North American AstroPhysical Observatory

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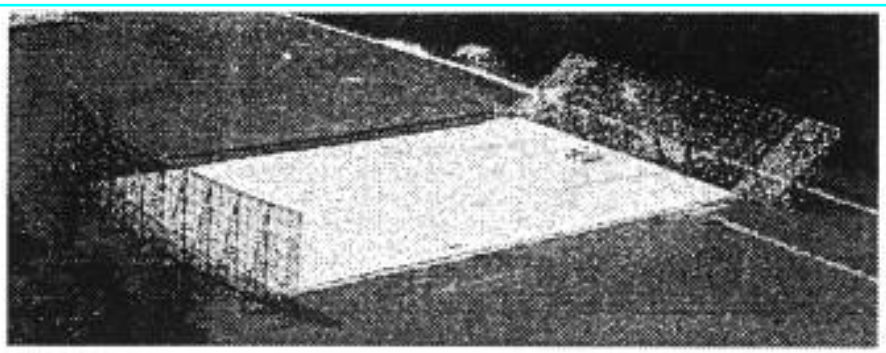
SIGNALS



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IN THIS ISSUE:

COORDINATOR'S CORNER
By: Phil Barnhart

The year has produced a bunch of extra-solar planets — most of which are in the range of the mass of Jupiter and a few orbiting pulsars about the mass of the earth. It has been a long search for planets outside the solar system, based upon a belief that the universe 'should' not contain unique examples of anything. This is a cosmological principle that renders much of what we do to learn about our universe by presenting to us a coherent whole that has the same physics everywhere (an idea due to Newton), the same chemistry everywhere (verified by radio astronomers) and no unusual regions of space anywhere (a very useful statement of the way things 'are').

The serious search beyond our sun began in earnest when Peter Van de Kamp devoted a lifetime to the study of the proper motion of Barnard's Star hoping to

unravel from the data evidence of a periodicity in its variations in straight line motion across the sky. His work did not pan out and though he thought he had the 'wobble' he was looking for, it turned out he had insufficient accuracy and reliability of data to discern the effect he originally reported.

Discovery of extra-solar planets has begun by the application of new technologies in fiber optics, radio pulsar timing techniques, satellite observation and optical spectroscopic techniques. In all cases the technology needed to succeed did not exist a few years back when many astronomers were convinced such planets must exist and searches were begun to verify these convictions. Indeed, the search for intelligently generated technological artifacts may still be in a state of not quite having the necessary technology to get the job done.

This emphasizes the need to push further development of new and improved technologies to address problems we have sought to solve for decades with no evident results. We are in a sense lucky to be involved in a pursuit for which the " . . absence of evidence is NOT evidence of absense." We find ourselves still below the threshhold. But, discovery of planets orbiting other stars makes the threshhold that much more engaging to drive for than before. We take heart in the discovery that apparently, life is the only component of our existence not yet directly detected outside the confines of our modest ball of rock and water.

CHINA UNVEILS AMBITIOUS TELESCOPE PLAN

Chinese astronomers revealed an ambitious plan merging cutting-edge science with southwest China's unique natural scenery to further the search for extra-terrestrial life. The $1 billion project envisions construction of 30 mammoth radio telescopes over a one-kilometer range, forming a phased-array receiver some 100 times more sensitive than those currently in operation.

"At present the largest radio telescope has a diameter of 305 meters, but if the plan is realized, each of the 30 in the array will be between 300-500 meters," said Nan Rendong, vice director of the Beijing Astronomical Observatory.

"This will enable earth to receive information from 10 billion light years away and enlarge the range for the search for extra-terrestrial life."

Nan and fellow astronomers hit on the project during a visit to scenic Guangxi province, famous for its oddly-shaped limestone pinnacles known as karst

formations. "The funnel-line terrain forms a perfect setting for a telescope and lack of major urban areas guarantees absolute silence," Nan said.

Upon returning to Beijing, the researchers began studying 3-D satellite photos of the site and designated which karst groupings would best cradle the sensitive dish telescopes. "Using remote sensing technology, we can simulate the terrain with precision and have even figured out where and how much earth should be removed from each site," said Zhu Boqin, a researcher at the Chinese Academy of Sciences' Remote Sensing Institute.

