, it will be lost to the naked eye.

Because of the long lead time that astronomers have had since the comet's discovery, both optical and radio astronomers have had a good chance to plan their observing programs. The current flight of the Skylab astronauts was postponed especially to allow them to observe the comet from their vantage point above the earth's atmosphere. The cost of that delay to NASA exceeded NRAO's operating budget for a whole year!

Astronomers believe that comets are giant "dirty-snowball" objects, having nuclei five or ten miles across, that are probably formed in the same region of the solar system as planets Jupiter, Saturn, Uranus and Neptune and they probably have the same chemical composition: ammonia, water, methane and an admixture of heavier elements. Many such objects were probably formed at approximately the same time during the early stages of the solar system and the gravitational influence of passing stars on members of this "comet cloud" in the far reaches of the solar system perturb these objects so that a small percentage of them find their way toward the inner portion of the solar system where we can observe them. They appear randomly with spectacular apparitions occurring only a few times each century. As the comet approaches the sun, its nucleus heats up and its nuclear ball of material begins to vaporize, losing mass that forms the comet head which is finally blown out to form the tail of the comet through radiation pressure from the sun.

While the optical astronomers usually concentrate their attention on the cometary molecular products that result after sunlight has hit their parent molecules (e.g., CN, NH, H, OH, CO⁺, N₂⁺, C₂, C₃, CH, NH₂, sodium (Na), iron (Fe), aluminum (Al), and nickel (Ni)), the radio astronomers are intending to concentrate their efforts on the parent molecules themselves. Since Comet Bennett's unexpected and sudden apparition in 1970, radio astronomers have discovered many of the cometary parent molecules in interstellar clouds: OH, H₂O, NH₃, CH, HC₃N, HCN, CO, H₂CO, and CH₃OH. We now know what frequencies

to tune to. Comet Kohoutek will come within 13 million miles from the solar surface, four times closer than Comet Bennett in 1970. This means that the effects of solar heating will be much more intense than in the case of Comet Bennett, thus increasing our chances of detection. Radio astronomers will be looking for the lines of at least 18 different molecules in Comet Kohoutek and will be observing the continuum radiation from the comet head at at least 14 different continuum frequencies. At least 16 telescopes within the United States and 7 telescopes abroad will be looking at the comet. Besides radiation from spectral lines, radio astronomers will be trying to detect thermal emission from dust in the comet nucleus, and two or three observatories may attempt to detect radar reflections from the comet nucleus using telescopes at JPL, Arecibo, and Haystack. Over two dozen radio astronomical groups throughout the world will be conducting programs on Comet Kohoutek, and if even one radio detection is made, two things will happen: first, radio astronomers will have added to their observational bag one more object that heretofore has been in the province of optical astronomers, and second, I will win a beer from Bob Brown!

COMET KOHOUTEK OBSERVING TABLE

Date	When	Where	How
Nov. 1-15	2-3 hours before sunrise	Southeast, near horizon	Binoculars, small telescopes
Nov. 15-30	2-3 hours before sunrise	Southeast, near horizon --at midmonth it is farthest from sun (44 degrees)	Binoculars, naked eye
Dec. 1-15	1 1/2 - 2 1/2 hours before sunrise	Southeast, near horizon	Naked eye (perhaps best period for a.m. view)
Dec. 15-28	1 hour before sunrise until sunrise--will get closer to sun each morning	Southeast near sun	Naked eye Be careful not to look at sun
Dec. 29-Jan. 15	Sunset to couple hours afterwards	At first, in southwest near where sun sets, but higher in sky each night	Naked eye Best period: closest to Earth Jan. 15
Jan. 15-30	Early evening after twilight ends	High above western horizon	Naked eye, binoculars
Feb. 1-15	Evening after twilight ends --highest at midmonth, then will be lower each night at sunset	High above western horizon	Binoculars very helpful, still visible to naked eye
Feb. 15-30	Evening after twilight	Lower in western sky	Binoculars, small telescope needed

FOOD FOR THOUGHT

Richard Fleming

Recently I ate in New York and Charlottesville and I thought you might be interested in a comparison of food prices in these two places and the Green Bank cafeteria.

	<u>2 Eggs, Over</u>	<u>Bacon</u>	<u>Toast</u>	<u>Jelly</u>	<u>Coffee</u>	<u>Total</u>
New York	\$1.85	\$1.10	Incl.	Incl. (If you ask for it)	\$.30 (Each cup)	\$3.25
CV Restaurant	.80	.75	Incl.	Incl.	.20 (First cup)	1.75
GB Cafeteria	.55	.20	Incl.	Incl.	Incl. with meal (.05 per cup)	.75

	<u>NY</u>	<u>CV</u>	<u>GB</u>
Hamburger and French Fries	\$2.65	\$.95	\$.55
Ice Cream, 1 Scoop, Vanilla	1.45	.35	.10
Melon and Thinly Sliced Imported Prosciutto	3.25	What?	Forget it.

Even if prices were reasonably similar, I would still have to make these statements about the Green Bank cafeteria after eating in New York and Charlottesville:

the eggs are fresh,
the bacon is a full-length strip,
the hamburger is not breaded,

the "ice cream" is real ice cream,
the scrambled eggs are not powdered,
the service is good, and finally -
who cares about prosciutto?

If you are interested in prices of some of the dinners, drop by my office and I'll show you a menu.

ALIEN ADDRESS REPORT

A reminder that all aliens must complete a "1974 Alien Address Report". The report must be filed no later than January 31, 1974 and may be submitted to a clerk in any post office or mailed to the nearest Immigration and Naturalization Service Offices. Forms are available at any post office in early January, or at the Personnel Offices in Charlottesville, Green Bank, or Tucson.

ELECTION RESULTS

In a National Labor Relations board-certified election held December 4, 1973, Observatory employees who were eligible voted 64 to 26 against representation by the United Steelworkers of America, AFL, CIO, CLC. 90 out of a possible 92 employees voted in the election.

THE MONEY MAZEHOW A GROUP OF PEOPLE WANTING
A BIG TELESCOPE FARED IN WASHINGTON

Their Project Got Tangled
With Limousines, Housing;
But a Magic Word Helped

The Pitch to Sen. Proxmire

By Arlen J. Large

Staff Reporter of The Wall Street Journal

WASHINGTON—There it sits, Andy Jackson's granite Treasury building, a scrumptious target for all sorts of people who would like to get hold of its money.

Getting the money is hard, though, because of the quirky Washington obstacle course called "the budget process". Stern-faced bureaucrats screen out countless spending ideas. Those that do reach Capitol Hill are vulnerable to some Congressman's angry cry of "boondoggle!"

Yet over the past single year, \$246.6 billion has swooshed through that obstacle course, more than the cumulative outlays of the government's first 154 years. *Somebody* knows how to get it.

What follows is the saga of how one special interest group cleared hurdle after hurdle in its semi-successful pursuit of a modest \$10 million. The group's project is a radio telescope of novel design that ultimately will cost \$76 million. The telescope money is tucked away in a grab-bag appropriation bill that was wrestled untidily through Congress and signed by President Nixon on Monday of this week.

