

The O B S E R V E R

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1972 NRAORA-GB PICNIC

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1972 NRAORA-GB PICNIC

Five months of planning got all wet on Saturday, July 29, when your Rec. Association sponsored the Annual Picnic. Much of the Friday before was spent in preparation and setting up for the many planned activities to take place the next day. Well, the next day arrived and there it was--rain; I should say more rain. Booths and stands were quickly disassembled and along with tables and other equipment everything was moved to the Green Bank School Gym and reassembled. People soon started arriving and pretty soon, in spite of the rain, everything was in full swing. At one end you could find games such as spill-the-milk and penny pitch, along about the middle there were darts, charm and necklace engraving, ticket booth and free gift counter, while at the other end ping-pong toss and fish pond games were well underway.

Mix all of these with excited parents and children, crickets snapping, balloons bursting, kids screaming, prizes and presents everywhere and you would have a technicolor picture of the first two hours' activities.

Next came time to eat and talk about a good lunch--a full (and fat) menu was served to something over 425 people. The drawing for the door prizes was held and the lucky winners were: Skip Thacker, 12 inch B&W portable TV, and Mrs. Wally Oref, redwood picnic table set. After eating, a Bingo game was started and ran for about two hours. There were some real good prizes and lots of fun for those who played. All during the Bingo most of the games were still in full swing.

After the Bingo it was time to eat again and then live country music was the evening feature with dancing to go with it.

Due to the rain the field events (15 of them), horseshoe, egg throw, swimming events, and golf driving competition will be re-scheduled.

Well, as you can see (or saw), this was the biggest and best picnic ever held and it appeared to be much fun to all. A lot of people worked hard, both before and during the picnic, to put on such a happening and I would like to thank each and every board member and volunteer who worked so hard to bring about such a successful picnic.

Coming Events:

Teen Pool Party Friday night, August 11
Band

Labor Day Dance Saturday night, Sept. 2
Band - The Esquires

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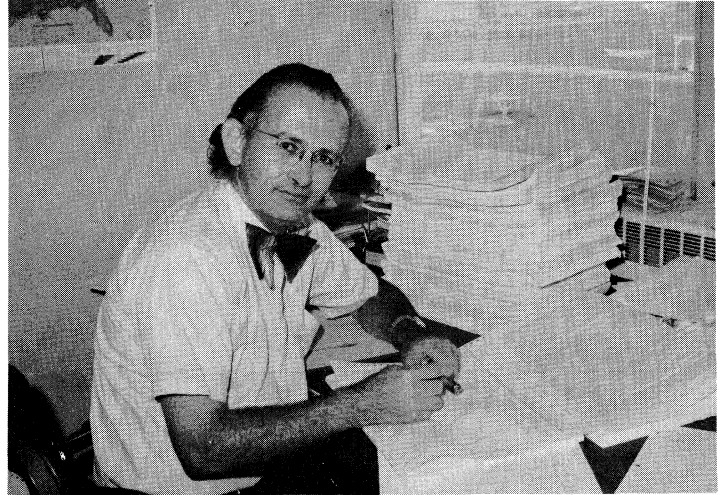
HOW DOES A STUDENT MANAGE TO
SUDDENLY TURN UP WITH A PH.D.?

Gart Westerhout
University of Maryland

Sweat, ladies and gentlemen, blood, sweat and tears! There is no suddenness in the Ph.D., even though it may sometimes seem that way. This article is written in response to questions we often get about graduate education in Astronomy. A student appears in Green Bank on the coattails of some famous, or at least established, Astronomer. He looks with awe at the telescopes, the complicated controls, the experience of the operators. After two years and several more observing periods, the observing program he is engaged in changes names. No longer is it Professor A and Student B, but rather Student B and Professor A. Sometimes, Professor A's name disappears altogether, Student B acts as though he knows everything, and starts worrying about receiver malfunctions, operator errors, etc. Then two years' silence. And suddenly there appears a Dr. B, who talks with authority, has a young student with him whom he bosses around, and not only acts as though he knows everything, but actually seems to know a good deal about what he is doing. What happened? Was the change easy? You bet it wasn't! Let us survey the student's career.

When he came to Green Bank first, he had perhaps just been admitted to University X as a graduate student in Astronomy. To gain such admission, he took a "Graduate Record Examination", testing his undergraduate background in Physics, wrote letters, filled in application forms, sent \$10 application fees, and convinced three of the professors in his college to write letters of recommendation. He did this not just one time, but actually ten, sometimes twenty times; to different universities, to his two or three prime choices first, but then to a whole lot of others, just in case his prime choices didn't want him. Insurance we call that! So now he had been admitted. He even got an assistantship. He was told that he was one of four new students and the the Astronomy Department received over sixty applications; it was intimated that he was awfully lucky to have made it. His assistantship required him to assist in teaching

hundreds of non-science majors (Home Ec., Education, Business Administration, Dance, etc.) what an O-star is and why the Copernican Revolution was so important for our modern civilization. He has office hours, conducts recitation sections, he tries to drum it in.



Professor Gart Westerhout

And he takes courses. Graduate courses! He finds that suddenly he is expected to work at his own pace. No drill sessions. Take it or leave it. Read the literature. Spend at the very least 5 hours per week in the library keeping abreast of modern developments - "but I don't understand a word of those Astrophysical Journal articles; I don't even understand the abstracts" -- "try anyway, you'll learn, and some of it will be on the exam next year" -. What exam? A grueling exam which is supposed to test his knowledge of the background of many fields in Astronomy and Astrophysics. In some Universities this is an oral exam, lasting several hours or even for several sessions. In others it is a two or three day written exam - "describe the principle of an auto-correlation receiver (3 points out of 100)" -- "describe in 1/2 page the evolution of a B-star from the cradle to the grave (2 points); derive the equations governing the equilibrium of this star during its stay on the main sequence (3 points)" - etc., etc. The student who has a solid undergraduate background and has worked very hard during his first year in graduate school will pass after one year.

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Others have their exams recessed, for 6 months, maybe another year. But then, after two years, he has made the hurdle. He has passed what is called the Preliminary or the Qualifying Exam.

Supposedly, he now knows the background. He can start in his field of interest. He has taken more advanced courses. Work in some of his courses has led to small research projects, under close supervision of the Professor. Sometimes, one of these has led to a paper by "the Professor and me", or if he has worked very independently, "me and the Professor." Sometimes he has accompanied an older student, working for his Ph.D. thesis, or the Professor, on a trip to Green Bank. He has programmed portions of the reduction procedures. He has hand-plotted contour maps. He has punched thousands of cards. His name appears in the last paragraph of the paper resulting from the work - "thanks are also due to Messrs. A, B, C, D, etc., who assisted in various stages of the reductions and observations" - not much for those many sleepless nights at the telescope, spent confusing the operator, or those 1927 cards punched (with only one error, in card number 1893, which took four weeks and hundreds of dollars worth of computer time to find). "Look", says the Professor, "you are learning all the time; last year you didn't even know how a card punch worked." - "Believe me, I still don't know."

And the student is learning. His questions in seminars and courses become more to the point. He begins to focus on an area in which he became interested during the study of the literature for a particular course; or during the observing period in Green Bank, while talking to Astronomers at coffee; or listening to a colloquium speaker who opened up a whole new field. Or maybe he finally finds time to concentrate on the subject he was determined to tackle two years ago when he entered Graduate School. The plan for a major piece of research, his Ph.D. thesis, begins to evolve. He has read almost all the papers (or if this is hundreds, all of the review papers and the most recent 20 or 30 papers) in his field. He has discussed his plans extensively with several faculty members, and with fellow students; he has tried to explain them to his wife. And now (at least in some Universities) he appears

before a faculty committee. They probe into his background. "Have you seen so-and so's paper on elliptical polarization?" -- "Elliptical polarization?" (Oh boy, I don't know anything about that) - "What is elliptical polarization?" - "You'd better read up on that subject, even though it's probably not important for your thesis." But he is given the go-ahead.

He applies for observing time - or if he is lucky, he happens to have chosen an area in which his Institution has been working for many years and in which millions of data points have already been collected and are crying out for a thorough analysis (or should we call such a student unlucky?). His Professor still keeps a finger in the pie, and the time asked is for the Student and the Professor. Follows a waiting period. Follows a phone call by Bill Howard asking him to reduce the time request by one-half -- "How can I possibly get a thesis done with that little observing time?" Follows a sudden cut in the NSF grant to the Professor (the student had made it to research assistant by now; he did not teach anymore), requiring him to go back to teaching in order to keep body and soul together. Follows a political demonstration at the University and extensive committee meetings trying to solve that University crisis. But finally, in spite of all these drawbacks, the student does turn up in Green Bank, thinking he knows exactly what to do, better than anyone else. Only to discover, when he runs his computer program in Charlottesville, at the end of the observations, that he had instructed the operator to turn the attenuator to 9 db, even though the operator was correct in stating that everyone else always used 6 db. But, together with other people's data, he has enough information to proceed with the analysis and discussions. This is the period in which he becomes invisible to the NRAO. He turns up at meetings of the American Astronomical Society in Puerto Rico, Hawaii, and other exotic places to present results (where he gets the money he doesn't know). He discovers two months after he predicted that he would have his thesis finished in three months that a

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thorough theoretical analysis is going to take another six months. During the AAS meetings he has talked to Astronomers from other Universities and Observatories about job openings after his Ph.D. He has written many letters, and asked his Professors to write letters of recommendation. The answer is invariably "no funds" or "we cannot consider you at present because of the uncertain funding situation, but will keep your file for possible later action." No one says flat-out "No."