Their initial study was given a boost when leading astronomers from 10 nations formed the International Large Telescope Working Group in 1993. "After three international conferences, various project designs have been discussed and discarded, leaving only two choices," according to Peng Bo, deputy director of the Chinese group promoting the plan. "One is the adaptive phased array and the other an Arecibo type, both of which are well suited to the region."

Scientists from the United States, the Netherlands and Canada have also inspected the site, following in the footsteps of representatives from the Large Telescope Working Group.

"The region's landform is very suitable for building a radio telescope," said Robert Braun, chairman of the group. "The different height levels of the site also provide natural support for the huge antenna, and the karst terrain acts as a natural screen to protect from radio interference."

Chinese scientists plan to continue imaging analysis and seek foreign funding while awaiting approval from the working group, project leader Nan said. "Our aim is to get the working group to confirm the project and the site by the year 1998 and then we will try to launch a pilot prototype," he added. "This is the only way to develop such a huge project."

CLYDE TOMBAUGH, DISCOVERER OF PLUTO, DIES AT AGE 90

Clyde Tombaugh, the man who discovered the ninth planet Pluto, died Friday, January 17, 1997, in his home in Mesilla Park, New Mexico, at the age of 90. He is survived by his wife, Patsy, two children, and several grandchildren and great-grandchildren.

Dr. Tombaugh, born in Illinois in 1906, was graduated from Burdett High School in 1925.

During his youth, Tombaugh explored the heavens with homemade telescopes. Later he was hired by Lowell Observatory, Flagstaff, Arizona, and discovered Pluto, the outermost planet in our solar system, in 1930.

During his planet search, Tombaugh photographed 65 percent of the sky and spent 7,000 hours examining about 90 million star images. Besides Pluto, his discoveries included six star clusters, one cloud of galaxies, one comet and about 775 asteroids. Few astronomers have seen so much of the universe in such minute detail.

Dr. Tombaugh earned degrees from the University of Kansas and Northern Arizona University. He concluded his career as an astronomy professor at New Mexico State University.

SATURDAY, 1/18/97 MEETING REPORT
By: Tom Hanson

We had a nice turnout for the meeting of January 18th, despite the cold weather. The door to the focus room had become unusable and the repair team entered the facility through the hatch, after the meeting. They were still at work on the problem when I left.

There is renewed enthusiasm to resume the card project, and Dr. Dixon is encouraging us to complete the work within the next year, due to possible loss of the Dreese Hall facility. Notes are ready for uploading, and I expect to complete that this weekend.

I am 'on call' this week, and am preparing to leave for one of our facilities a few minutes from now (*1:30 PM*), to verify some work done by Data Communications.

Russ Childers attended the meeting, after an extended absence.

Attending: Dr. Dixon, Russ Childers, Ang Campanella, Mike Brooks, Cindy Brooman, Jerry Ehman, Jody McKean, Steve Brown.

This report begins just as Dr. Dixon's opening monologue was coming to an end. Fortunately, he added a topic or two later in the meeting.

Russ Childers: Telescope is at minus 23 degrees. It is too cold to move telescope — will not move today either. The brakes will not release, and the solenoids are sluggish. The sun has overwhelmed the receiver system for about an hour per day, since the sun is currently at the same elevation. The flat movement equipment will not function due to the cold. Russ would like to replace a failing thermostat in the focus room. Steve Brown confirmed that a replacement could be purchased at a hardware store.

Card project: Tom Hanson committed to determining how many boxes were in which category. Categories include unread boxes, boxes which have been reconciled and written to 3.5 inch diskette after editing and then discarded, boxes which have been written to 5.25 inch diskette but which are not reconciled. We believe there are currently no reconciled boxes ready for the Editor. There is a need for a volunteer to take over leadership of the final phase of the card project. Ron Leeseberg has

