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CARD ENTRY PROJECT. PART II

By Tom Hanson

(ed.note: This is a continuance of the punch-card project report that volunteer Tom Hanson is performing. The first installment was in the last issue of *Signals*, the last installment will be in the next issue.)

Let's continue this month with the "what and why" of the project. On one hand, there is the fact that punched cards are an obsolete form of data storage. During the process of setting up the project, in fact, high speed card processing equipment was removed from Baker Hall, and a slow serial card reader was installed. While investigating ways of punching cards, I learned that there are very few key punches left in Columbus. In short, it is just a matter of a few years after which it will be almost impossible to carry out a massive transfer of card data to anything, in this part of the US. My own company, for example, has totally eliminated card handling equipment from its Columbus operations. There are still 2 keypunches in our Cleveland office, but their tenure is likely to be brief.

It is also worth noting that the readability of punched cards after years of storage is a function of the care with which the proper environment has been maintained. Fortunately, the observatory has kept the cards in an air conditioned facility, and most of the boxes were packed tightly so that warping did not occur. The few exceptions illustrate dramatically the difficulty the project team would face if such care had not been taken.

On the other hand, the punched card data we have is totally meaningless unless it is documented, organized and distributed. The number of people who have any idea at all of the contents of the archive is limited in the first place, and with the passage of the years, we are in danger of losing contact with everyone involved. Our primary resource for making sense of the card data is Dr.Dixon.

From observation of labels on the boxes, and on groups of cards inside the boxes, I conclude that much of the data represents output from the IBM 1130 when it was installed at Big Ear, carrying out observations related to the Ohio Survey or other similar surveys of the sky. It is my hope to eventually learn if the individual cards may represent actual objects found during the survey. If that is true, then it seems likely that the objects may still be found at the locations recorded in the punched

data, which would imply that making the data part of a database to be consulted during future observations would have value for comparisons of the object's emissions today.

Dr. Dixon has informed us that a portion of the data which waits further on into the archive consists of data keypunched by students, staff and even a convict or two from printed records of radio sources. These records too can have value for future surveys.

Watch for part III next issue!

Arthur Crawford dies at 83

Designer Of the Horn Antenna

Arthur Crawford, former head of radio research and designer of the horn antenna at Crawford Hill, died Sept. 7. He was 83 years old. Throughout his 44-year career, he specialized in radio research, including measuring techniques, propagation and antenna studies in the shortwave and microwave areas.

During WW II, Crawford worked on various microwave components for radar systems. He developed antennas for terrestrial radio links, including satellite communication systems and radio astronomy.

He designed and supervised construction of the horn antenna in Crawford Hill that was used in 1965 to discover radio astronomy evidence confirming the "big bang" theory of the creation of the universe. The antenna was designated a National Historic Landmark in June.

Crawford was a Fellow of the IEEE and is survived by his wife Mary Ruth.

Columbus *Dispatch* Article

During the recent SCIENCE 2000 seminar held at Otterbein College Jill Tarter and Bob Dixon were interviewed by a Columbus Dispatch reporter concerning the status of the Radio Observatory and the NASA SETI Program. The resulting article is reprinted in its entirety.

--- ed.

OSU's 'Big Ear' is, down, but not out

By Michael B. Lafferty

Dispatch Science Reporter

The Ohio State University's "Big Ear" radio telescope is down but not completely out in its effort to become NASA's main listening post to the stars.

A panel of astronomers has recommended that the space agency use a telescope at the National Radio Astronomy Observatory at Green Bank, W.Va., for a comprehensive attempt to detect intelligent signals from space.

[Click on photo below
for larger version.]



Tarter

It was a financial and technical decision, said Jill Tarter, a National Aeronautics and Space Administration astronomer. Tarter visited Columbus recently.

To modify the Green Bank scope would cost \$500,000 less than modifying the Big Ear — which is south of Delaware. And operating costs for the Green Bank scope could be shared with other research projects, she said.

"At OSU, we'd have to be the sole operators," she said.

Tarter admitted the recommendation was a blow to Big Ear. "They're barely

keeping it going."

The radio telescope operates on donations of money and time and a \$20,000 annual grant from NASA. And 45 percent of the NASA grant is siphoned off to the university to pay for "overhead."