The radio-telescope project has been picked more or less at random as a case study of how to tap the Treasury. It would have been just as appropriate to single out an aircraft carrier, a wad of food stamps, an educational-television grant, scenic highway in West Virginia, a maritime subsidy, a computer for the Senate, a dam in Idaho or the State Department's whiskey allowance.

"Stars Will Still Be Shining"

These and thousands of other burdens on

the Treasury all have merit to somebody. All are protectively watched by their constituencies and ignored by most other people. All are subject to bureaucratic ambush, unexpected bad publicity, congressional whimsy or plain bad luck. The most frequent kind of bad luck is when your boondoggle gets caught up in an unrelated fight over somebody else's boondoggle.

Unlike the supersonic transport or a freeway aimed at a peaceful neighborhood, the radio-telescope project has no active enemies who feel threatened by it. But it does carry the handicap of astronomy's seeming remoteness from anything useful, and it must compete for money with enterprises that promise more immediate earthly benefits. The radio telescope will just sit in the sagebrush on a New Mexico plain, passively receiving natural radio-frequency transmissions from swirling celestial dust clouds and far-distant galaxies.

This vulnerability became vividly clear to the telescope's backers earlier this year at a House subcommittee hearing. That was when the project was suddenly attacked by Democratic Rep. George Shipley, who comes from a hard-times district in Southern Illinois.

"We wonder if the direction is right," he said. "The stars will still be shining in 20 or 30 years, but pollution is going to be a heck of a lot worse in 20 or 30 years." Opposition from Rep. Shipley and a few other House members nearly toppled the telescope right then.

This was a shock to backers, whose project is festooned with blue ribbons from the science-government establishment that has been so adept at Treasury-tapping since World War II. It's sponsored by the National Science Foundation, the federal agency in charge of bankrolling basic research. The National Academy of Sciences, a prestigious group organized to give the government scientific advice, last year put the radio telescope at the very top of its list of astronomical equipment needed during the '70s. The White House Office of Management and Budget has given the project its blessing at a time when other science construction proposals are on ice.

As it turned out, all these glamorous institutional endorsements weren't enough. The telescope's money had to be saved by some old-fashioned lobbying from New Mexico politicians.

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Nature's Laboratory

The project itself dates back to the late '50s, when the National Science Foundation hooked together three dish-like antennas at its radio astronomy observatory at Green Bank, W. Va. Spaced apart but connected electronically, the antennas could measure celestial transmissions more precisely than a single dish. David Heeschen and other Green Bank astronomers began designing a much bigger array of antennas that would work on the same principle of interconnection.

What they came up with is the world's biggest astronomical instrument. Nearly 38 miles of railroad track are to be laid in the form of a Y. Spaced along the arms will be 27 dish antennas connected to each other and to a central computer. While most single radio telescopes just produce squiggly lines on a graph, the computer receiving signals from the 27 antennas will be able to produce photo-like images of gas clouds that form much of the Milky Way galaxy.

With those clouds, "nature has provided us with a laboratory where we can study atoms in excited states in a way not available on earth," says Claud Kellett, a physicist who supervises the science foundation's various radio telescopes. The new telescope will be installed on flat New Mexico rangeland where it's away from everything and where there's little water vapor in the atmosphere to interfere with its operations.

By the late '60s, the science foundation felt enough confidence in the telescope's design to point it down that obstacle course to the Treasury. The telescope by then was equipped with a government-issue name and initials, Very Large Array or VLA. However, the Office of Management and Budget, which is supposed to weigh priorities in all government spending, was being balky. Astronomers were competing among themselves for the OMB's favors; some demanded funds for a satellite to measure cosmic rays from space, while others were pressing for a big-dish radio telescope in New England.

The OMB approved the space satellite, thus removing one competitor. Next, the New England astronomers dropped out, deciding to display a solid scientific front for the New Mexico project. By October 1971, the Very Large Array was at the head of the line, and the OMB vaulted it over its initial hurdle by approving \$3 million in start-up funds.

Congress approved this the following year, and the New Mexico telescope reached the blessed bureaucratic state of being an "on-going" project.

So last fall, when the science foundation asked the OMB for \$10 million to start actual construction, the telescope escaped the ax that fell on other big-ticket science spending projects. Though President Nixon was demanding fiscal stringency, the OMB forwarded the \$10 million request to Congress as part of his official budget. "The reason we went ahead with the VLA is that we had committed ourselves to it," says Hugh Loweth, an OMB science reviewer.

For and Against

The Capitol Hill adventures of that \$10 million request this year illuminate, among other things, the odd workings of the legislative committee system. The full membership of Congress makes no effort to understand all of the pending legislation; specialized committees of the House and Senate screen the proposals in narrow detail and make key decisions that usually go unchallenged on the floor.

The National Science Foundation is one of those agencies needing two laws every year to get its money. The first is an authorization that sets a ceiling on a later appropriation and imposes policy decisions on how the money is to be spent. The House Science and Astronautics Committee, as friendly to science as the Armed Services Committee is to the Pentagon, gladly approved the radio telescope's \$10 million as part of the foundation's \$610 million total authorization.

Simultaneously, the House Appropriations Committee was considering the actual money. For no logical reason, the science foundation is lumped into the same appropriations bill that provides money for housing, veterans, selective service, space and securities regulation. After Rep. Shipley's deadly remark about the eternally shining stars, the subcommittee handling this bill cut out the whole \$10 million.

Not only that, it pounded nails into astronomers' hearts by singling out the telescope project in the written report accompanying the bill: "Although the committee approved the initial funding for this project in (fiscal) 1973, it now feels that in view

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of general budget constraints and other earth-bound National Science Foundation priorities, the VLA can be deferred."

By chance, the science foundation authorization bill and the housing-space-science appropriation bill came to the House floor on the very same afternoon. During the authorization debate, only passing reference was made to the bill's \$10 million telescope item; the members were more interested in arguing about presidential power to impound funds voted by Congress. The bill passed routinely. Then the appropriation debate centered on housing and the draft: nobody challenged the committee's deletion of the telescope money, and that bill passed, too. In a matter of hours and with only a few members aware of it, the House had voted first for and then against the telescope.

The second vote was controlling, because a zero appropriation slams the Treasury vault shut. Now the money would have to be restored by the Senate, or the project was dead.

The Magic Word

By another chance, New Mexico's Gov. Bruce King and his administrative assistant, Frank Diluzio, found themselves on the same Washington-bound plane one day with Sen. Joseph Montoya and Rep. Harold Runnels. These Democrats had an impromptu conference about the telescope setback. The project isn't the traditional kind of pork-barrel prize that would lift the state's economy; only 60 people will work at the San Augustin Plains site when the instrument is finished in 1981. But it does mean prestige, "and we have a strong astronomy group here," Mr. Diluzio says.