These final few months are hectic. Typically, the student works 13 hours per day, seven days a week on his thesis. Only during the last week, when it is all typed, all figures are reproduced, and it appears in a nice brown binder, does he suddenly discover that it is a masterpiece. And so it is. Often, the Ph.D. thesis is the most complete single piece of research the Astronomer ever completes in his lifetime (there are quite a few exceptions to this, however). The final exam is usually a formality. At this stage, the student is supposed to be more familiar with the subject than any of his Professors, and usually is. He can parry almost all penetrating questions, and put aside with a single remark those that are irrelevant.

The acquisition of the Ph.D. degree is truly the result of many years of unremitting effort. The period of graduate study for the Astronomy student is usually the most intense in his life. It leads to the start of a professional career in which the young Doctor still has many, although lesser, hurdles to overcome: to start new projects, come up with new ideas, try to decide about the priorities of the many possible projects. And mundane things such as finding a job to one's liking, finding research funds, settling down in a position which might be permanent - "but I am not sure; should we buy a house now or wait another two years" - etc., etc. The Astronomer, however, is one of the most fortunate human beings; he does in general exactly what he likes to do. Surely an enviable position, a position he reached through very hard work, and a position which, because of its nature, makes him continue to work hard, in pursuit of the Astronomer's goal: to probe the mysteries of the Universe.

CAVE RESCUE

Craig Moore

We were just finishing the main course of a delightful dinner at the Hogg's when a telephone call interrupted. For me?! No, it wasn't trouble at one of the telescopes. A woman was explaining in a very calm voice that two boys were at the bottom of a pit in a cave and needed some help in getting out. Further, one had fallen and may be hurt. Yes, I would come and help. A pick-up truck would meet us at the bridge in Clover Lick.

As I hurried home across the common I quickly assessed our resources. Mike Balister is now in Charlottesville. Bill Brundage and Skip Thacker would be invaluable -- both experienced in caving and in pulling people out of caves. As I shed my coat and tie I dialed Bill. I explained the situation to his wife and she said he would call back shortly. I then tried calling Skip. Drat, the number had been changed. A glance out the window showed no activity at his house. I was quickly changing my clothes and mentally reviewing what equipment I should get out of the closet when Bill called back. He would come. He thought Skip was at Dunmore and would try and reach him. We would meet at Bill's and take my Jeep Station wagon.

I arrived at Bill's and learned Skip was on his way. Ahh, a good, experienced team was half the battle. While we waited I organized my climbing and caving gear and Bill made a few phone calls and took down some phone numbers in case we needed more help later. We then stopped at the Jansky Lab to pick up a 300-foot nylon rope, a map of the cave (Walt Allen) which was in one of my NSS (National Speleological Society) publications and got some more phone numbers.

During the drive to Clover Lick we discussed the cave description. The map indicated several short drops preceded a 60 foot pit, then a crawlway off the bottom to a 140 foot pit where the cave ended. We were counting on the boys being

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at the 60 foot pit and not at the 140 foot drop, since we had to bring them out the same way they went in -- over all of the drops. We also hoped that the injured boy would be able to climb a cable ladder, otherwise we would need much manpower to haul him out of the pits. We decided Bill would stay topside and coordinate efforts for equipment and additional manpower. Skip and I would enter the cave and determine the situation. Skip would stay at the top of the drop to man the safety rope and supervise the hauling effort if needed. I would descend to the boys, assess the situation, and give what first-aid I could.

It was nearly 10 p.m. when we met the pick-up truck in Clover Lick. We followed up the Clover Lick Mountain road, finally stopping at a pasture lane where we met the father of one of the boys. He said that his boy, Gary Beverage, was injured. The nature or seriousness of his injuries was not known. He believed both boys were at the bottom of the 140-foot drop. We sent Bill off in the pick-up truck to get some more help while Skip and I put the Jeep in 4WD and followed a Scout up the pasture lane for nearly a mile to a small camp. Each of the several pasture gates along the way were manned by someone who had them open when we passed and closed them behind us -- time saving organization. At the camp we talked to the boy who had stayed atop the troublesome pit while the others explored below. He went for help after the accident. He said the cable ladder they were using had broken while Gary was climbing out and thus they had no way of getting up. He also said they were at the bottom of the 140-foot pit, but didn't go through any crawlway to get to it. Was this the cave we thought it was? Skip had been in Walt Allen cave several years ago, but so far nothing seemed familiar.

We gathered up our gear, lit our carbide lamps (it was now quite dark) and headed for the cave about a half mile away. At the cave entrance John Hubbard (a visiting engineer at NRAO and the father of the other boy, Terry) had organized a human communications system inside the cave and had already sent a sleeping bag down to Gary. We grabbed up some food and clothing bundles and headed in.

At the first drop (a 20-foot stone water-

fall) Skip confirmed that this was Walt Allen cave and we were then quite certain that the boys were at the bottom of the 60 foot drop. We rigged a rope and rappelled down. We continued on down a 30-foot drop on the same rope, noting that the cable ladder already there was securely anchored for our return.

We found the boys at the 60 foot drop and were told that Gary wouldn't be able to climb out. We freed a badly tangled safety line and sent down some food, clothing and water. Then we hauled up the cable ladder and replaced the broken section with an extra one the boys had brought in with them and left at the top. Then I descended the repaired ladder. Gary was lying on a pile of rocks with his feet in a pool of water, wrapped in a sopping wet dacron sleeping bag, moaning and groaning that his head and back hurt and shivering like mad. Both his eyes focused on the same point and contracted when the light from my lamp scanned his face. Breathing was regular, deep and quiet. He could move all of his fingers and toes, arms and legs. His shoulder was sore but did not appear broken or dislocated. Terry was telling me that Gary had fallen from the top of the ladder while trying to go over the top ledge. I looked at him, concerned for his mental health. No one falls 60 feet onto a rock pile and doesn't break nearly every bone in his body. Then I remembered the broken ladder. I looked up to where the break had been, about 10 feet from the floor of the cave. I recalled that the ladder appeared to have been torn apart violently where it was broken. Terry recounted that Gary's foot and hand had caught the ladder at the last minute and broke his fall -- a very fortunate circumstance. I rechecked his legs for a break. No sign of that.

I hollered up to Skip that Gary was in pretty good shape physically but he would have to be hauled out of the cave. A Stokes litter (wire basket stretcher) would be helpful if available. Then I sent Terry up the ladder with a rope safety from above.

Now all was quiet. With my help Gary was able to move himself out of the water and I made him a little more comfortable. I then sat down to consult my first-aid

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check list. I must have overlooked something. I didn't believe he was in such good condition. After a time Skip returned with a dry sleeping bag and said that Richard Fleming, Steve Mayor, Tom Dunbrack, Bill Brundage, and others from the Marlinton Rescue Squad, were on their way in with a Stokes litter.

It was nearly 1:30 a.m. when Richard Fleming came down the ladder, followed shortly by the Stokes litter. We strapped Gary in and rigged a haul rope and a safety rope to the litter. Then we watched helplessly from below as those above grunted and groaned and hauled Gary up 60 feet. With excellent team work we repeated this effort at the 30 foot pit and the 20 foot stone waterfall. Finally at just after 6 a.m. Gary emerged from the cave. I understand he was in Dr. Aga's office by 7:30 a.m. and pronounced fit, except for some very painful bruises.

Several of us stayed behind and cleared the cave of all equipment. It was after 8 a.m. when we departed for home, very tired but also successful.

As we started down the pasture lane, Skip magically produced from the back of the Jeep three semi-cold cans of beer (with the Virginia tax stamp, no less). While not in the habit of having beer for breakfast, I considered this an unusual day and quickly placated my thirst. Who said there's nothing interesting to do in Green Bank except work for NRAO?

CRYOGENICS

Dave Williams

Cryogenics is moving at a rapid pace these days. At present, we have eight systems either in use or in the assembly stage with plans for several more. These eight systems include the following: 2 cm, which has just recently arrived from Comtec and is being assembled by Craig Moore and Tom Dunbrack; 3.4 cm, which was originally built by Joe Halpain from Rice University, but just recently returned to 7880 MHz by Joe at his new company in Dallas, Texas; 6 cm, narrow band and 6 cm, broad band, both which have been in use several years; 18 cm, in use for 3 or 4 years; 21 cm,

just recently completed by Skip Thacker and company. The final receiver which is now in actual construction is the 3 mm receiver being built by Jochen Edrich in Denver, Colorado. This system will be installed on the 36' sometime early next year.

We are presently in the final stages of testing a Germanium Resistance Thermometer, which, if it proves to work properly, will eventually be installed on all cooled receivers. The sensor will permit the necessary persons to monitor the actual refrigeration temperature from the control room. These thermometers will also be helpful in case of impending trouble due to troubles within the refrigerator.