Robert S. Dixon, assistant director of the OSU Big Ear Radio Observatory, said it might cost more to modify the OSU telescope, but it would be cheaper to operate.

And, Dixon said, while OSU may be down, it is not out, because NASA wants a telescope dedicated to one mission — the signal search. The 140-foot Green Bank scope will not be handed over to NASA until a 300-foot scope on the same site is rebuilt in 1995. It was knocked down in a windstorm.

That is a year after NASA had planned to begin its continuous search. Both Dixon and Tarter said there is a chance Big Ear could be chosen if NASA does not want to wait an extra year.

"Ours is up and running now," he said. OSU has been conducting a full-time signal search on a more limited scale since 1977.

Dixon said Big Ear suffered because it is in a metropolitan area. The Green Bank scope is in a remote region in the middle of a national radio quiet zone.

Dixon countered that the OSU instrument suffers little or no interference from local sources on the frequency bands that NASA will use for its search.

Dixon also disagreed with NASA's cost estimates. "We think we could have done it for much less. We've always done everything on a shoestring, as opposed to a federal lab."

Tarter did say, "We definitely should find some use for the OSU telescope."

She said Big Ear could be used to mount large-scale and extra sensitive spectrometers. A spectrometer is a device that measures the light waves emitted by stars, planets and other objects so astronomers can determine their relative speed and motion. Some researchers are putting this new equipment on small telescopes which, in effect, limits the usefulness of the spectrometers. Big Ear makes more

sense, she said.

But budget cuts make it problematic whether a search will be mounted anywhere. The \$12 million NASA sought for such a search in fiscal 1991 was eliminated in the U.S. House of Representatives. It was restored in the Senate budget but faces an overall budget compromise. "We're standing somewhere between zero funding and full funding," Tarter said.

Attempting to determine whether we are alone in the galaxy is worth the \$100 million the effort is expected to cost, Tarter believes.

Humans have been listening in fits and starts for 20 years and have identified well over 20,000 sources of radio emissions — stars, gas clouds, quasars. NASA's search program would be the first simultaneous search of millions of frequencies in the microwave spectrum astronomers believe are most likely to contain a message from space.

Telescope plan passes legal block

TUCSON, Ariz. (AP) — A judge yesterday refused to issue a temporary restraining order that environmentalists had sought to prevent the University of Arizona from starting construction on Mount Graham.

U.S. District Judge William D. Browning, conducting a hearing by telephone conference call, rejected the request of the Sierra Club Legal Defense Fund. The fund represents a coalition of environmental groups seeking to block the \$200 million Mount Graham International Observatory.

The environmentalists say the telescope project would encroach on the habitat of the endangered Mount Graham red squirrel.

Browning said he had not heard "anything that rises above speculation" that construction could begin before Tuesday, when another hearing is set before U.S. District Judge Alfredo C. Marquez.

On Thursday, the U.S. Forest Service said the Justice and Agriculture departments had authorized construction of three telescopes after determining that a 1988 law

passed by Congress, precluded further biological study over the impact an observatory would have on the squirrel.

The Ohio State University is involved in building one of the telescopes, which would be the most powerful in the world.

By yesterday, the University of Arizona had signed a construction contract, obtained a special use permit from the Forest Service and planned to get work crews onto the mountain as soon as possible, probably by early next week.

Sierra Club attorney Mark Hughes said the restraining order was needed because the university would not promise to delay construction until the hearing Tuesday.

The hearing concerns reopening a suit that Marquez stayed last month, at Hughes' request, challenging the observatory. Hughes said Marquez would be asked to enforce a provision allowing for a new biological study.

Jim McNulty representing the university, said some work might begin before the hearing, but it was unlikely heavy equipment would arrive at the site by Tuesday.

Part of Foster Inventory Sold

Jim Hurt, of the Central Ohio DX Association volunteered to take a sample of the Foster Inventory to Findlay and Cincinnati to test the waters at the ham flea markets. We agreed to split the take down the middle with the DX group.

Jim learned that there is a slump in the ham market, reasons unclear. Things that attracted hams in the past went untouched, while commonly used items seemed to move slowly.

NAAPO has a check for \$126.50 for the materials he did unload. If we still have quantities left after surplus vultures have a shot at the inventory, we may impose upon him to try again, especially if the economy turns around and the hams find themselves with more cash than they know what to do with.