expressed interest, and he and Joe Mitchell have corresponded. Dr. Dixon reminded us that the reconciliation process must be completed this year, so attention focused on pre-reconciliation and reconciliation processes. As boxes emerge from reconciliation, there will be a need for the Editor to complete the process. Steve Brown says he believes that the automated pre-reconciliation process may already exist for PC use. Steve said he would look for the needed files. Cindy Brooman has received a CDROM donated by Bob Tournoux, and this would permit the PC she is donating to serve as the base for pre-reconciliation. Pre-reconciliation is suspended on campus for several reasons, such as the demise of the VAX, and limits on Steve Brown's time, and the non-availability of a volunteer other than Steve. Steve Brown recalled that pre-reconciliation software consisted of a FORTRAN program which merged two boxes, another which created statistics, and there was a complex shell which instructed the operator to perform various steps. The batch file from the VAX cannot be recreated directly in PC batch language. Cindy Brooman inquired if the file could be created in PERL, and Mike Brooks suggested it might be created in C. Steve offered to think about how to recreate the automated pre-reconciliation process on a PC. The metaprogram Steve wrote for the VAX worked with groups of files, and it created a PC style batch file which was downloaded to the PC at Dreese Hall. This PC batch file would then instruct the operator to insert a floppy diskette, and to write a label for the diskette. Steve believes there are still floppies at Dreese Hall which were output by the process described above.

Dr. Dixon then brought up the planned visit of a news crew from Cincinnati. On January 22nd, there will be a meeting of dignitaries. The planned starting time is 4:30. WKRC of Cincinnati is coming the following week. Russ Childers said that the horn cart is able to move under manual control. Dr. Dixon inquired about the procedure for moving the cart manually. Russ explained that there are three controls on the Horn Cart. The top switch is for power, and it is not labeled, due to solar radiation damage to the original labels. The knob between two switches is for direction and speed. The bottom switch is for automatic (*up*) or manual (*down*) operation. Russ repaired a switch which had deteriorated. It was recommended that Dr. Dixon perform a trial run of the horn cart.

Ang Campanella: Following discussions on email.

Mike Brooks: Serendip has been running for two weeks. Mike keeps running out of space with the RFI program. He's been dialing into the PDP for months. The modem runs at 2400 baud. The PDP can run up to 9600 baud. Dr. Dixon suggested that we

purchase a faster modem. Steve Brown reminded us that the PDP must have both the hardware and software changed to 9600 baud. Steve said it's not impossible, it's just a pain. Mike inquired about using a 9600 baud port which goes to a VT100. Russ said we are very low on serial ports, and it was decided not to pursue this idea.

Cindy Brooman: The electronic version of Signals is up on BigEar.Org, available to members.

There was a discussion of the volume of chart recordings filed at Dreese Hall. Dr. Dixon estimated there are about a dozen file cabinets. Steve Brown reminded us that there are a considerable number of printouts in Dreese Hall as well. There are a few filing cabinets of reports and papers which would be regarded as critical to the organization.

Steve Brown – worked on lock to focus room door. The dead bolt was working until today. Dr. Dixon quoted a locksmith who recommended Teflon Spray Lubricant on locks. This led to an extended discussion of techniques for freeing locks. Russ reminded us that the hatch is another access path. After the meeting, the access hatch was used to enter the focus room, and at the time I departed the Observatory, the dead bolt had been disassembled partially from the inside, but the door was not yet open.

Jody McKean: Jody printed additional copies of the Observatory roster. Several members expressed appreciation for Jody's work on this valuable documentation. Steve Brown will post a copy at Dreese Hall, and another at Dreese Hall. Cindy Brooman made the individual email addresses of members clickable, in the version of the roster which she has installed on BigEar.Org.

Note: Mike Brooks requested donation of a monitor for a donated PC, to be used in the focus room to create diskettes of data from the PDP. After the meeting, one of the recently donated PC's was checked out for Mike's use.

There was a discussion of gamma ray bursters at this point. Ang pointed out that there are two characteristics of gamma ray events ... the count of pulses, and the energy of the individual pulses. Steve Brown added that in radio, we normally look at a narrow energy range, as defined by frequency. Ang asserted that most gamma ray detectors will tell the observer the energy of the incoming photon.

Next, the discussion moved to recent announcements about evidence for the existence of black holes. Steve Brown reminded us that the conversion of hydrogen to iron is not a reversible process. If hydrogen is not being created in free space, then eventually the Universe will run out of fuel for stars.