In early May, Howard Brown, Bernie Pasternak, and myself spent three days in Palo Alto, California, attending a Vacuum Seminar sponsored by Varian. As of this seminar, the cryogenics department assumes full responsibility for all vacuum systems and associated problems. In conjunction with this, we have purchased a Mass Spectrometer - Helium Leak Detector. This piece of equipment will aid us greatly in finding leaks not only in dewars but also in refrigerators, compressors, piping and associated equipment.

This unit and all cryogenic equipment will be used in the cryogenics lab located in the rear of the Works Area Building in the offices formerly occupied by Tom Williams and the engineering department.

SCIENCE CAMP LECTURERS

Three staff members lectured at the 1972 National Youth Science Camp located at the 4-H Camp at Thornwood this summer.

Dave Buhl lectured on "The Population of Space", "Buck" Peery lectured on "The 140-ft. Radio Telescope", and Dave Heeschen lectured on "The Future Research in Radio Astronomy."

DIVERSIONS, SUBVERSIONS, AND PERVERSIONS

Dennis Bechis, Duncan Chesley, and Gary Jorgenson¹

The Fischer-Spassky World Championship Chess Match has sparked much anger among the Icelandic people, but has set fire to the spirits of many chess-minded Americans, including the Green Bank summer students at the Hannah Hilton. The nearby swimming pool and tennis courts and the outdoorsy indoors of the Hilton (once a farm house, but now inhabited by only mice and men) have provided us with the concentration needed to do research in chess, perversions of chess, and assorted chessboard recreations. The latter include solving such problems as arranging eight Queens on the chessboard so that none can capture any other. Perversions of chess I take to mean such games as blindfold chess, 5-seconds-a-move chess, and upside-down chess, with players on their backs looking up at a magnetic chessboard suspended above them. We, at the Hilton, have specialized in more refined perversions.

We have Sir Duncan Chesley to thank for developing an interesting variation of the game of anti-chess, in which the one who loses actually wins. To clarify this paradox and explain the new variation which we hereby christen as Chess-ley, Chesley presents the rules of Chess-ley, the first three of which are the same as in anti-chess.

1) The winner is the player who loses all his pieces except his King or who is checkmated by his opponent.

2) If a player is able to capture a piece of his opponent, he must take it.

3) A player may not make any move that places his King in check; if in check, he must, if possible, capture the attacking piece; if he cannot, he must then either move out of check or block the check by intervening any piece.

4) If a player is not in a position to capture an opponent's piece, he may move either a piece of his own or a piece belonging to his opponent. If the player decides to move his opponent's piece and one of his opponent's pieces can capture a piece, the player must make that capture.

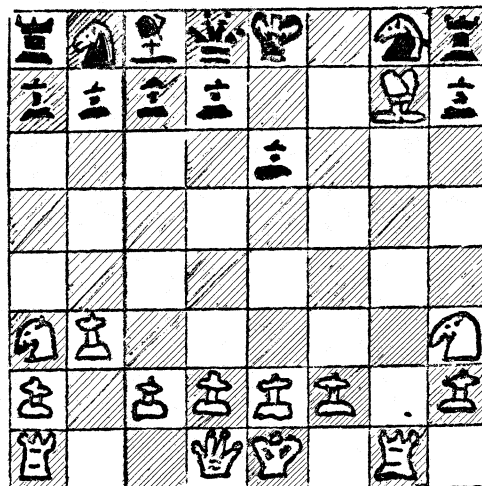
5) The player who moves any pawn to the last row has the privilege of promoting it to a piece of any color and value except, of course, a pawn.

6) If unanticipated or impossible sit-

uations occur, several options are open: shoot it out on the pistol range, race each other up the ladders to the feed of the 300' telescope, discover a new interstellar molecule first.

7) All other rules of chess prevail.

To illustrate the game in more detail, we present a full game with the board position after the seventh move. If you play out the succeeding moves, you'll find that White has already lost the game. "WR-KN1" means that Black moves (indicated by -) the Rook belonging to White (w) to the first (1) square on the White King's Knight file. (ALL moves are given in the reference color of the piece moved; a "b" instead of a "w" means that a Black piece is moved.) This is an excellent (!) move for Black uses White's Rook to do a lot of dirty work behind Black's Pawn line. Black's tenth move combines mystery with strategy: it cleverly prevents White's Rook from capturing (indicated by x) a Black Pawn and escaping from his dirty work.



QR QN QB Q K KB KN KR←FILE

The West Virginia Special

	White	Black	White	Black	
1	bP-K3	bB-R6	11	wRxB	bN-K2
2	wNx B	wP-QN3	12	wRXP	bRxB
3	bP-KB3	bP-KB4	13	wR x N*	bK-N3
4	wP-KN4	bPxP	14	wR x PatKR2	bR x P
5	wB-R3	bPx B	15	bR-QB1	bR x P
6	wNxP	wB-N2	16	wNxR	wN-B4
7	wB x P	wR-KN1 !	17	wNxP	wN-Q8
8	wB x R	bP-Q3	18	wNxP	bK-R3
9	wR x N*	bK-B2	19	wNxP	wN-B8
10	wR x Q	wR-N8 !!	20	wNxP	WINS
*	Check				

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Chess-ley requires a lot more strategy than anti-chess and is certainly more exciting; if you are unwary, of course, your opponent may move your won pieces against you with deadly results. Although Chess-ley is far from rivaling chess in strategy, it does surpass chess in the variety of possible end games. Some of us like and play chess and chess-ley so much that we now have serious problems keeping the two sets of rules apart when we play.

We will close our article with this, ala Fischer. We students demand of NRAO that the Hannah Hilton be rebuilt in the shape of a rook, that we have sole use of the swimming pool and tennis courts, that the golf course be painted in large black and white squares to be a chess-board, and that we be supplied with 32 appropriately colored and shaped Diesels and drivers.

¹ Dennis, Duncan, and Gary are summer students in Green Bank.

THE SAND PILE

Ever make a discovery and wish you hadn't? I did. I happened to be looking out the south (back) windows of the Jansky Lab and discovered a huge pile of white sand neatly piled on a large piece of clear plastic near the stairwell leading to the basement conference room. My first thought was that this sand must somehow be related to a new elevator supposedly slated for the Jansky Lab. Sensing a story for the Observer, I began to investigate. I wish now that I hadn't.

Assuming it was an engineering function, I cut a fast gait to the east end of the Lab to the headquarters of our engineering department. The first engineer I asked thought the sand was for an elevator well but said that I best check with Buck Peery. Buck wasn't in his office so I went "Buck" hunting in the places I've known him to frequent. Finally, I caught up with him in the parking lot and put the finger on him for trying to hide a story. "What story?" he asked over and over. "Come on, Buck, what's the story on the new elevator for the Lab? I've seen that big pile of white sand." "Well, there might be a big pile of white sand out there," he said, "but it's not for an elevator shaft." With that he left me in a big cloud of diesel smoke. No one is

going to fake me out that easy, so I made a bee-line to the Lab but on my way I was thinking about that sand pile.

That pile of white sand must be for an emergency exit. Clever!! In case of fire you jump out into the sand pile and the looseness of the sand grains cushions your fall. Boy, that safety committee is right on top of things! Naw, it couldn't be that! It's too obvious. Still thinking about the sand pile, I made my way through the throng of women folk and into the electronics lab.

Just through the swinging doors I ran smack into one of the really big honchos that works there. Sure, he knew about that big pile of white sand. "What about it?" he asked. "What's it for?" I asked. "Oh, come on now, you know what it's for." "No, I don't; honestly I don't." Without cracking a smile he says, "It's for filling the assistant director's ash trays."

I sort of slumped backwards away from him and while doing so bumped into a wag from the works area. Hastily apologizing, I popped him the question about the white sand pile. "Sure," he said, "I know what the sand is for." Jim Finks sent it over from Charlottesville. It's a fringe benefit for the people who work in the electronics lab. They can play in it during lunch time if they want to." "Sure," I said, and made a hasty retreat to the cafeteria.

Hardly half way over to the cafeteria, I ran into one of our telescope operators and, against my better judgement, asked him about the white sand pile. His answer was no better or no worse than the others. According to him, the sand was used for ballasting hot air balloons that were fueled on the second floor. That's funny! I hadn't seen any hot air balloons up at the parking lot end of the second floor. They must do it in the middle or down towards the Reber scope end.

I still don't know what that white sand is for but I went out and got me a jarful. The next guy who mentions that damn sand pile to me I'm gonna tell him to take that jar full of sand and

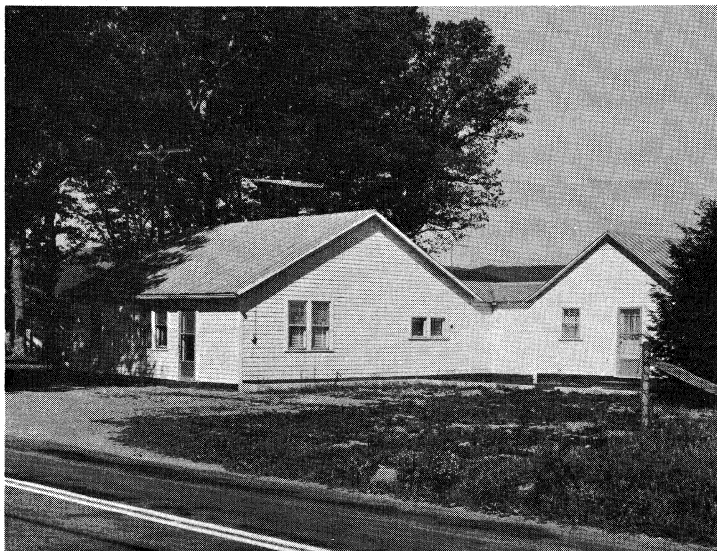
* The author, who wants to remain anonymous, is with the National Radio Astronomy Observatory, Green Bank, W. Va., operated by Associated Universities, Inc. under contract with the National Science Foundation, Washington, D.C.