Discovery sets *Ulysses* Afloat

-- EP

The shuttle Discovery lifted off the Earth's surface on 10/6/90, carrying the solar probe Ulysses in its cargo bay. This was the first successful shuttle launch in roughly 6 months, after being plagued by numerous hydrogen fuel leaks, and other sundry problems recently.

The probe will be the first to map the polar regions of the sun. It will take roughly 4 years for the satellite to get to the sun, as it must first travel to Jupiter for a gravitational kick of energy from that planet.

After sending the satellite on it's way, the astronauts performed other experiments for the 4 days it orbited Earth, and sent a birthday greeting to one of the astronaut's wives, who felt that their singing will not put Earth-bound bands in jeopardy.

LDEF Bears Fruit ... Sort of

-- EP

The tomato seeds which spent 6 years in orbit on the LDEF, or Long Duration Exposure Facility, have borne fruit here on Earth. The LDEF was brought back to Earth in January by the shuttle Columbia. The satellite was initially intended to remain in orbit for only about a year, but delays in the shuttle program extended its flight to 6 years.

Part of the cargo aboard was tomato seeds, which was meted out to the nation's schoolchildren for germination and growth. The students were to observe the effects, if any, the exposure to space had on their growth. There were early reports of radiation contamination, which proved groundless.

Now that the growing season is over, reports are beginning to trickle in on the seeds' performance. The reviews are mixed, some good, some bad. A class in Reynoldsburg, Ohio, the reputed birthplace of the tomato, shows poor growth. Another class from Reynoldsburg shows good growth. Those that have grown well show no discernible difference from control tomato plants grown at the same time. A possible reason that some of the seeds did not grow well may be due to the aberrant weather patterns of this growing season, with alternating dry and wet spells.

All in all, the space seeds seem to show that long exposure to the effects of space should produce no discernible effect on the plants and fruit. This early result has significance. This would mean that seeds could be transported to artificial bioclimes in space, such as the space station Freedom, and help support the humans who will be on board for extended periods of time. This results in less food having to be transported from Earth, which means that the overall scientific payload could be increased by that amount. There is also the psychological effect of being able to pick ripe fruit for consumption. Of course, there are many more experiments to be performed on other types of seeds before this ideal situation will be realized, but it is a big step in the right direction.

Hubble Trouble Update

-- EP

Some clever detective work by NASA has uncovered most of the problems associated with the HST's 2.4 meter primary mirror. By testing, it has been found that the mirror suffers from what NASA officials have called "a textbook case of spherical aberration". The mirror's figure departs from its intended shape by about 3000 angstroms, or about half of an optical wavelength. The outer edge of the mirror is 2 microns off. In its current state, the Hubble's resolving power is no better than that of current mountaintop observatories.

If there had been no errors in the figuring of the main mirror, the Wide Field and Planetary Camera (WFPC), one of 5 instruments aboard the satellite, would have had a resolution of 0.08 arcsecond, an order of magnitude better than the best possible seeing conditions here on Earth. The "seeing" on Earth is a combination of many factors; one of the most important of which is upper atmospheric turbulence. Looking through the Earth's atmosphere is akin to looking through water. Imagine trying to read the name of your boat while scuba-diving. The turbulence of the water continually shifts the image. This makes it nearly impossible to read the name painted on the hull of your boat. Turbulence in the Earth's upper atmosphere is roughly the same; it is constantly moving, therefore difficult to remain focused through. That's why the best observatories are on mountaintops. The scopes are above much of the Earth's atmosphere and obscuring cloud coverage, and the seeing is better.

Fortunately, the error in the mirror is very nearly perfect, which is to say that it is