As a long-time staffer for former Sen. Clinton Anderson, Mr. Diluzio is a Capitol Hill veteran. He buttonholed old acquaintances in the Senate, using arguments fed to him by scientists from back home ("ground-based astronomers are unhappy about all the money going to space astronomy activities"). An appeal also came in from the science foundation's director, H. Guyford Stever, who stressed radio astronomy's importance to the understanding of matter and energy. ("Energy" is a magic word in Congress this year.)

Above all, the telescope's cause was helped by Sen. Montoya's membership on the Senate Appropriations Committee. Though busy with the Watergate hearings, he sought out

Sen. William Proxmire of Wisconsin and made a personal pitch. Sen. Proxmire is chairman of the subcommittee that handles the housing-space-science money bill. Sen. Montoya also sent letters to the subcommittee's other 11 members. The bill went to the Senate floor with the \$10 million restored.

Focusing on Limousines

Senators were more interested in the bill's housing and veterans money, and the telescope wasn't challenged. Passage of the Senate bill left it up to the senior members of the House and Senate Appropriations committees, meeting in conference to resolve differences between their bills. When the matter of the telescope came up, the conferees carefully deliberated the merits of zero dollars vs. \$10 million and hit upon the traditional solution. They split the difference at \$5 million and went on to something else.

It's necessary for both houses to approve such conference compromises. When the bill went back to the House just before the August recess began, there was lively debate over funds for the limousines of government bigshots, but nobody complained about the restoration of half the telescope money.

Indeed, at that point those limousines had become the only remaining item of controversy in the bill, and they held up approval of everybody else's money. Sen. Proxmire struggled to win severe limits on the use of these government cars by HUD officials, but he lost out. The Senate gave final approval to the bill on Oct. 13, and though it contained a lot more housing money than the President wanted, he decided to sign it anyway.

The science foundation's Mr. Kellett says the halving of this year's telescope fund won't push back the 1981 target for full operation, as long as the missing \$5 million is restored in future budgets. He hopes it is. "It would be a very sad day if this much-needed instrumentation is not available by 1981," he says. "We're satisfying a great need."

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WATERGATE RIDES AGAIN

Chuck Brockway

Faithful readers of the OBSERVER may recall that in the last issue I related how I had accidentally intercepted a conversation between two black bears, Watergate and Alice, that were wearing collar radio transmitters in connection with a wildlife study by the Department of Natural Resources; and that Watergate had expressed somewhat of a distaste for Snowshoe, Inc., the big recreational development planned for Pocahontas County. I never dreamed that there would be more to the story until I bumped into Wally Oref in the lobby one morning. Well, to make a short story not so short, my latest brush-in with Watergate came about as follows:

I was wandering along an old logging road up near Bald Knob a couple of weeks after that article appeared when I heard a lot of snarling and crashing noises in the woods. Before I even knew what was happening, this huge black bear leaped out into the road right in front of me. I saw that radio transmitter collar around his neck and knew in a flash it was none other than old Watergate. I was wearing my old Marine Corps field jacket; you know, the kind with your name in big letters over the breast pocket to make it real easy to volunteer for all those extra duties, and I saw a flicker of recognition in Watergate's eyes as the name registered.

"Aha," he said. "Boy, you in a heap of trouble."

"Now wait a minute, Mr. Watergate; I don't work for Snowshoe or anything like that."

"I don't mean that. I mean that article you wrote for that newspaper thing down at NRAO. There were some people who didn't like at all what I had to say. Why, a few have even taken pot shots at me -- and out of season, too."

"But I thought you'd want people to know how you felt about Snowshoe, Mr. Watergate. I didn't think you'd mind my eavesdropping on you and Alice and telling it. After all, it's not every day that a bear gets his opinions stated in a prestigious publication."

"I just don't like being bugged, boy. Now then, before I eat you, what else do you know about Snowjob?"

"M-m-m-maybe we can work out a deal, Mr.

Watergate. I'll tell you about the Snowshoe meeting a few weeks ago at Pocahontas County High School if you'll curb your appetite."

"I'm not promising anything. But under the circumstances, I don't see where you've got anything to lose by telling me about it."

Well, that made sense to me, so I began telling Watergate how one day in October had been proclaimed Snowshoe Day and how the Snowshoe officials had met with the school administration and students to talk about the future employment needs of Snowshoe. That night they had a public meeting in the high school cafeteria and outlined their plans and timetable. They even had this model of the development, and from the back of the room it reminded me of a giant oyster. One lady asked how much one of those condominiums would go for and the Snowshoe architect said probably somewhere between twenty-five and fifty thousand, and I thought I heard several people swallow hard. There were a couple of questions asked about sewage disposal and the Snowshoe people said an engineering consulting firm was looking into it. There was some discussion on what effect a million customers a year would have on a county with a population of under ten thousand, and the president of Snowshoe went on to say how Snowshoe will likely be what is called a "destination resort" which I took to mean that people are supposed to drive straight to and from Snowshoe with a minimum of stopping to eat, sleep, shop or pollute. The president also said that Snowshoe would try its best to maintain the integrity of the environment and that road construction in the development would be minimized. He said people who come to Snowshoe want to see the beauty of nature and I remembered that I had recently read how the popularity explosion of ski resorts coincided with the advent of stretch ski pants. I went on to tell Watergate how the Snowshoe officials had come across to me as decent enough fellows of a reputable sort and not out to make a quick buck as land butchers and that their role in the annihilation of a quiet and uncongested Pocahontas County would be an indirect one; but that in the absence of a more responsible attitude towards land use it was inevitable that Pocahontas would be sacrificed in the name of progress anyway.

Well, I could tell by the expression on Watergate's face that none of this talk about

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Snowshoe was making a favorable impression and that he would never be satisfied with anything less than for Snowshoe to move out, one hundred and fifty acre lake and all. I thought that now might be a good time to bring up a point that several people had made concerning Snowshoe.

"Mr. Watergate," I said, "you know there are worse things that could happen to that land than having Snowshoe move in. What about strip mining? What about that place in Berkeley County in the eastern panhandle, I think it's called Jellystone "resort", where the land was carved up into tiny lots and people crammed themselves in there and made a devil of a mess until the Health Department blew the whistle on them? What about . . .?"

I stopped short because even through all that black fur I could see that Watergate's face was so red you could have lit a cigarette off it.

"That's human nature for you," he roared. "You can talk yourselves into accepting anything just because it's possible to imagine something worse."

Well, I didn't want to start Watergate to lecturing on human nature and I was getting more and more anxious to get away from there.

"I'll tell you what, Mr. Watergate," I said. "If you'll go your way, I'll go mine and I promise I'll never bug you again and write about it in the OBSERVER."

Watergate thought for a moment, then said, "Okay, that's all right with me. All this talk about Snowjob has taken away my appetite anyhow."

NRAORA DATES

Children's Christmas Party, Children thru
12 years of age. 16 December 1973

Teen Christmas Ball, 13 thru single college
age. 22 December 1973

Band - "The Soul Sensations"

New Year's Dance. 31 December 1973

Band - "The End Results"

WHAT'S HAPPENING WITH THE VLA?