THE KESSLER HOUSE

Wally Oref

The other day I was down at the tour center shooting the bull with Paul Kesler, one of the bus drivers. In the conversation that was going back and forth, I mentioned that they had moved the old double garage from the Kessler House over between the "Nut-Bin" and the Shina-berry House.

The Kessler House, owned by the Observatory, is the white, frame dwelling sitting next to the Liberty Presbyterian Church and almost opposite the house where Beaty and Jamie Sheets live.



I asked Paul if he was related to that Kessler who, I thought, spelled his name with two s's.

Paul said, "Yes," he was related to that Kessler. "My uncle, Dice Kessler, lived in that house until it was bought by the Government for the Observatory."

I asked, "Why the two s's in some Kesslers' names and only one s in other Keslers' names?"

"Well," Paul said, "some of the Keslers, when they got up 'into their letters', so to speak, went fancy and added another s."

Paul went on to say, "My uncle Dice was quite a man. You know he was blind but he once ran a broom business and a store. He was

in the broom business first and made first-class brooms, which he learned to make at the school for the blind at Romney. His Broom shop was a little 12 x 20 foot building located a little north (towards the Lab) of the present Kessler House. The present Kessler House grew around this little broomshop."

One local story told about Dice Kessler originated in that little broomshop. As I recollect it went like this: Dice Kessler prided himself in making quality brooms. One day an elderly matron (we had them here too) came into his shop to purchase a broom. After he had shown her one of his brooms, she asked, "How much?" "Seventy-five cents", said Dice.

"Well now," she said, "no broom that costs only seventy-five cents could be much of a broom. If you have a better quality broom, I would like to see it."

"Of course I have," Dice said. "I have a \$1.25 broom. It's the best I make."

"Fine, let me see one," she said.

Into the back room went Dice and grabbed two brooms. These brooms were no different. He only made one model. Out of the back room he came and to the matron said, "Here's the best broom I make and also the best money can buy."

"This is more like it, young man. I'll take two. Here is your money." And with that she went out the door.

Ole Dice and the Natives chuckled over that one for years and years.

With his own savings and \$100 borrowed from Paul's dad, Dice went into the store business. Shortly thereafter, he moved the old broom shop about 20-feet to the south and changed its orientation 45 degrees from its old orientation. This was necessary so he could have a better entrance into the store from the highway side. Next, he added several rooms to give him more store space and living quarters. These additions resulted in the basic Kessler House. Later, when his store business demanded it, he added two small buildings off to the right of the main store. Today these two additions might be called modular additions. Out in front he put in two gas pumps. He used to tell how many gallons he was pumping by the bell that rang

--continued, next page

after each gallon. The old gas pumps worked that way, you know. He could give change by feel - both coins and paper.

His barn was across the road from the house, and in the loft Dice stored his paper boxes. The loft door was left open and Dice could walk out of his store to a particular spot from which he tossed the boxes through the loft door. Although blind, he seldom missed.

After the Observatory acquired the Kessler House, they used it, first, for a field office (about May, 1957). In July, 1957, the first electronics lab was set up in the "add on" rooms and Warren Wooddell (Carl's brother) was hired as the first technician. After the Jansky Lab was completed, the Kessler House became a family residence and in recent times it has been used for transient housing.

I suppose every old house has a story. Perhaps someone else may write about another old house. The "Nut Bin", for instance, comes to mind quite quickly.

VISITORS TO NRAO DECLINE

For the first time since 1960, the number of visitors to NRAO has not shown an increase. So far this year the number of visitors (9,743) is running 3,258 behind 1971 (13,001). At first, the reason was thought to be simply the June rains, but there seems to be more to it.

Second thoughts, however, indicate that it's more than the June rains, and we have made some effort trying to find out why people are traveling or vacationing less. So far our investigations, observations, and inquiries have revealed:

Most of the tourist attractions we have contacted have experienced a percentage decline similar to NRAO's.

Some people who operate tourist attractions for profit contend that recent rains and flooding have kept people at home and spending less.

Several long-time tourist operators said that they have experienced a business decline every election year.

Chartered buses to NRAO have been noticeably scarce this year, but last year they were common, averaging three to four per week. On one day last summer we had five in one day.

The people who keep the records, meet the public, answer their many questions, and who tour them about are relatively unknown to most employees. We can't introduce you to them personally, but you can meet them through the picture that follows.



Standing, left to right: Nathan Fertig, Paul Kesler, June Riley, Grover Barkley. Sitting, left to right: Pam Weaver, Ele von Hoerner.

The other group that helps to make the tour program a success is the summer students. Each of them takes a turn demonstrating the 2-ft. (22 GHz) radio telescope. They are doing a fine job for NRAO. Their group picture is in the "New Employees" section.

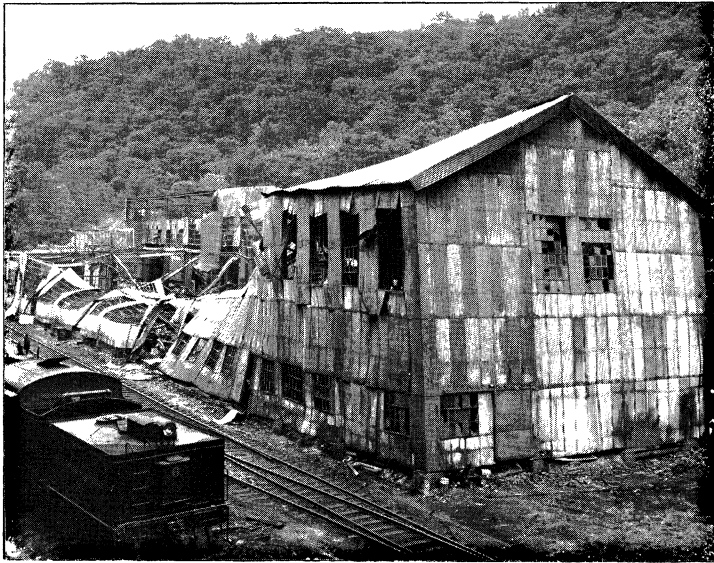
CASS RR SHOP BURNS

Wally Oref

A fire started by a short circuit in the electrical system gutted the old, but working, Cass RR locomotive repair shop. The fire started sometime in the early hours on Sunday morning, July 23.

At one time one of the best steam locomotive repair shops east of the Mississippi, the Cass shop was used to repair and maintain the steam locomotives used on the Cass Scenic RR.

Gone are the unique, giant lathes and other tooling equipment of a bygone steam engine era - equipment that probably no longer existed elsewhere in the USA.



Several residents of Cass reported that sometime around 3:00 a.m. on Sunday, July 23, they heard a tremendous explosion and seconds later the entire shop was engulfed in flames. There was no way to save the building and contents. Almost total destruction took place in minutes.

The accompanying pictures tell best the intensity and fury of the fire that ravaged the locomotive repair shop located about one mile up track from the railroad depot.



The Cass Scenic RR will continue to operate as long as engines are running. There are no other repair facilities at Cass, so when the operating engines break down, that's it.

In the meantime, Department of Natural Resources officials are meeting to discuss plans for building a new repair shop at Cass.

1972 CALENDAR OF NATURE EVENTS

Sponsored or Co-sponsored by
West Virginia Department of Natural Resources

- | | |
|--------------------|---|
| September 8, 9, 10 | West Virginia Fall
Nature Tour
Tygart Lake State Park |
| September 16 | 5th Annual Little Kanawha
Regional Nature Wonder
Weekend
North Bend State Park |
| October 6, 7, 8 | 14th Annual Junior Con-
servation Workshop
Outing
Pipestem State Park |

A LADY NAMED AGNES

John Weaver

The weather word for the spring and summer, thus far, of 1972 is rain -- great gobs of it. Since May, rainfall has been much above normal for the period. This has been the result of an abnormal upper air pattern for the season. Normally, the mid-latitude flow aloft up to near the tropopause tends to become zonal or west to east by mid-spring and more or less continues this pattern through the summer months. So far this year, however, the flow aloft has followed a meridional or more north-south pattern with large sinusoidal waves. This pattern brings into play large temperature contrasts over relatively narrow bands, which in turn cause a marked increase in cyclonic disturbances, or, to return to the word, rain. This article will deal with the single most rain producing phenomenon of the season, indeed, for the eastern United States, of modern times, a lady named Agnes.