The meeting then converted to a work party, with one group headed to the focus room to work on the lock problem, while another remained in the meeting room, to find a PC for Mike Brooks to install in the focus room.

Saturday, 2/15/97 Meeting Report
By: Tom Hanson

Attending: Dr. Dixon, Dr. Barnhart, Don James, Cindy Brooman, Jerry Ehman, Steve Brown, Ang Campanella, Earl Phillips, guest: Chris Pezzutti, Russ Childers.

Opening discussion: Bringing Dr. Barnhart up to date on events during his extended absence.

Dr. Dixon received a book named "*AWE*" out of the blue. The book is a stage play which is difficult to read because of the stage instructions. Michael J. Weinstock is the author. The book is available for borrowing if anyone is interested. Dr. Dixon is invited to a conference in Australia concerning the square kilometer telescope. It is unclear that it will be possible to attend. There have been discussions with leadership at Methodist Theological School of Ohio (*MTSO*), and with others, concerning the Observatory move to the new proposed site. Dr. Dixon has reviewed the Big Ear web page which is managed by Cindy Brooman, and he had suggestions for further clarification of the text, while at the same time praising Cindy's work with the site.

Don James – As a Red Cross volunteer, Don spent January in Sacramento, where flooding was a serious problem. There are 3000 miles of levies which were breaking down. Heavy snow in the Sierra's threatens further flooding. A discussion of global warming followed, led by Ang Campanella.

Ang Campanella worked on the 'edge of the box' issue. In addition, Ang took some boxes to his home and found one 'box from hell'. Someone had flipped a group of perhaps 20 cards that had been read upside down. Ang typed these in. In other places, cards were missing — had to be typed also. One card was not found (Box 226) He also experimented with typing in data (on * * * * * * * lines) written on the edge of groups of cards. On campus, there is a great deal of construction underway, and

travel to Dreese Hall from the east is blocked. There is a new road to Dreese Hall. There is an elevated enclosed passageway from the parking garage next to Dreese Hall. Dr. Barnhart inquired if Tuesday meetings are still taking place, and Dr. Dixon clarified that they are not. Ang added that he got involved in the punch card project because it has been hanging on for a long time, and that he liked to help close projects if he can. He noted that some boxes could be discarded now, pending examination of Herb Johnson's documention of the box-front information (is said box-front information sufficient to represent all *needed* comments on each box?). We agreed to meet Wednesday at 5pm @ 805 Dreese to discard boxes which may be removed from the project on the above basis. Steve Brown will provide a dumpster cart.

Earl Phillips received a note and a check, from Skip Lewis. Dr. Barnhart accepted the gift, and passed around the letter. Earl mentioned www.shareware.com as a source of software.

Cindy Brooman reports that the BigEar.Org Web site had 4300 hits last month. Cindy passed around a printout showing a breakdown of the visits to various portions of the web site. The Wow signal page received the most hits, after the Home Page itself. Images have been added to many of the pages on the site. These were scanned from photographs. A "Beginner's Guide to Radio Astronomy and SETI" document, written by Cindy, was also added. Bob Dixon's Argus paper from the Jodrell Bank conference proceedings was also added to the site. Cindy described her addition of figures to the Web article. One of these had to be recreated from scratch. Dr. Dixon commented that Cindy's version of the "Inefficiency of Directionality" diagram looked better than the original. Cindy has been continuing to enter Cosmic Search articles into the collection on BigEar.Org. Cindy has to go through several steps to complete each article. The BigEar.Org Web site has also now been listed under the NRAO page. Cindy noticed that OSU was not listed, and submitted the entry. Cindy mentioned an article in the New York Times, regarding advances in developments of optical instruments. The article also mentions radio astronomy in a positive way. The article appeared in the Science Times section, on February 11, 1997. In a separate article, there was discussion of the reduction in career opportunities for astronomers.