Barry Blaisdell

After five months of silence, the VLA is back on the air. Don't think for a minute that silence indicates inactivity! We've been busy trying to keep the Project rolling along.

The biggest news is financing. After some ups and downs in the various Authorization and Appropriation Committees of Congress, the VLA came out with a \$5 million appropriation. This is only half the \$10 million which was requested, but it is enough to keep us going at a good pace.

The staff now numbers 33. New additions are Bob Dorr, Business Manager, replacing Jim Finks; Emory Egler, a construction engineer; Gary Bonebrake, Bill Wireman, Tom Royston and Earl Herndon in the electronics area; and John Torson in the computer area. We are glad to have these men aboard.

Land acquisition goes well. We now have possession of the central 652 acre section of land and procurement action on the thirty-eight miles of the arms is progressing.

Second biggest news item is the award of the contract to design, fabricate, assemble and test the twenty-eight large steel antennas to E-Systems, Inc., of Dallas, Texas. John Findlay, Bill Horne, Ray Werner, Lee King, and all the other members of the Technical and Business Evaluation Committees deserve a great vote of thanks for bringing this action to a successful conclusion. The contract was finally executed on October 18, 1973. Only the design phase will be ordered. After test and acceptance, production models will be funded at the rate of four or five a year until completion. Total cost of the contract is \$16,894,000.

The third item is the engineer-architect work being done for the site buildings, utilities and wye facilities by the E/A firm of BWH/CVR Joint Venture. On September 12 and 13 a two-day meeting was held which, in general, approved the design of these facilities. The final conceptual design report has just been received. Forrest Wells and Emory Egler have been closely supervising this activity, and in the next issue of the OBSERVER we will be able to give you details of the site facilities to be constructed.

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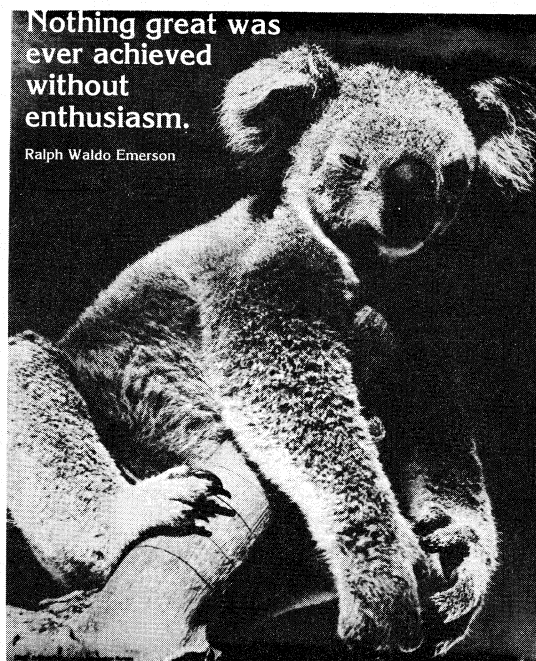
The reduction in 1974 funds has required us to completely re-evaluate the proposed scheme for the site and wye construction. We had intended to complete all the buildings and a sizeable portion of the wye in the coming year. This is no longer possible as we must fund the two prototype antennas and electronics in 1974. To provide adequate site facilities, we have pooled a small amount of 1973 and 1974 funds which will permit us to construct over half of the general maintenance building and construct sufficient utilities such as electric, water, and sanitary systems, in order to permit us to begin operations at the site. This initial minimum construction will be designed this winter, with construction starting early in the spring. Construction of the balance of the buildings, site work and utilities cannot begin until 1975 funds are available.

Other major procurement actions now underway are for the transporter for the antennas and the continuum computer system. Seven proposals were received for the transporter on November 8, and are under review at the present time by a selection committee consisting of Bill Horne, Ray Werner, Ed West and J. Marymor. Nine proposals were received November 19 for the continuum computer system and are also under intensive review by a selection committee consisting of Bob Burns, Barry Clark and Ed West, who in turn are being assisted by Bob Hjellming, Jerry Hudson and Benno Rayhrer.

The design of the electronics computer for the VLA is proceeding well. A model cooled front end assembly is undergoing subsystem testing. A 200-meter section of 60 mm circular waveguide has been tested, found acceptable, and was shipped to the site in late November for direct burial tests in the soils of the Plains of San Augustin. The tests at the site will be run by Alan Parrish, Forrest Wells and Emory Egler. The radiation monitor trailer has been completely outfitted and will be shipped to the site for use in determining range and density of background radio noise. Gary Bonebrake is responsible in this area. Other electronics efforts are going along, and these will be detailed in the next issue.

We haven't said much lately, but we've been pushing along. The entire group appreciated Mr. Pumpkin's gift to the Project, which is shown opposite. The quotation is apt, but

we think the Koala bear should show a trace more life! We're trying!



Nothing great was
ever achieved
without
enthusiasm.

Ralph Waldo Emerson

FOR SALE

Sony Model 650 Reel-to-Reel Stereo
Tape Deck with Accessories.
Excellent Condition.

Jerry Turner
Ext. 349 - GB

FIRED?

A man who was employed by the Observatory for over thirteen years has been dismissed. Much of the blame for the conditions which prompted this action probably belongs on the shoulders of others as well. Is the decision concerning unionization of the Observatory that important to sacrifice a man's career?

It is appalling that the Observatory employees have remained silent when some of the causes for unionization arose from similar actions taken in the past.

--Ed Fomalont

A NATIONAL HERO - THE ASTRONOMER

"They're nocturnal, mostly, and dwell on mountain tops in silvery domes that open only at night. They do come down into cities occasionally, to greet their wives, kiss their kids, and pick up fresh supplies.

If you talk to him and his words have little meaning to you, it's because he thinks in a polyglot jargon of technical terms invented to convey ideas beyond the ken of ordinary mortals. If he seems like he's from another world, it's because that is what he deals with most of the time: other worlds. But...he's an astronomer.

Once he wore black robes and peaked cap, and ordinary folk thought he could tell the future from the stars.

The star-gazer's formal training lasts as long as a physician's. Twenty years or more of study pass before he wins his doctorate. The astronomer of today must be a master of mathematics and physics. He must know geology and chemistry so he can understand the make-up of other planets, biology and botany, electronics and engineering, the new science of nuclear energy because the sun and other stars are hydrogen bombs in endless explosion, four to six foreign languages, and public affairs because today he spends a great deal of public money and consequently is involved in politics."

--From *The Daily Progress*, June 24, 1964.

MEDICAL INSURANCE FOR DEPENDENT STUDENTS

Children of Observatory employees are regularly covered under the employee's Family Medical Insurance Plan until the December 31st following their nineteenth birthday. A child over age nineteen may continue to be covered if he is unmarried and if he is attending school on a full-time basis.

If there is a full-time student in your family who has reached age nineteen this year, be sure to apply for Dependent Student Coverage on his behalf as soon as possible. There is no additional premium charged for this coverage.

Applications can be made by contacting

Mary Ann Starr in Charlottesville, Beaty Sheets in Green Bank, or Maxine Thomas in Tucson. Further information can be obtained by calling Monroe Petty in Charlottesville, extension 234.