Agnes was spawned in the western Caribbean, and her existence was first detectable at a land weather station on the Yucatan Peninsula on June 14. The Central American land mass prevented Agnes from proceeding normally in a westerly direction, so she remained in the region of her birth for a few days, gathering strength and devising a plan of action. Kept from doing her normal thing by land masses, Agnes looked around and spotted a trough of relatively low pressure to the north and, by now being a lady of decisive action, she took off taking a mean swipe at the western end of Cuba and emerged into the Gulf of Mexico on June 18 as a full-fledged hurricane.

For the next two days Agnes meandered slowly northward through the Gulf picking up energy and moisture from the warm waters while her attendant winds, rain and high tides lashed the west coast of Florida. Moving inland she was centered over western Georgia at 7AM EST on June 20. Torrential rains pelted the region and, weakening now, Agnes attempted to turn in an easterly direction. This was to be expected at the latitude she had now reached and forecasters breathed a sigh of relief; Agnes was headed back for the open ocean.

The forecasters' sighs proved to be premature, however, for as Agnes headed eastward, she ran up against a wall of pressure too high for her to buck in her weakened condition. This was the well-known Atlantic high, or Bermuda high as it is more popularly named. Agnes again turned northward and revised and amended forecasts began coming thick and fast. A very significant development at this stage resulted from the fact that the eastern portion of Agnes' circulation pattern was now over the warm Gulf Stream in the vicinity of Cape Hatteras and she was being refueled and restrengthened.

Agnes by now was furious at being pushed around and frustrated at every turn, and began to wreak vengeance as she again meandered slowly northward, seriously flooding portions of the Carolinas, Virginia, eastern West Virginia and Maryland. During this phase rainfall in excess of three inches was measured at the interferometer with much larger amounts being recorded farther east.

At about this time Agnes realized that she was far to the north and west of where she should be and decided to make one more break for the Atlantic. She made it offshore in the vicinity of Cape Charles and on the morning of June 22 was centered several miles out to sea off Cape May, New Jersey. However, she was destined to be seriously frustrated once more and this time by her own hand. Following the old adage that all that goes up must come down, the tremendously large amounts of air that had been funneling upward in Agnes' circulation pattern were subsiding out ahead of the center and building up pressures which again blocked her forward movement. Again, however, her moisture and energy supply was being replenished by the Gulf Stream.

It was now clear to Agnes that she was never to escape to the North Atlantic to die as a decent hurricane should so she decided to go down venting her anger and frustration over land. Turning abruptly westward she penetrated to north central Pennsylvania by the morning of June 23. Encountering high terrain, her entire system was forced to rise, and as a result her moisture condensed and torrential rains fell over the entire region from central Pa. into New England. Rainfalls

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in excess of ten inches in 24 hours were common.

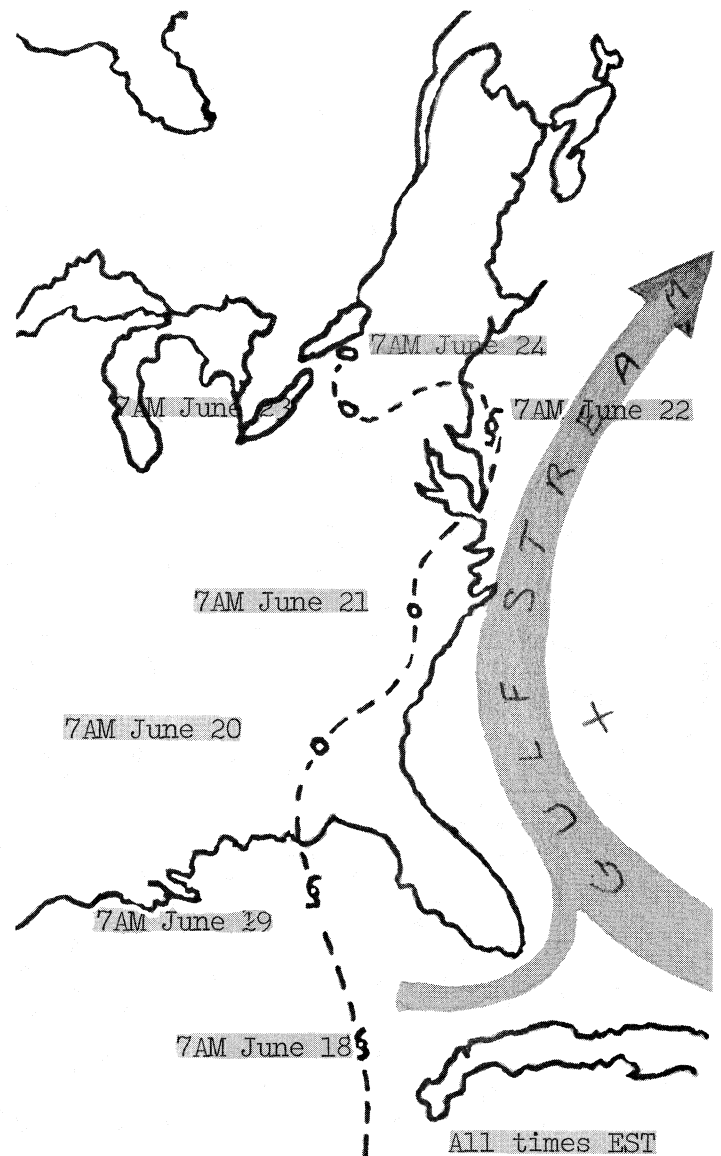
Agnes was being severely weakened now by dissipation of her moisture and energy, and it was plain that she was dying. She continued to produce heavy showers for a while longer but by the morning of June 24 Agnes was dead. No further traces of her tropical origin were detectable.

During her lifetime Agnes was responsible for the most severe flooding on record, particularly in central and northern Pennsylvania and central New York. Her effects will be felt for many years to come. Loss of life was great and property loss and damage amounted to billions of dollars. The total effect of the storm on the ecology of the affected region will be nearly impossible to assess; however, studies are already turning up some very interesting facts.

Chesapeake Bay is a salt water estuary. Tidal action maintains the water salinity at near that of the open ocean, approximately 15 parts per thousand. So much fresh water was dumped into the bay by runoff from the floods that it has been completely flushed out and changed to a fresh water inlet. Salinity of the bay waters is now less than one part per thousand and this falls well below standard criteria for fresh water. Months will be required for the water to return to normal, and by this time large numbers of oysters, clams, crabs and other marine organisms will have died. Fish which made it to the open ocean will not return for a long time. Since much of the industry of the region depends on fisheries, this means economic disaster.

To return for a moment to my opening paragraph, the meridional flow of air currents aloft has been responsible for some other significant phenomena which I will briefly mention here. Our hard freeze on June 11 resulted from an outbreak of air from near the North Pole reaching the southern U.S. The upper air maps for this period look normal for mid-winter. Again, just a few days ago we were sweltering under record heat and humidity while it was snowing in Montana and Wyoming. Sometimes it just doesn't pay to be a weather man. Oops, sorry, weather person.

Forecast for Picnic - Hot 'N Dusty



AGNES' ODYSSEY

Apparently someone else is getting into this weather kick. The following is quoted verbatim from an extremely unreliable source.

Dort: "Wally, I have clothes on the line; go out and see if it's raining."

Wally: (popping the top of another Schlitz) "Aw, Hon, call the dog in and see if he's wet."

300-Ft.

Ken Cottrell

Perhaps the satisfied should remain silent. So it may be with us, at the 300-ft. In the past few issues of the Observer we have kept our silence. Indeed, if we speak, or if we write, it can only be in praises or in contented relishings. For our's is a smooth, and pleasing, and elevating endeavor.

Let the summer days wander, wistfully, by. Our burden is light. Lounging in air-conditioned comfort, in our new control facility, we gaze out a 12 x 4 picture window upon a delightful scene---"almost heaven" as the recent hit song so glowingly describes it. Ah, how easy, oh Pocahontas. How easy it is to find solace in your land. In such blissful surroundings we are led to ponder the deeper gratifications of our calling.

We are certain that our's is not "just another job." We know that we are part of something which may bear implications of awesome moment to human destiny. We state this without the least sense of sensationalism or hyperbole. We state it in the knowledge that man has not yet arrived. He has not escaped the Adversary. Paradise is not yet regained. That search for a higher state of being, that search for species immortality, if you will, must go on. And what is being done at Green Bank and Tucson, and what will be done at Socorro is a great frontier in that search. What we do here contains the seed of deliverance, of salvation, for mankind. We will not decry nor abandon that hope.

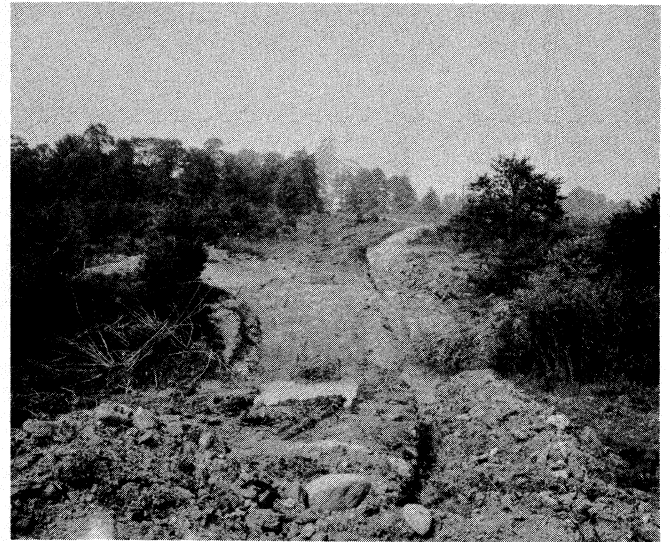
The Observatory has hired two temporary operators during the summer months to fill in while permanent operators are on vacation. Paul Giguere, a graduate student in astronomy from the University of Virginia, has been assigned to work at the 300-ft. It is an arrangement which is proving to be highly successful and mutually beneficial to all concerned. While Paul is gaining much needed experience in running experiments on the NRAO's telescopes, we are gaining helpful insights from his extensive knowledge of physics and astronomy. It is hoped that the Observatory will continue this new policy in the future.