Jerry Ehman read the article in the conference summary from the conference in England which Dr. Dixon attended last year. Jerry noted that the article had been edited to exclude the figures which Dr. Dixon had provided for the talk. Dr. Dixon subsequently observed that the editors had substituted text describing the figures for

the actual figures. Jerry read most of the articles in the conference summary, as well as Dr. Dixon's article. Jerry discussed a figure which had been created by a student, which Dr. Dixon asked to have improved. Cindy asked Jerry to try to compute a new figure for a hypothetical Argus array. He created a total of six figures, using different numbers of elements, with both the Archimedian and logarithmic spiral formats. Ang asked what algorithm is used to spot the elements. Jerry said he personally liked having a central element. Ang asked what the signal processing software required. Dr. Dixon reminded us that he is hoping for a conceptual illustration to replace the student version. In round one of Jerry's efforts, he produced a result which was perfectly symmetrical. In round two, Jerry used a different value for progression, which resulted in a more recognizably varying array. Steve Brown commented that as far as he knew, the only instance in which signal processing methodology would influence element placement, would be if there were two sets of parallel lines intersecting another set of parallel lines. This discussion went on for an extended period. Jerry's final topic was antenna modeling programs, which he is investigating for possible purchase for Observatory use. Jerry printed out an order form to order a full version of the NEC4WIN software for $30.00, and he is planning to order the product with his own funds at this point. Jerry is planning to experiment with various helix arrangements, using the software.

Steve Brown reports that he assisted Mike Brooks in calibrating the RFI monitoring system, in the Focus Room.

Russ Childers reports that the current survey is reading at 23 degrees, 40 minutes. 37 more weeks remain in this survey. Russ has been unable to communicate via email because he has upgraded to Windows 95. A set of directions for connecting Homenet using Windows 95 was emailed to Russ, but unfortunately, he is now unable to receive them. Russ will attempt to [ERROR! Remainder of sentence not printed.]

Dr. Barnhart reports that Nova is sending a representative to visit Big Ear. Nova is broadcasting a search for extra-solar planets and is seeking permission to use the Tom Root aerial photo of big ear. Dr. Barnhart reported that he has received notice of a new book, written by a former student. Copies of the roster were available for attendees who might want them. There is a need for a new Volunteer of the Month. The deciding factor may be knowing whose photographs are available. Jerry Ehman was chosen.

Chris Pezzutti (Guest). Chris was drawn to the Observatory by the Web Page. Chris

has worked with Dr. Dixon in the past. He is an amateur astronomer and amateur radio operator. He is in the telecommunications department at the university. He is specifically working with cable systems, and with compressed video systems.

Saturday, 3/01/97 Meeting Report
By: Tom Hanson

Attending: Dr. Dixon, Dr. Barnhart, Cindy Brooman, Jerry Ehman, Steve Brown, Earl Phillips, Guest: Steve Ellingson, John Ayotte, Ken Ayotte, Ang Campanella, Mike Brooks, Chris Pezzutti

The meeting opened with Dr. Dixon's remarks, including a review of the successful card (discard) party which took place at Dreese Hall recently.

Dr. Dixon received a new book: "Astronomical and Biochemical Origins and the Search for Life in the Universe" – Proceedings of the 5th International Conference on Bioastronomy IAU Colloquium No. 161.

Jerry Ehman ordered the $30.00 version of program NEC4WIN. While working with the demo version, it would not print. Encountered 'out of memory' errors. Has taken computer in for service and may add memory to the system. Jerry used MathCad to draw three versions of a log spiral, for Dr. Dixon's presentations. Cindy took one of the versions for the BigEar.Org web site.

John Ayotte said that he had concluded that a working antenna might be constructed with straight line segments. This comment followed Jerry's description of his use of multiple straight line segments to run the antenna modeling program. Has not had time to build a physical prototype of an **Argus** antenna yet, but he expects to be able to work on that soon. He is considering building a model with straight line segments. He put a Radio Observatory survey map up on his web site. Ang Campanella reported a problem printing it. John asked if anyone else had tried to print the file. The third project John has been working on is the master catalog. He has finally finished major editing, to identify duplicate entries which had been entered as 'ditto'. The database currently occupies 12 MB on disk. There are problems sorting, due to the presence of + and - characters in some object description strings. John worked on the data file while he was traveling by plane. Jerry asked what size the wire should be for the antenna design. He used 2 mm diameter wire for working with his model. Dr. Dixon predicted that the size would not be critical. Ang suggested that Jerry tell

us what size wire to use.