If you have a child who no longer qualifies for Dependent Student Coverage, please notify Mary Ann Starr immediately.

CHRISTMAS CUSTOMS

Many of our present Christmas customs date back to the pre-Christian era. Kissing under the mistletoe, for example, has its source in ancient rites. Man was fascinated by mistletoe, which grew, bloomed and sported glistening berries in the dead of winter. He thought that a tea made from mistletoe berries could cure sterility. A kiss under a sprig of mistletoe was thought to insure a fruitful marriage.

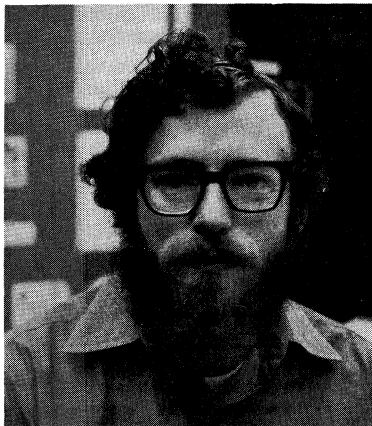
In fact, early man saw something magical in any plant that grew or at least stayed green during cold weather. He thought that the life of growing plants was somehow held secure and protected through the winter in evergreen trees and so honored the pine, the hemlock, the spruce and the holly with special religious observances. The Christmas trees we decorate in our houses is a relic of those rites. So are wreathes and garlands.

The yule log preceeded Christianity too. Yule originally was the name of a winter month in Teutonic and Celtic cultures, the time when the winter fire was again rekindled. The Yule log became the foundation of that fire, the lighting of which was attended with great ceremony. Each individual hearth in a village was then lighted with fire from the Yule log.

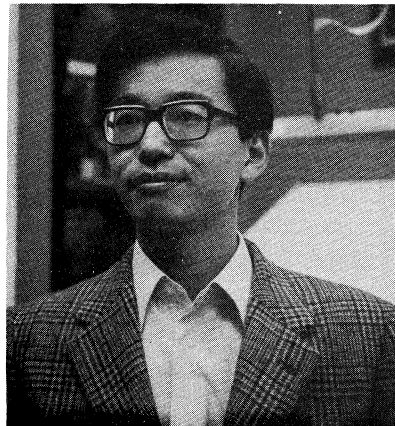
Giving presents at Christmas traces directly back to the ancient Roman festival of Saturnalia, celebrated from December 17-24. Among customs of Saturnalia was the giving of gifts, especially wax candles and dolls - both of which still figure prominently in Christmas gift-giving today.

Security is not a full barn--it's a full faith.

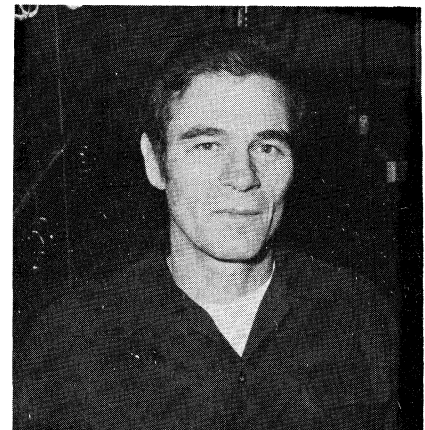
NEW EMPLOYEES



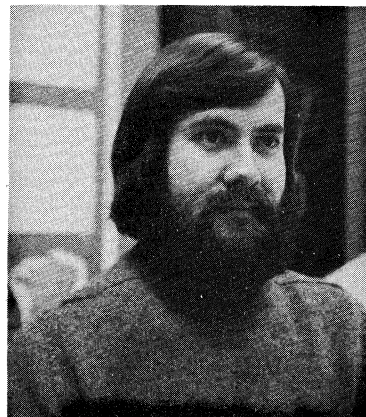
Harvey S. Liszt
Research Associate
Basic Research - CV



Norio Kaifu
Research Associate
Basic Research - CV



Fred Bierer, Jr.
Asst. Plant Maint. Supvr.
Plant Maintenance - GB



James M. Torson
Scientific Programmer
VLA Project - CV

TERMINATIONS

- | | |
|----------------------|------------------------------|
| Albert Z. Taylor | Administrative Services - GB |
| William R. Gillispie | Plant Maintenance - GB |
| Paul D. Kuhlken | Administrative Services - GB |
| Pamela W. Johnson | Computer Division - CV |
| John Riley | Plant Maintenance - GB |
| Leroy G. Webb | Telescope Operations - GB |

--continued, next page--

TERMINATIONS (continued)

Patricia B. Brubaker	Fiscal Division - GB
Edward K. Conklin	Tucson Operations
John D. G. Rather	Tucson Operations
Charles H. Moore	Computer Division - CV
Elizabeth D. Rather	Tucson Operations
Lee H. Hagar	Tucson Operations

RETURN FROM LEAVE OF ABSENCE

Billie Jo Kinnison	Fiscal Division - GB
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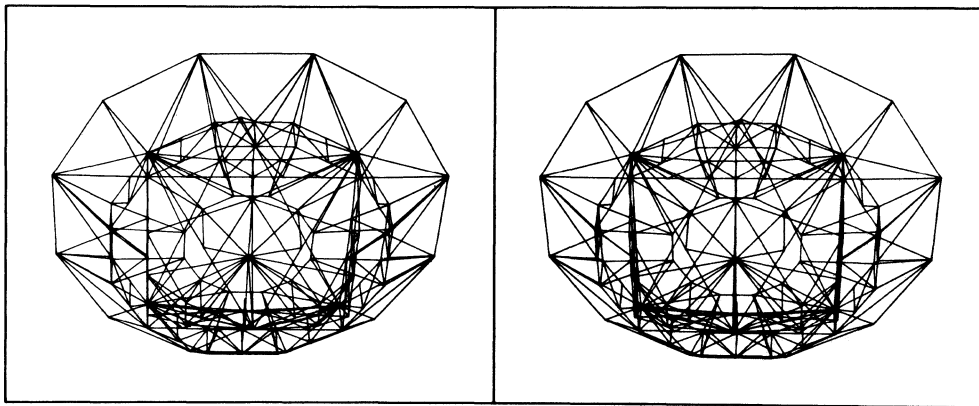
140-FT - A STEREO VIEW

W. Y. Wong

In case you are with NRAO for 2 months or 20 years, or something in between, and still don't have the slightest idea how the 140-ft telescope looks from the backside, here is your chance to take a good look at it! Take out your stereoscope, or just look at it with

some adjustment of your eyes, and think stereo!

These pictures were plotted by the cal-comp plotter. If you don't have a stereoscope, you might borrow one from Sidney Smith. Or you can hold a piece of cardboard paper between your nose and the center line of the picture. Then set your eyes as if you are looking very far away. The two images should coincide with each other to form a stereo picture.

DID YOU KNOW?

Dr. Lubos Kohoutek discovered our currently onrushing comet last March (it was his second in quick succession but the other was unspectacular). He is a Czech-born astronomer at the Hamburg Observatory in West Germany.