CANALS AT GREEN BANK

Jim Dolan

You may have noticed a lot of digging going on around the site lately, and consequently a long ditch with lots of water, particularly during the month of June. We were just getting started on the project when the skies opened, and the monsoons came, and our long ditches became lovely, muddy canals.

The reason for all the digging is to provide a route for direct cable connections between all major instruments and the Jansky Laboratory. Three cables are being strung: one 19-pair general purpose cable and two foam-filled 1/2 inch semi-rigid coaxial cables.



Cable trench partially back-filled after cables were laid. The 140-ft. is in the middle background.

One of the coaxial cables will provide a 5 MHz reference signal from the maser oscillator that is located at the 140-ft telescope control building. The other coaxial cable will be used for other radio frequency signals as required. If the weather allows, the project will be completed during the first part of August.

COMPARISON SHOPPING

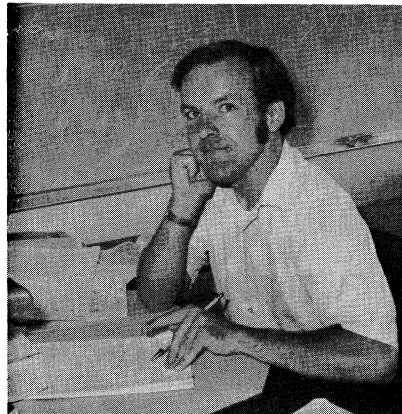
Everyone is talking about high food prices. On this sheet is a list of products and their average prices in Charleston, W. Va. How do these prices compare with prices where you shop? If you use this sheet to compare prices, how about sending The Observer a copy? (An extra sheet has been provided for this purpose on the last page). If we get enough returns, we will publish an article in the next issue.

PRODUCT	Average Cost in Charleston, W. Va.	NAME OF STORES AND PRICES		
Peanut Butter - Jif 12 oz.	.50			
Mayonnaise - Kraft 16 oz.	.45			
Mustard - French's 12 oz.	.33			
Vinegar - Heinz 32 oz.	.41			
Milk - 2 half gallons				
Vitamin D	1.17			
Margarine				
Blue Bonnet 1 lb.	.38			
Cheese - American 12 oz.	.73			
Eggs - 1 dozen - Grade A Large	.51			
Spaghetti - Mueller's 48 oz.	.72			
Kellogg Corn Flakes 18 oz.	.37			
Tang - 18 oz.	.87			
Round Steak - Top per lb.	1.64			
Chicken legs per lb.	.77			
Pork Chops				
Center Rib per lb.	1.40			
Dishwashing Liquid				
Ivory 22 oz.	.56			
Tide Powder - 49 oz.	.86			
Oranges - each	.09			
Bananas per lb.	.17			
Lettuce per head	.28			
Potatoes per lb.	.12			
Instant Coffee - Maxim 8 oz.	2.04			
Ketchup - Heinz 26 oz.	.48			
Tomato Sauce - Hunt's 15 oz.	.25			
Cooking Oil - Crisco 24 oz.	.57			
Flour 5 lb. Robin Hood	.61			
Sugar 5 lb. - Domino	.70			
Bread	.27			
Bread - 1 lb. 4 oz.	.33			
Coca Cola - 128 oz.	1.10			
Bologna - 3/4 lb.	.87			
Ground Beef - per lb.	.81			
Steak - T-bone - per lb.	1.84			
Wieners 1 lb. all meat	.68			
Bacon - 1 lb.	.75			

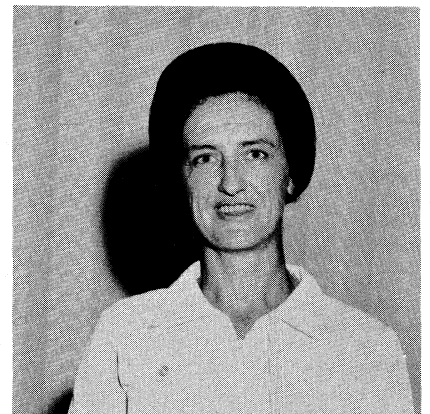
NEW EMPLOYEES



Hrant M. Tovmassian
Visiting Scientist-CV
Basic Research



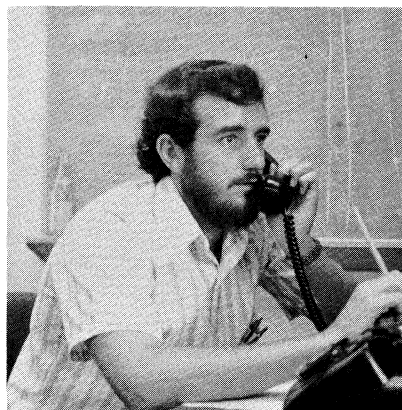
James R. Fisher
Research Associate-GB
Basic Research



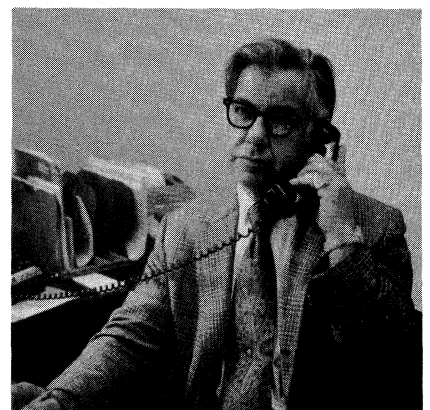
Dotty M. McLaughlin
Housekeeper/Food Handler-GB
Admin. Services



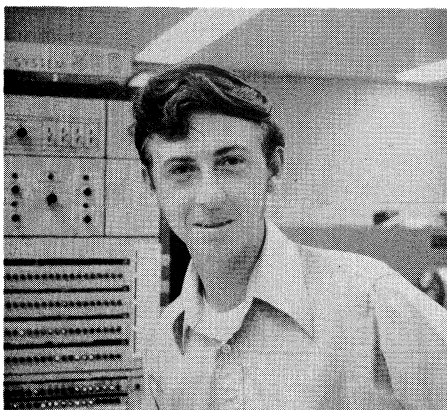
Carl A. Gottlieb
Vis. Asst. Scientist-CV
Basic Research



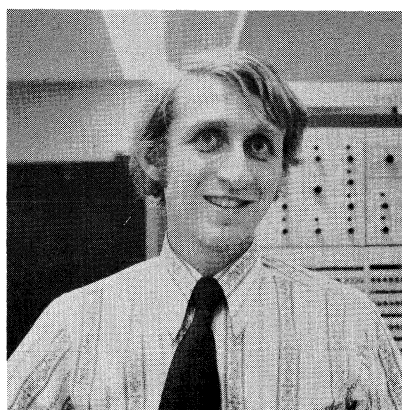
Peter J. Napier
Research Associate-CV
Basic Research



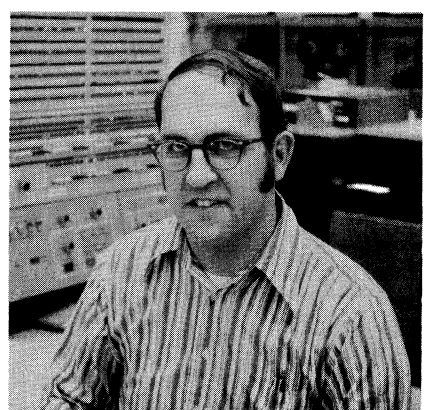
Julius Marymor
Manager of Contracts-CV
Bus. Manager's Office



E. Leroy Napier
Computer Operator-CV
Computer Div.



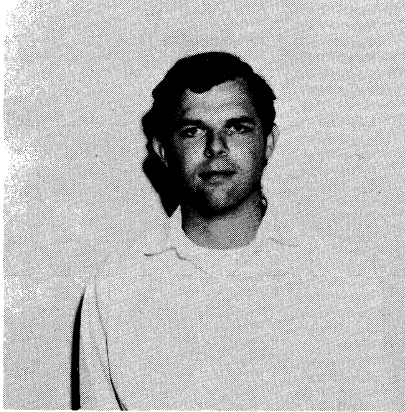
Charles P. Kellejian, Jr.
Computer Operator-CV
Computer Div.