The current Sky and Telescope issue contains an article asking if the sun is setting on radio astronomy. The problems caused by planned new satellite systems are discussed.

Steve Ellingson was a volunteer in 1989. He worked on the RFI system, which Mike Brooks is working on now.

Dr. Barnhart will reply to a letter from Skip Lewis, concerning construction of cones for **Argus** antennas.

Dr. Dixon asked to speak to John Ayotte after the meeting, to discuss a new antenna design he has conceived.

Steve Brown has been working on his dissertation. The bin that was filled with cards has been emptied, and now filled again with VAX manuals. Steve suggested we no longer need Decus proceedings, and Dr. Dixon agreed. Regretfully, it was agreed that a file of beautifully organized documents on Unibus products should be discarded. It is believed that Jim Bolinger may have assembled this file.

Ang Campanella reported that he had contacted Joe Mitchell via email. Joe wrote back and said he would look into his records, to answer Ang's request. John Ayotte said he now can make copies of CDROM disks at work. Ang has reconciled another half dozen or so boxes. Dr. Dixon confirmed that Herb Johnson's notes had proven to be adequate, so that reconciled boxes could be discarded. Steve Brown reviewed the steps which are needed before boxes are discarded. Ang will continue to follow up with Joe Mitchell. The long term hope is that Ron Leeseberg will pick up this task. Steve Brown reminded us that there is a PC available for use by the Editor. It was brought back by Joe Mitchell.

Mike Brooks has succeeded in setting up a donated IBM PS/2 desktop to collect RFI data. Mike purchased a high speed modem for use with the PDP. Steve Brown said that he would have to take apart the PDP to change a jumper, to allow the PDP serial port to run at 9600 baud. Dr. Barnhart will work out a solution to the challenge of reimbursement. Mike provided the one and only receipt for the new modem to Dr. Barnhart. Mike asked if anyone is interested in hardware catalogs which he receives at work, and Dr. Dixon asked for them.

Dr. Barnhart received a letter from Bill Schultz, a volunteer from Cincinnati. The Hale-Bopp comet will be viewed in a public open house. Dr. Dixon or anyone from the Radio Observatory is invited to attend the viewing, and to give a talk. March 29th is the date for the comet viewing. The astronomical group has a dark site on a hill. Hale-Bopp is low in the northeast, visible at about 5:30 in the morning. On April 7th the comet will be at its brightest, and Dr. Barnhart will be observing from the equator. As we departed, Dr. Barnhart briefly discussed the Open House he would like to schedule. It appears to me that we may decide to have one large open house this year, rather than two. Dr. Barnhart mentioned October as the likely date.

VOLUNTEER OF THE MONTH: Jerry Ehman

Volunteers come and go over the years and often seem to maintain a longstanding interest in the workings of the telescope and the project to operate and maintain the instruments. The volunteer who has been with the program for the longest time along with Bob Dixon is Jerry Ehman.

Jerry had worked at Ohio State University as an astronomer for six years until the federal funding for the radio telescope was terminated. He then volunteered to help Bob with the **SETI** search, using the 110-meter telescope and computing equipment left over from the sky survey days of the observatory. Much of the **SETI** data collection and reduction routines are authored by Jerry.

World wide recognition came Jerry's way in 1977 when he wrote an exhuberant "**WOW**" [actually **"Wow!"**] in red ink beside the now famous signal which remains the foremost example of the encounter of the 9th kind

[actually there were only 4 kinds: Search Strategies 1, 2, 3 & 9] — matching in all respects the desired sort of signal the program set out to encounter. Though no repeat of a similar event from that position in the sky it continues to appear in print and television media over and over again. Its latest incarnation was on the 18 February Nova presentation concerning the search for extra-solar planets. It has been referred to on a number of video documentaries and such shows as the X-Files.

After a few years of 'making a living' Jerry returned to the volunteer fold and has carried out a number of important tasks including a re-analysis of the original **WOW** signal and the composition of a '*Primer on **ARGUS***' to describe the basic principles involved in the new type radio telescope under development.