Did you know that most comets have been discovered by dedicated amateurs? It's true. The living record holders, with 12 apiece, are Minour Honda of Japan, who found his first in 1940, and Leslie Peltier of Delphos, Ohio,

who began comet hunting in 1925. Probably the all-time comet finder was Jean-Louis-Pons, a doorkeeper at the Marseilles Observatory, who discovered 37 comets between 1801 and 1827.

Probably the luckiest comet finder was a Texas schoolboy named Mark Whitaker, who discovered a comet on his third night of looking. This is very unusual. Most comet hunters spent 300 hours or more observing before they found their first comet.

<p>ENERGY RESOURCE CONSERVATION AT GREEN BANK</p>

Ross Jeffries

Reports given at a Green Bank Division Head meeting Friday, 30 November, showed that steps are now being taken to conserve energy resources (gasoline, fuel oil, electricity) on our site. In addition to the items already put into effect, other possible areas of conservation were discussed and where potential savings were seen, action was started to enact further conservation procedures.

Conservation steps in effect:

Outdoor lighting reduced to minimum;
Laboratory office & shop lights off at night except in areas in use;
Reduced water temperatures in hot water heating systems;
Reduced thermostat settings for weekend and holiday hours - in some buildings furnaces will be cut off during these hours;
Removal of light bulbs in areas where full lighting is unnecessary (hallways, cafeteria, etc.);
Shuttle speed and other Observatory vehicles reduced to 50 miles per hour;
Combined trips for materials and equipment and personnel;
Reduced testing of emergency generators to once every two weeks.

Conservation steps in process:

Automatic thermostat resets controlled by outside temperatures;
Insulation of hot water tanks;
Time clocks on diesel engine heaters;
Water treatment for boiler water;
Turn off heat completely in buildings not in use;
Greater use of outside air for cooling where air conditioning is needed in cold weather;
Add insulation in buildings showing high heat loss.

What you can do to help conserve energy at the Green Bank site:

Conserve hot water;
Keep doors, windows and ventilation vents closed in cold weather;

Turn off equipment when not in use;
Lower thermostats to 65-68 degrees;
Turn off lights in areas not occupied;
Comply with the 50 miles per hour speed limit set by the site director;
Use the shuttle for Charlottesville and airport trips;
Combine on-site and off-site trips with other employees;
Co-operate in combining over-the-road trips.

Do you have any suggestions for energy conservation at Green Bank? If you do, contact your Division Head. He will appreciate constructive suggestions.

Your co-operation and toleration in these energy conservation measures is of great importance, if they are to be successful.

<p>QUIET - THANK YOU</p>

Rick Fisher

"Not a creature was stirring, not even a mouse." So it was over the Thanksgiving Day break at the NRAO. Thanks to the co-operation of all involved we now have a goal to shoot for in our stepped-up campaign against interference on and around the Green Bank site.

Observations below 1000 MHz over the past few years have raised doubts about whether the Observatory's radio environment is as clean as it once was. This, coupled with the certain prospects of increased activity in this part of the country, makes it imperative that we keep a sharp eye on the possible sources of man-made noise if we are not to lose the low end of our observing spectrum. With more people and modern living come all sorts of sources of electrical noise: auto ignitions, power lines, electric motors, neon signs, fluorescent lights, TV boosters, etc. The list is long. The Observatory itself generates a significant amount of noise from its many activities too.

It was the purpose of the test on Thanksgiving Day to see just how much interference we generate ourselves and what comes from outside. We set up a monitor at 150

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and 210 MHz where one is most likely to hear electrical noise using the low frequency radiometer at the feed of the 300-foot. The recorder was started several days before Thanksgiving, then everything not absolutely essential to the maintenance of a standby condition was shut down at midnight of the 21st. Computers, drive motors, and most lights were shut down, and we even asked Wally Oref to use a diesel to get from the lab to his house.

The results were encouraging. Except for some isolated pops and crackles and the power line south of the site it was pretty quiet. The power line is scheduled to be rerouted sometime in the next few months which should eliminate 75% of our problems. The other 25% is a combination of dozens of intermittent sources each of which is around only about 5 or 10% of the time. Today it may be the computer at the interferometer, tomorrow a bad switch at the 300-foot, the next day an oscillating TV booster somewhere else, and so forth. Each one we have to chase as it pops up and sniff it out with the ice cream truck (interference van).

I think we're off to a good start. We are slowly finding where the worst problems are and taking preventive measures elsewhere. A directional antenna will be put above the 300-foot focal point for permanent monitoring and direction finding. Bob Viers' crew has been most helpful in shielding the 300-foot control building windows and lights and just plain putting up with our extra goings-on. In fact, with few exceptions everyone in the area has been very co-operative with Jim Dolan and his crew when they're out looking for sources of interference.

ON THE HILL

J. W. Findlay

In the language of Washington, the title means "on Capitol Hill" and is often used to describe a formal statement made to a Committee of Congress. I have recently been twice on the Hill, before the House Subcommittee on Space Science and Applications and the Senate Committee on Aeronautical and Space Sciences. The House Subcommittee (Chairman, James W.

Symington, Democrat, Missouri) had invited members of the full Committee on Science and Astronautics to attend, so Ken Hechler (Democrat, West Virginia) heard my testimony. The Senate hearings were chaired by Senator Frank E. Moss (Utah) and, among others, Senator Barry Goldwater (Arizona) and Senator P. V. Domenici (New Mexico) were present.

Both hearings were devoted to the use of the space shuttle; this is to be the space transportation system of the 1980s and beyond. Its main feature is the shuttle orbiter. This is a reusable spacecraft about as big as a Boeing 707. It is boosted into orbit and remains there for up to four weeks during which time it, with the four-man crew, can carry out many experiments. It then re-enters the atmosphere and is finally flown by its own crew to an aircraft-type landing. It can then be re-used for many subsequent flights.

My task was to describe the results of the Study which I led this last summer, and to do this here I need only reproduce in a shortened form some of the testimony that I gave.

The Space Science Board of the National Academy of Sciences recently completed a study to explore the scientific uses of the space shuttle. In particular, the study considered in detail the ability of the shuttle to carry a payload in orbit that remains attached to the shuttle, and then to return it from orbit in from one to four weeks--the sortie mode. The study also considered the use of the shuttle for launching, servicing, and recovering satellites, and for launching lunar, planetary, and interplanetary missions. The Space Agency's interest in the sortie is particularly great because of the recent decision by the several European countries to develop a space laboratory consisting of pressurized module and unpressurized pallet.

Some 50 U.S. and 11 foreign scientists met for two weeks in July of 1973 at Woods Hole, Massachusetts. The study involved the scientific disciplines of atmospheric and space physics, high energy astrophysics, optical and ultraviolet astronomy, infrared and radio astronomy, solar physics, life sciences, and lunar and planetary exploration.