"perfectly wrong", as Senator Gore announced in a subcommittee hearing. As a result, it will be a fairly simple matter to build a corrector lens. A replacement WFPC has been planned for 1993, with Shuttle astronauts replacing it in orbit during a scheduled maintenance stop. Work is now being stepped up to have the new WFPC built with the corrector lens, so that when it is replaced, it will completely make up for the figuring errors. Until then, the main science from the HST will be shifted from the visual wavelengths to others. For the next 3 years, scientists will concentrate on spectroscopy, photometry, and astrometry. There is so much science the satellite is capable of, that virtually any one of its 5 instruments could easily fill the entire 15 year observing lifetime of the HST. Once the correcting camera is in place, the satellite's observing will be shifted back to the optical wavelengths. Obviously, the problem with the main mirror is troubling, and should never have occurred, but the main goal of the satellite, to advance man's astronomical knowledge by orders of magnitude, will still be fully realized. No, the HST isn't a garbage bucket rather than a light bucket! It is still one of man's crowning achievements in space science. It does speak however, to man's age old problem, that of appointing a committee to do anything. Remember Kraus' law? "The larger an organization, the larger the number of steps and persons, the greater the cost and time required to perform a task; in the ultimate organization the steps, persons, cost and time become infinite and the task is never performed." Moral: "Think Small"!

Coordinator's Corner

As the saying goes, "Things happen." We enjoyed a well attended SCIENCE 2000 seminar and the opportunity to visit again with Jill Tarter. She impressed a large number of students with her wit, charm, and good sense.

I should also point out there are some college students who feel that if a subject is not within their particular field of interest there is no need to pay attention to anyone in a position of expert. Such is the fate of the educator.

I am in one of the most trying terms in my entire career of college teaching. I am entirely aware of the reasons and the person to blame. It just seems that as we grow older we should grow also wiser. Don't you believe it. I will survive the term, though somewhat the worse for wear. Most of my problem is one of overload. I don't know when not to volunteer — in this case for an extra course.

My volunteering for work beyond the paycheck has not suffered all that much. The back-up crew of volunteers has done a magnificent job of covering the crises as they have arisen this month. When the Power shut down, threatening to burn out the focus room on the way, Earl Phillips got the phone lines cooking and came up with materials AND labor to put it back in shape. That is what I call jumping in with all four feet. Details will follow next issue.

I did take a weekend off with my wife to get to know her again. She seemed much as I remembered her before this school term began. She has adjusted nicely to the inconvenience. I hope she will adjust just as nicely to me being around the house winter term — when I will again be on sabbatical to the Radio Observatory project. This will not come as much of a surprise to her.

[At last count I am responsible for 190 students in 3 five hour courses. This without graduate teaching assistants. One full time observing assistant (volunteer) helps tremendously!!!!]

MEETING NOTES — NEWS FROM E-MAIL

Meeting Notes are compiled by Earl Phillips (at Radio Observatory) and Tom Hanson (at Dreese Labs 805). E-Mail comes straight from the computer screen and may contain stange comments.

Meeting Notes

6 October 1990 — EP

The meeting began at roughly 10 am. Those in attendance were Mitchell, Bolinger, Dixon, Phillips, Bates, Barnhart, Janis, Brown, Childers, VanHorne, Ferryman, and Ron & Nancy Leeseberg, guests of Barnhart.

Barnhart reports that he has had many conversations with Jill Tarter. She states NASA sees great potential for Big Ear and encourages us to apply all we can for money not earmarked for the SETI program. She feels that there are funds available, though funds tagged for the SETI program itself are in question at this time.

Barnhart also reports that he is going to Marion to address the Ham group there, as he did last year. Barnhart then informed everyone of a donation made to him & Otterbein College by Arch Tripler of many astronomy and radio astronomy books, as well as much astronomical equipment, some of which he will make available to

the group. Barnhart also reports that Mr. Lonc has contacted him and gave him further information on how to tweak down the output on the signal squirter, which he built.

Brown reports that on Thursday he noticed the A/C in the focus room acting weird again, this time due to the main power feed to the focus room. He discovered that the cast-iron conduit that the main cable is in had collapsed on the cable in many places, causing it to short out. It is necessary to replace the main feed, though he was able to continue electricity to the computers by cutting off the electrical feed to the A/C and avoiding the shorts. Janis has agreed to contact OSU to determine if they will pay for a replacement, though this does not seem likely. Phillips agreed to see if he could get the needed replacement cable donated, so that we could replace it ourselves. Brown is the acting captain of this quickly flung together replacement team, and will start mapping out the area the new run must go.

Phillips reports that the fence repair has been completed in the area where the boys with the ATV's tore it down. He also reports that another room in the RO office building has been painted by the Jones Middle School volunteers, and that the window broken by the golfers has been replaced.