In describing his source of satisfaction in working at the radio Observatory, Jerry maintains, "Both the individual and group interactions and discussions give me great satisfaction. I have become more knowledgeable in radio and optical astronomy, in computers and in other areas as a result of these interactions. There is a wonderful spirit of helpfulness to those who know less about a subject than someone else in the group.

Jerry did his undergraduate work in Physics at the University of Buffalo and has a Masters degree and a PhD in Astronomy from Michigan State University [Correction: University of Michigan]. He has also completed a B. S. in Business Administration and Management Science at Franklin University. He is currently a 'semi-retired Professor' and apart time consultant in computer software applications.

He points to the wide variety of backgrounds and interests among the many OSURO volunteers, and maintains that diversity contributes greatly to his satisfaction being a volunteer. We greatly appreciate Jerry's contributions and are honored to have among us the most likely candidate for having been contacted first by an alien intelligence in the history of the entire human race.

Saturday, 5/17/97 Meeting Report
By: Tom Hanson

Attending: Dr. Barnhart, Cindy Brooman, Jerry Ehman, Ang Campanella, Mike Brooks, Russ Childers.

Opening discussion – Next weekend's Open House. Expected staff: Ron Leeseberg, Ang Campanella, Cindy Brooman, Jerry Ehman, Tom Hanson, Russ Childers, Dr. Dixon, Dr. Barnhart, Steve Brown, Mike Brooks. Earl Phillips and Amy will be on a honeymoon in Jamaica.

Cindy Brooman has continued to develop her Web service, and has added new clients. Cindy has posted an impressive banner on BigEar.Org, announcing the Open House. She has added a new SCSI hard drive to her Web system, and hopes to see improved performance for people visiting her site.

Russ Childers arrived — he has returned from Lithuania. Russ will enlist Ron Leeseberg to assist with Radio Pictures next weekend. Dr. Barnhart inquired about brownies. Ang Campanella offered to pick up a supply. Cindy Brooman agreed to run the store. Jerry Ehman offered to take the Control Hut Station again. Ang Campanella will take the post outside the focus room. We hope that Steve Brown will once again take the Focus room station. Dr. Barnhart will take the parabola position. Noon is the planned arrival time for volunteers. We expect Dr. Dixon will give his talk, starting with the first visitors who complete the tour, and ending at about 5 PM with the last group. It was suggested that Dr. Dixon join the first group of visitors and conduct an inspection of the Open House positions. He would then have direct knowledge of when his first audience would be arriving at the lecture room.

Russ reports that the current telescope position is minus 29 degrees even — the telescope is moving twice a week. Serendip is not in operation at the moment. **LOBES** is not detecting much. Russ believes the receiver system for **LOBES** needs attention by Steve Brown, due to an increased noise level. Ang inquired about the accuracy of the continuum data being gathered. Russ said that the time/position data are quite accurate. He explained that it is more difficult to compare the power measurements, since the original survey used a different algorithm than Russ is using. Russ explained that our current use of two horns has the effect of eliminating any gas clouds which appear in both horns. Dr. Barnhart inquired as to when the dual

horn design was installed, and Russ recalled 1973. Dave Cole conducted an 8 channel survey around that time. Minus 36 degrees is the limit. Russ estimates 10 or 11 weeks will be required to complete the current survey. Mid-August is the likely completion date. The telescope would have to be brought back to the north, which is a much more difficult process than the current advance to the south. This is because the safety brakes must be released. There was a discussion of Dr. Kraus' interest in current research at Big Ear. Russ Childers spoke to Dr. Kraus about two months ago. Apparently Dr. Kraus would like to see a paper or papers coming out of the current survey. Russ said that he personally has no experience with the process of writing a paper for publication. Ang offered encouragement to Russ. Russ said he is running the current survey as a hobby, and he would welcome detection of a transient event or other interesting phenomenon. A discussion of solar wind and interaction with comets followed. It appears there may be x-ray generation. Mike Brooks has encountered challenges in interpreting data he has received from the work he has been doing, comparing noise detected by the discone antenna and the Serendip system. He plans to visit Dr. Kraus to discuss the data. Mike reminded us that the Big Ear horns are designed to minimize locally originating noise, while the discone antenna would receive anything which might be occurring. He said that he is able to see noise he has generated quite easily, but he is not seeing RFI which may be occurring. One interpretation might be that the band he is studying is relatively clean. He is thinking of studying the Iridium satellites, now that an initial launch has succeeded.