Out of the study emerged the following findings, which, together with the complete

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report, have yet to be reviewed by the regular Academy review process and may be modified by that review:

1. The shuttle can be an important asset to scientific research in and beyond the 1980s.

2. An important aspect of the shuttle system for science will be its ability to carry many large and heavy payloads into orbit with potentially substantial economies.

3. Many of the potential advantages of the shuttle depend on the development of efficient and flexible procedures for flying multipurpose missions and combined payloads.

4. The ability of the shuttle system to recover or service payloads in orbit will be of special value for large and expensive systems such as large observatories; for some less expensive payloads the economic advantages of recovery and of possible servicing are unclear.

5. Most planetary missions can be launched with a Shuttle/Centaur system. Some missions identified for the 1980s require additional capability such as might be provided by tug, solar electric, or some other advanced propulsion system.

6. For biomedical research in space, the study identified a clear and essential requirement for the use of the manned pressurized space laboratory.

7. Many disciplines require rapid interaction between man and payload. This function appears to be adequately fulfilled in many cases by the payload specialist and his console. However, for some experiments, in atmospheric or space physics in which continuous involvement of man is required, the pressurized space laboratory is highly desirable.

8. The ability to operate instruments mounted in the shuttle bay, the pallet mode with or without a pressurized laboratory, is an important feature for all disciplines except the life sciences.

9. Payloads carried into orbit by the shuttle and then released as free flyers are major elements in most discipline programs.

10. For most discipline groups the 28-day sortie mission duration (or even longer if possible) is judged to be very valuable.

In summary, the study found that the shuttle will have many capabilities of great value to space science. It will provide opportunities sufficiently different from the ways in which we now conduct space science

that they demand innovations in management and execution, if we are to minimize costs and realize the full benefits of this new space transportation system.

At the end of the formal testimony, the witness can be questioned by the Committee, starting with the chairman and going round in order of seniority. A reporter records everything that is said, and the record is sent within a few days so that the witness can edit out errors and remove some of the useless words which creep into verbal replies. The atmosphere is serious but friendly--few hearings have the hard interrogatory nature of the Watergate hearings. The Committee is concerned to hear and record the best facts on the subject of interest. They will use these hearings as an aid in coming to conclusions on the bills for which they are responsible; they may draw on the hearing record in speaking in the House or Senate on the legislation involved. Members of the committees before whom I have appeared have all been very well-informed of the subject. Most questions are direct and penetrating. There are sometimes unexpected (but very welcome) comments; for example, from the Senate record:

Senator Goldwater: "I was interested in your background in radar. I remember your name from World War II in that field; it was a rather remarkable development."

Dr. Findlay: "Thank you, Senator."

Most Senate and House hearings are open, but the subjects to be heard and the names of the witnesses are usually only readily available in, for example, the Washington Post on the morning of the hearing. There was a good audience at the Senate hearings, including at least one high-school class. They would not learn too much from my report, but other witnesses described such things as ways to generate electric power in large quantities in space and to transmit it, with surprisingly low losses, to the DC power system on earth.

Success is getting what you want;
happiness is wanting what you get.

NRAO MAJOR MEDICAL FEATURES "SET BACK" PROVISION

Monroe Petty

It's getting close to income tax time again and in preparing your tax return you will be reviewing all of your medical expenses for 1973. With the NRAO Major Medical Insurance Plan, it is important that you pay special attention to the medical expenses you incurred during the latter part of 1973. It is possible under our Major Medical Plan to count certain expenses from the last three months of this year toward your \$100 deductible for next year. This is because of a special feature in our plan called a "set back" provision. Here is a brief review of our Major Medical coverage and the special "set back" provision.

The Observatory Major Medical Insurance Plan provides 80% reimbursement (50% in the case of a dependent's mental illness) to any insured individual who has incurred more than \$100 in "out-of-pocket" medical expenses

during a calendar year. "Out-of-pocket" expenses mean medical costs which have not been reimbursed under NRAO's Basic Medical Insurance Plan.

NRAO's plan is an "all cause" plan, meaning that expenses for different illnesses may be reimbursed under a single major medical claim. The major medical benefits, once qualified for, continue until the end of the calendar year. A new major medical claim and a new \$100 deductible must be established every calendar year.

The set back provision is designed to benefit those individuals who incur the major portion of their medical expenses toward the end of the calendar year. It provides that expenses incurred in October, November and December, which have not been reimbursed previously, may be used as a credit toward the next year's \$100 deductible. This feature applies even though you may have established a major medical claim in 1973. Following are three examples of how the set back provision works:

Calendar Year 1973	Out-of-pocket expense	Counted toward \$100 deductible	Eligible for 80% reimbursement
Jan-Sept	-	-	-
Oct-Dec	\$60	\$60	-

In this example the individual incurred only \$60 worth of out-of-pocket expenses and did not establish a 1973 major medical claim. However, since the \$60 was incurred during the 4th quarter of 1973, it may be counted toward the individual's 1974 deductible.

Calendar Year 1973	Out-of-pocket expense	Counted toward \$100 deductible	Eligible for 80% reimbursement
Jan-Sept	\$ 20	\$20	-
Oct-Dec	\$120	\$80	\$40

Even though the individual established a major medical claim last year, \$80 of his 1973 deductible was incurred during the 4th quarter. Therefore, that \$80 may also be counted toward his 1974 deductible.

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Calendar Year 1973	Out-of- pocket expense	Counted toward \$100 deductible	Eligible for 80% reimburse- ment
Jan-Sept	\$120	\$100	\$20
Oct-Dec	\$ 20	-	\$20

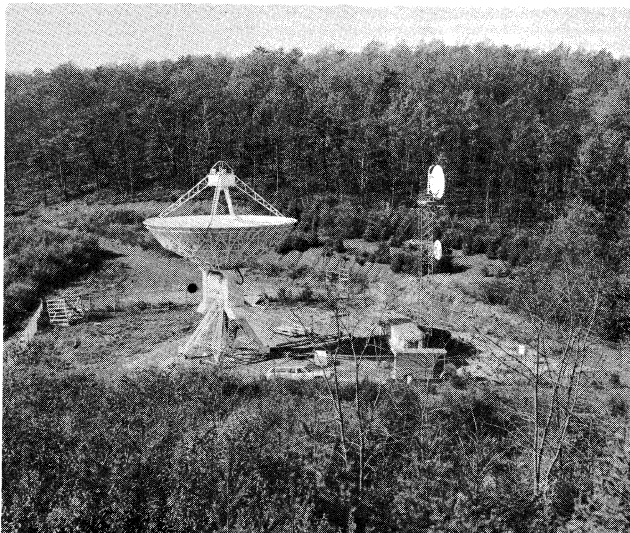
In this example there is no credit toward the next year's deductible because the 1973 deductible was satisfied in the first 9 months and the individual received 80% on the \$20 worth of 4th quarter expenses.

During the coming months we will be providing you with further information concerning your insurance benefits at NRAO. In the mean-

time, if you have any questions or wish further information, please call Monroe Petty in Charlottesville, extension 234.