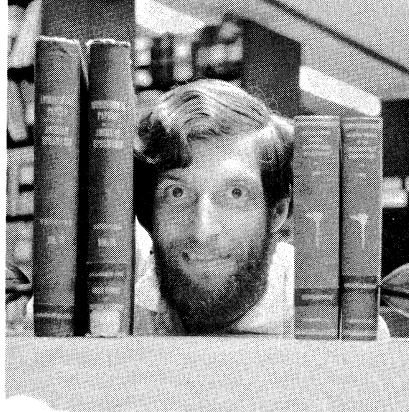
C. Thomas Young, Jr.
Computer Operator-CV
Computer Div.

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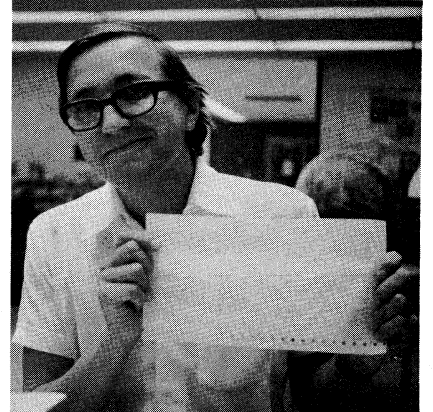
NEW EMPLOYEES - cont.



Daniel R. Matlaga
Telescope Operator-GB
Telescope Operations



Royce Q. Shaw
Library Assistant-CV
Scient. Services



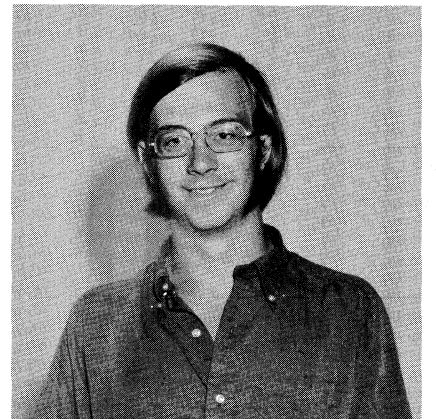
Istvan Fejes
Jr. Research Assoc.-CV
Scient. Services



Janet P. Young
Receptionist/Telephone Opr.
Bus. Manager's Office



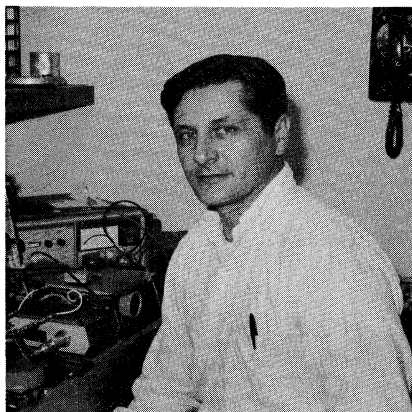
Dana L. Moyers
Life Guard-GB
Maintenance Dept.



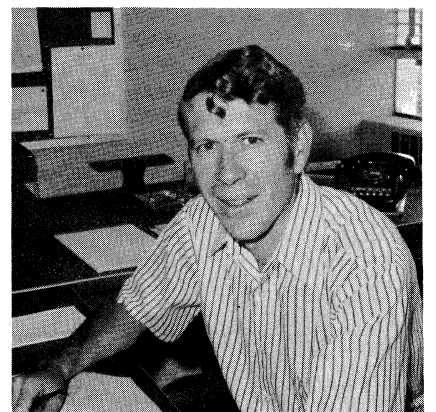
Jeffrey P. Warner
Ground Maintenance-GB
Maintenance Dept.



John A. Campbell
Electronic Eng.-GB
Electronics Division



Charles J. Brockway
Electronic Eng.-GB
Electronics Division



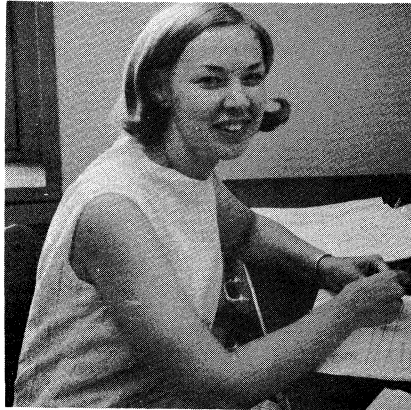
Ross E. Jeffries
Head - Adm. Services
Admin. Services

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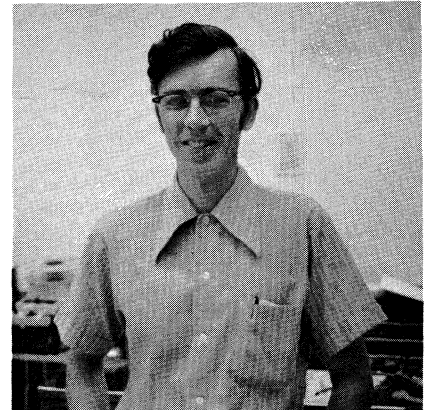
NEW EMPLOYEES - cont.



Robert Haas
Electronic Engineer-CV
Electronics Division



Linda C. Blankenship
Scientific Assoc.-CV
Basic Research



Benno Rayhrer
Electronic Engineer-CV
Electronics Division



CV Summer Students

Bottom Row - from left to right

- Changlin Wey
- Patrick Yeung
- Tom Gandet
- Tom Bania
- David Gibson

Middle Row - from left to right

- Steven Peterson
- John Chandler
- Vicky Diadiuk
- Linda Lucignani
- Michael True

Top Row - from left to right

- Pamela Bonnell
- Alma Zook
- Rosemary Kennett
- Stanley Hansen
- Lars Pettersson
- Philip Stickney
- Daniel Grayson

Not Pictured: Peter Camana, Michael Cherry, Francis Chin, and Jay Lockman

Pictures Not Available

Margaret L. Halliday	Secretary	Tucson
Lee P. Hagar	Design Eng. I	Tucson

(cont.)

NEW EMPLOYEES - cont.



GB Summer and Co-op Students

left to right:

Francis Chin

Vernon Fisher

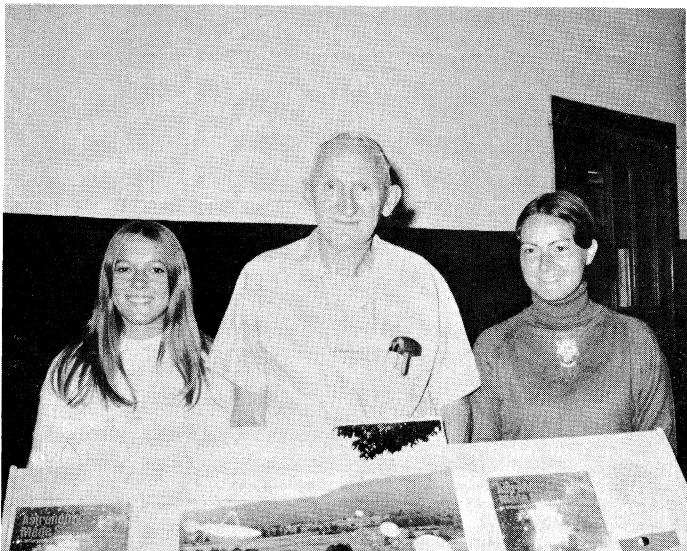
Duncan Chesley

Paul Benzel

Stephen Maas

Gary Jorgensen

Dennis Bechis



Pam Weaver, tour receptionist; Nathan Fertig, bus driver; Ele von Hoerner, tour receptionist
Administrative Services



Don Gordon, Central Shops - Wm. Gillispie, Clarence Wright, and Tim Waybright - Plant Maintenance

TERMINATIONS

Lloyd M. Swartz.....Electronics Division
 Gary L. Wesner.....Electronics Division
 Jo Anne Byram.....Business Manager's Office
 Gene H. Kesler.....Administrative Services
 Ellis C. DeMasters.....Computer Division
 William F. Beyers, Jr.....Computer Division
 Johnny C. Nelson.....Administrative Services
 Sol Lawand.....Co-op
 Stephen J. Hirsch.....Co-op
 Edward B. Davis, Jr.....Co-op
 Michael M. Davis.....Basic Research
 Carl A. Gottlieb.....Basic Research
 Edith A. McCloud.....Fiscal
 Patricia W. Quinn.....Business Manager's Office
 Peter Brosche.....Basic Research
 Ignatius F. Cutitta.....Business Manager's Office
 N. Elaine Webster.....Basic Research
 Lars E. Pettersson.....Student
 M. Cristina Gobin.....Tucson

TRANSFERS TO CHARLOTTESVILLE

Michael Balister.....Electronics Division
 Robert W. Haas.....Electronics Division

REHIRES

Keith H. Johnson.....Tucson
 Grover L. Barkley.....Administrative Services
 S. Allen Farris.....Computer Division
 Julius Marymor.....Business Manager's Office
 William N. Waybright, Jr.....Plant Maintenance
 Ronald E. Bowyer.....Plant Maintenance
 Patrick W. Coleman.....Plant Maintenance
 John F. C. Wardle.....Basic Research
 Kurtiss J. Gordon.....Basic Research
 Paul T. Giguere, Jr.....Telescope Operations
 Gary C. Beverage.....Electronics Division
 James C. Jafolla.....Co-op
 Louis J. Gross.....Co-op
 David M. Berg.....Co-op
 Claude N. Williams, Jr.....Co-op

FOR A BOTTLE OF FINE WINE
-BUNG-

Ingredients:

4 pounds of any fruit (cherries, tart plums, peaches, blackberries, elderberries, etc.)
4 quarts of boiling water
4 oranges, sliced
4 lemons, sliced
4 pounds of sugar
1 envelope of dry granular yeast or 1 cake of yeast
1/4 cup of lukewarm water
1 slice of toast

Directions:

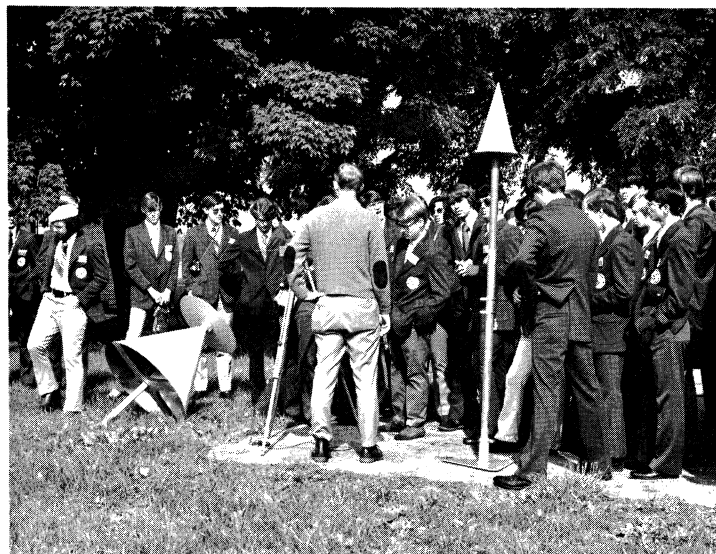
Wash fruit and cut fine. Add boiling water and let cool. Add sliced lemons and oranges. Let stand for four days. Strain, add sugar, stirring until sugar is dissolved. Sprinkle yeast in warm water and stir until dissolved. Place toast in dissolved yeast until all the liquid is soaked up. Float toast in fruit juice mixture for four days and then remove toast. Strain and bottle the wine, corking it loosely until fermentation stops. Pour off leaving sediment on the bottom. Re-bottle and cork tightly. Wine will be ready to drink in four months. Makes about one gallon.

Note: Use a crock or plastic container large enough to hold all the ingredients. Don't use a metal container. You can store your wine in gallon glass jugs that have been well cleaned. With just this recipe and kitchen equipment you can make a pretty good wine. Of course, you can go the limit and purchase all kinds of "goodies" at a wine supply store -- I believe there is one in Charlottesville.

APHIDS

Ground tomato leaves soaked in water makes a spray that works for aphids on peach trees and rose bushes. Rhubarb leaves used the same way are supposed to be effective against rose aphids.

SCIENCE CAMPERS



A group of National Youth Science Campers listen to Lloyd Swartz, Electronics, discuss interference problems at NRAO. Members of the 1972 National Youth Science Camp were here for a half-day visit on July 6.

FOR WHOM THE SHOE FITS

IF YOU ARE THE INDIVIDUAL OR INDIVIDUALS WHO ARE FLIPPING EMPTY BEER CANS ALONG THE OBSERVATORY ROADS, WILL YOU PLEASE STOP or at least throw a full one away once in awhile.

SAY THANKS

Next time you see Jim Dolan, say thanks to him for getting his hair cut. Now we don't have to wonder about him (I think).

POP BOTTLES

Turkey Oliver asks that people having pop bottles from the picnic to please return them to the Lab. That means you too, Bill Meredith.

HURRY BACK

Hurry back, Tony Hamed! Coffee calls are starting to cost us money.
-- his friends.

PEARL S. BUCK'S BIRTHPLACE

Hillsboro, West Virginia. - The Pearl S. Buck Birthplace Foundation recently awarded a contract to the Nelson Wood Construction Company of Elkins, West Virginia, for the first phase of the restoration of the famous author's birthplace near Hillsboro. The work will primarily consist of removing the nonconforming 20th century rear addition to the house. The house will be restored to the 1892 period, the year of Miss Buck's birth in it.

The restoration drawings were prepared by the Foundation's architectural firm: Grigg, Wood, Browne and Williams of Charlottesville, Virginia. This firm has restored the Old Stone Church in Lewisburg, West Virginia, and portions of Jefferson's home, Monticello. In early June, the United States Department of the Interior approved the architectural plans of the Charlottesville firm for the first phase of the Pearl Buck Birthplace restoration.

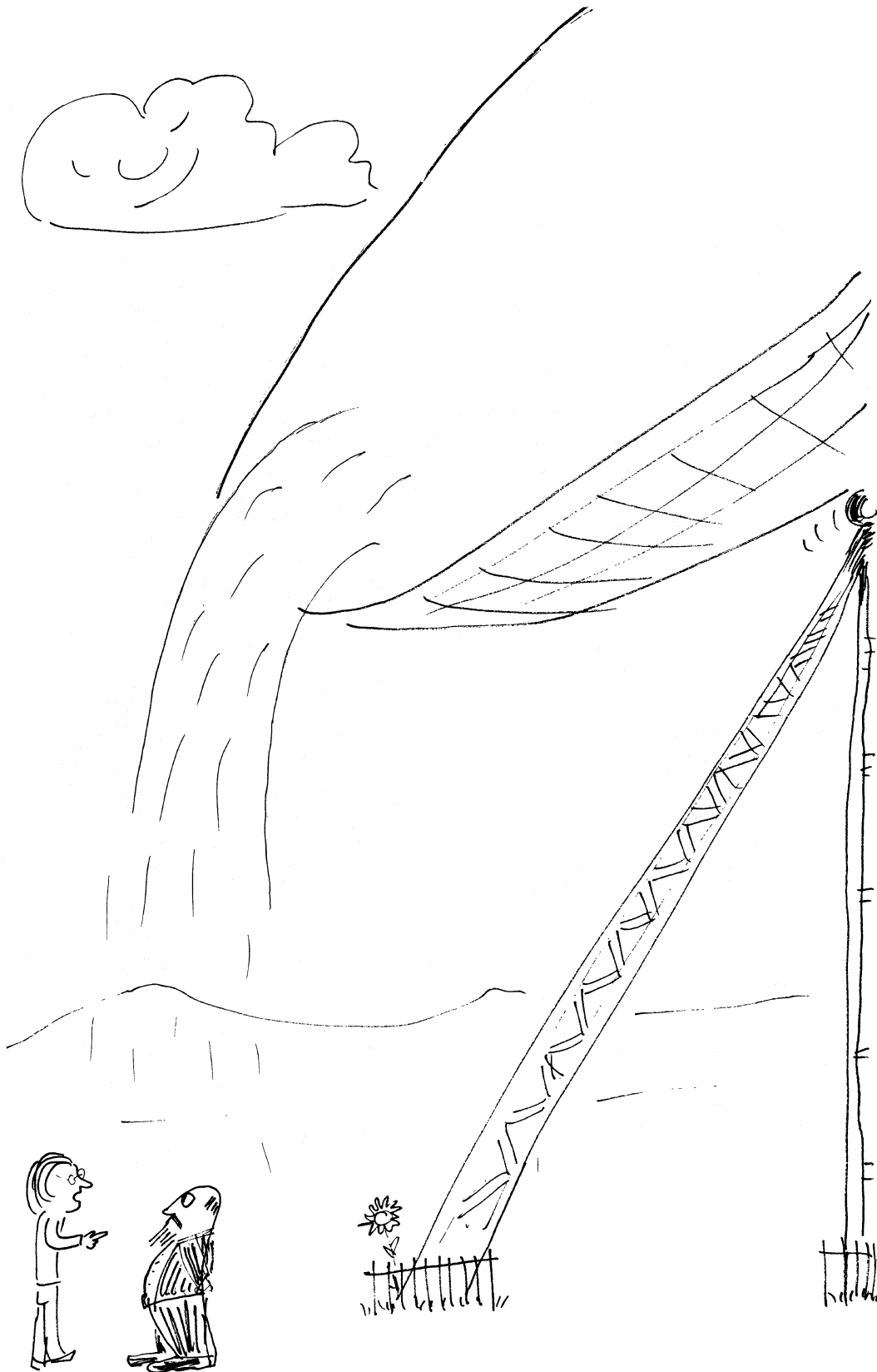
Recently, the Birthplace was open to the general public during the local "Pioneer Days" festivities and over 500 people visited the historic shrine. During those three days, visitors from fifteen states and the Canal Zone viewed the progress already made on the project.

Since the public showed such an interest in the restoration process, the Birthplace will be opened for visitation on the second, third, and fourth weekends of August from 9 a.m. - 5 p.m. on Saturdays and 1 p.m. - 5 p.m. on Sundays. Located in the area north of White Sulphur Springs, the museum is just a short distance north of Hillsboro on U.S. Route #219.

Guides in period costumes will conduct the tours and explain the history of the house and the unique construction aspects involved. No period furnishings, however, will be displayed until after the completion of the work.

A small admission fee of 50¢ for adults and 25¢ for students will be charged in order to defray the costs related to the openings. Also, rare autographed copies of Miss Buck's books will be on sale.

Children are welcome. Supervision and games will be provided for them during the thirty minute adult tour.



Believe it or not - we found just water on Mars !