Jerry Ehman read Ken Ayotte's prize winning report on the radio antenna and receiving system he built at home. The latest issue of QST has an article on the Arecibo dish, as well as other antennas. Jerry has been upgrading his computer system, so he has not worked as much on the antenna modeling program as he would have wished. He's gotten back to the effort, and found an error (or feature) of the software which produces overly high readings for gain. There is a limitation of the program of 50 line segments, and Jerry reached that limit as he attempted to increase the number of line segments he was using to simulate a helix. He found a comment in the program indicating that it doesn't handle loops very well. Jerry compared output of the program with predictions based on one of Dr. Kraus's formulas, and found the correlation was not close. He reported that impedances vary irregularly as the frequency under study changes. Dr. Dixon had advised Jerry that impedances may not be significant at this point. Jerry indicated he is contemplating using alternative means of performing this analysis. He has downloaded Fortran and C code but has not yet started to study the code. Jerry has a Pentium 133 system board

now. He bought a 3.1 Gb Western Digital drive, and the first one was defective. The replacement drive is working. Cindy Brooman has installed new hard drive and other SCSI devices on her Web server. She started at midnight and finished at 4 AM. She discovered the Zip Drive software for Windows NT was not available on the Zip disk which came with the drive, and she had to order a disk by calling an 800 number. To her surprise, an agent answered the phone in the middle of the night. Cindy reported that very few Radobs members who visit BigEar.Org are looking at Signals online.

After the meeting, Dr. Barnhart provided copies of the Big Ear Open House announcement. These will be delivered to Columbus State University and to DeVry Technical College.

HAWKING ADMITS MISTAKE

Dr. Stephen Hawking, whose book "*A Brief History of Time*" illuminated the mysteries of the universe for people befuddled by long division, has conceded he was mistaken about something called a "naked singularity."

The New York Times reports that Hawking has admitted losing a bet about the cosmic phenomenon "on a technicality."

Hawking bet two California Institute of Technology professors "clothing ... embroidered with a suitable concessionary message" that a "naked singularity" could not exist.

The phenomenon is described as a mathematical point at which space and time are infinitely distorted and where the rules of relativistic physics and quantum mechanics break down. Singularities are believed to exist at the center of black holes, which mask their existence. A naked singularity would exist without that cover and theoretically be visible.

The two California scientists, John Preskill and Kip Thorne, won the bet thanks to supercomputer calculations by University of Texas in Austin scientist Matthew Choptuik, who concluded that a naked singularity might be created by a collapsing black hole.

Choptuik told the Times that the possiblity of such a thing happening, however, is about equal to the chance of standing a pencil upright on its sharpened tip.

GALILEO MISSION STATUS
April 28, 1997

As the Galileo spacecraft prepares for another encounter with Jupiter's largest moon, Ganymede, playback of data from the craft's previous Ganymede flyby on April 4 Pacific Standard Time is nearing completion.

This final batch of data return from the April flyby will conclude around noon Pacific Daylight Time on Saturday, May 3. It includes observations of Ganymede's bright, dark and dark-rayed regions from the remote sensing instruments, and high resolution fields and particles data on the magnetospheres around Jupiter and Ganymede and the interaction between the two.

Playback also includes observations of Europa's lineated circular regions. This will be used to help determine how these features originated and to construct a global map of Europa at regional resolution. Regional observations of Jupiter to be returned this week will also be used for a global map of Jupiter.

A few Jupiter observations from the remote sensing instruments will be returned, including a study of a small red spot in the Jovian atmosphere, a hot spot on the planet and a single image of Adrastea, one of Jupiter's small inner moons. The fields and particles instruments' survey of Jupiter's magnetosphere will resume on Friday, marking the start of the second magnetospheric "mini-tour."

The Galileo flight team will transmit the first set of encounter sequence commands to the spacecraft later this week, as it prepares for the next encounter with Ganymede on May 7. This will be Galileo's final close flyby of Ganymede.

[Back to List of Issues in Volume 13] | **[Back to List of Volumes]** | **[HOME]**

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