THE 45-FOOT TELESCOPE

Ray Hallman contributed the accompanying picture which Gene Crist took. It shows NRAO's new, portable telescope at its site near Huntersville. This site was selected because it



45-Foot Telescope at Huntersville Site

is in line-of-site (ask Jim Coe) of Green Bank and because it was already there. The previous occupant of this site was a large rotary drill that had drilled an exploratory hole for oil or gas. The site is located on Brushy Mountain at the head of Barclay Run and is reached by a rough, winding, mountain

road.

More specifically the line-of-sight is between a microwave tower near the interferometer building and a similar tower at the Huntersville site (in the photo the tower with the two dish-like antennas to the right of the telescope). Communications via this microwave link permit total remote-control of the 45-foot system from the interferometer to monitor outside temperature, wind speed and direction, dew point, and barometric pressure at the 45-foot. Surprising differences are sometimes seen between the weather at the 45-foot site and Green Bank.

A Christmas tree can be made a little more fireproof by standing the freshly cut tree in a pail of water in which ammonium sulfate has been dissolved. For every four pounds of tree, use one pound of ammonium sulfate in one and one-half pints of water. Cut the tree on a slant to keep the cut surface off the bottom of the vessel holding the liquid. As the water is absorbed, the chemical will be carried to the branches. To get the greatest absorption, keep the tree where the temperature is from 55 to 65 degrees, but not in direct sunlight. Ammonium sulfate is available from fertilizer dealers.

VACUUM POWER
THE ULTIMATE SOLUTION TO THE ENERGY CRISIS

Pierre Lafrance

As the energy shortage and the growing pollution problem threatens to rot our lungs, render our wallets obsolete, and even perhaps spell the collapse of our electric pencil sharpener technology, I am astounded that a virtually inexhaustible source of clean energy has been overlooked for so long. I am talking of course about the tremendous amounts of energy stored in vacuum. Despite the fact that we have been exposed to countless hints that vacuum contains usable energy, we have repeatedly ignored this vital issue that will no doubt revolutionize civilization. For example, is it a coincidence that radio tubes, used as power amplifiers, work best when filled with potent vacuum? Is it mere chance that a tiny amount of powerful vacuum in a barometer can pull several times its own weight in mercury? Has no one taken notice that our ears pop as we go higher above sea level, and move closer to the humongous stores of vacuum of outer space?

The time is ripe for us to put all this good energy to use. Large vacuum turbines could be built (or existing ones suitably modified) to produce electricity on a massive scale and at little cost. One end of the turbine is connected to the vacuum while the other is open to the atmosphere, et voilà... power--clean power. Power to heat our homes. Power to light our cities. Power to run our factories. Power to sell at a huge profit!

The possibilities afforded by this novel discovery are endless and new areas of research will immediately open, providing respectable employment for physicists, engineers, chemists, astronomers, mathematicians and other assorted vagrants. Initially, of course, our vacuum would be supplied by large pipe lines from outer space. Since our whole solar system zooms through space at great speeds, we need not worry about depletion since we are constantly moving into regions packed with fresh vacuum. Yet, some day, we may not have to go so far to get our vacuum. We all know that atoms are mostly made up of vacuum with a little bit of matter in it. What's more, the space between the atoms themselves contains large amounts of this commodity. Once we learn to filter out

these tiny bits of matter, photons and useless phonons, we'll have an abundant source of power right under our very noses.

A boon to astronomers, vacuum energy can now provide a possible mechanism for these mysteriously energetic quasars. And once the quasar has used up much of the vacuum about itself, it runs out of energy and turns into a black hole. Being made of used up vacuum, black holes suck into their interiors anything in their immediate vicinity in a way reminiscent of strong gravitational attraction.

Il suffisait d'y penser.

MOVIE - THE CRAB NEBULA

Dates and times for CV and GB showings will be posted.

The story of "the star of 1054" is told in this lengthy, but fascinating, film of a celestial formation born out of the explosive death of a star--a supernova. The history of the Crab Nebula is traced from its first observations by Chinese astronomers in 1054 to the present. In their study, astronomers found that the nebula emitted sound as well as light, thereby discovering a new type of star: the pulsar, only 20 miles across, but with power emissions 25,000 times greater than the Sun's.

Filed in observatories around the world, the film affords the viewer the opportunity to see and hear the astronomers who researched the Crab. They discuss and demonstrate the many methods of their research, including time-lapse and polarized photography, the use of rockets to detect radio emissions, and the use of computers in discovering that the Crab Nebula is a major source of energy vital to support life on Earth.

The vocabulary used is closely aligned with astronomy and may be somewhat confusing for students unfamiliar with the terms. The narration is very informative, the photography and graphics are excellent, and the background music and sounds are quite apropos. --Jack M. Zerbe, Media Specialist, Council Rock High School, Newton, Pa:

ANNOUNCEMENTVLA "ON TO NEW MEXICO" NIGHT

It has been suggested that a meeting be arranged in Charlottesville some Friday night late in January to begin to acquaint VLA and all other interested NRAO families with the VLA site and the surrounding area.

The suggested program might be

Tequila

Margueritas

Mexican type appetizers

Co-operative covered dish supper of Mexican dishes prepared by those attending from recipes supplied by Bob Dorr

Illustrated talks on the following:

What the VLA is All About

The Site and Its Surroundings

Socorro as a Place to Live

New Mexico Recreational Areas

Shopping in the Area

Magdalena and Socorro Schools

Employees interested in participating in such a meeting should call Bea Allenson, CV extension 367. If enough interest is expressed by Green Bank employees, a second meeting will be scheduled in Green Bank.

REMEMBER - EVERYONE IS INVITED!

NOW IS THE TIME TO:

Shop
Hurry
Scurry
Mail early
Sing carols
Hunt rabbits
Admire the stars
Polish silverware
Hurry some more
Water houseplants
Sing "Silent Night"
Make popcorn balls
Re-read Luke 2:1-40
Mulch the strawberries
Enlist in the book club
Write letters to Santa
Knock snow off the shrubs
Clean the basement windows
Admire Mom's new winter coat
Read Dickens' "Christmas Carol"
Speak first to that grouchy neighbor
Ask Grandma if she could use a basket
of juicy red Jonathans
Have fun, but drive carefully; don't
become a holiday statistic

HOLIDAY FOR YOUR BIRTHDAY?

What would happen if the Observatory gave you the day off for your birthday? "Well," as the eminent Sam Ervin would say, "the Constitution wouldn't collapse and the Government would keep right on going." Seriously, the idea has been kicked around before, but not many people knew about it.

The idea is to use one of the two floating holidays that NRAO usually provides and allocate it to be taken on your birthday. If your birthday should fall on Saturday or Sunday, you would be allowed to take the following Monday off.

You may wish to make your feelings known on this important idea. If so, I would be happy to act as a clearing house for a poll and to compile the results for presentation to the management. Express how you feel about this idea by putting a check mark in the appropriate box below. Detach this sheet from the rest of the OBSERVER, fold as indicated, and mail to Ray Hallman.

TO:

Ray Hallman

Green Bank Laboratory

I like the idea of having a day off for my birthday.

I don't like the idea.