Dixon reports that the 11/23 computer works fine, but that either the software or hardware does not. We need someone to work on it, so if anyone out there has experience in this type of computer, please contact Dr.Dixon. Dixon also reports that he has received 2 letters from school debating teams requesting information on SETI. He sees this as evidence that the public's awareness of SETI is increasing, and that hopefully this will mean a more favorable funding future.

Hanson reports that a new volunteer to the punch card project, Andrea Carr, will be given a training session and is expected to be a valuable assistant afterwards. He also reports that he has had success in getting the cabinet of the computer @ Otterbein opened.

The meeting broke up at roughly 11:30 am, with most going off to their respective tasks.

E-Mail

From: BOLINGER-J
Subjects 11/44 cabinets, part II
Date: 4 Oct 90

Previous message was a bit unclear.

What I meant was...Try to remove the side panels or top. You may also be able to pull out chassis from the front. Once you can get to the insides you can easily remove the lock.

Have you tried the key from the 11/44 in DL805?

From: BROWN-SB
Subject: News from RO
Date: 5 Oct 90

I discovered at the RO today the the focus room AC wiring had developed a short in the conduit under the tunnel. As a consequence, the focus room has no AC power. (I turned it off.) Don't try to restore power to the focus room, unless you are very, very sure of what you are doing. There is a fire risk, as well as a potentially deadly risk of electric shock. Judging from the condition of the wiring and conduit, I suspect that a minimum repair will be to replace the main AC wiring and conduit to the focus room entirely. Further diagnosis will have to wait until things have dried out thoroughly. (The cast-iron conduit has entirely rusted away over most of its length, exposing the wiring to water. The short or shorts were probably triggered by last night's rain, but have been latent for a long time.) There was no evidence of flooding at the other end of the focus room, where the newly installed plug in the pipe to the parabola is.

Steve

From: HANSON-T (Tom Hanson)
Subject: Jim Bolinger Visit to Dreese

Date: 5 Oct 90

Sorry to hear about the need for re-wiring of the AC to the Focus room. In our collective battle against entropy, entropy seems to be nipping at our heels.

Many thanks to Jim Bolinger, who was able to schedule several hours to review procedures for performing a sysgen of the PDP 11/44, last night.

Jim identified the disk pack needed as input to the process, provided insights into how to proceed, and explained how to set up the two packs which are involved.

It was established that DEC's hardware and software documentation have different values for the location of the tape drive address. In the next sysgen, we will be trying the software documentation value.

Anyone interested in taking part in the sysgen is welcome to do so. Please contact me so we can set a time (preferably Monday Oct 8).

From: HANSON-T (Tom Hanson)

Subject: Baker Hall

Date: 8 Oct 90

Andrea Carr is continuing to learn the procedure for loading cards onto disk, under the guidance of Dave Langford. New JCL for use by students who will not be working with magtape is under development, and should be ready by Tuesday evening. The new JCL will enable the students to send verified files to Dave Langford, so that he can move them to tape.

From: HANSON-T (Tom Hanson)

Subject: Science 2000 and VAX Cabinets

Date: 4 Oct 90

Two members of Radobs were in attendance Wednesday evening at Otterbein (and there may have been several others I didn't happen to see). Dr. Dixon and Ron

Leeseberg and the audience heard TV science news commentator George Strait talk about the role of journalists in reporting news of scientific developments. He spent considerable time talking about the difficulty of validating reports, and gave numerous illustrations from his experience or knowledge. Dr. Jill Tarter was in the audience as well. She will be presenting at 2 PM Thursday October 4, and at 7 PM she will be part of a panel discussion with Dr. Dixon.

The VAX 11/780 cabinet yielded to screwdrivers and wrenches, and both locks were disassembled, disabled, and reassembled so that the doors can now be opened with a simple screwdriver. Numerous bolts were found to have become loose during transportation of the equipment, and the ones found were tightened.

Inventory of the components is planned for the near future.

From: BROWN-SB

Subject: news

Date: 7 Oct 90

News from the Front: Report from the RO

After much headscratching over the maze of AC wiring at the RO, Russ, Ron Leeseberg & I figured out that the short occurred in wiring which powers the A/C and the compressor hut (& all the outlets on the lockposts.) That wiring was disconnected, allowing us to restore power to the focus room proper, and there was light. It is not necessary to replace all the wire and conduit between the control hut and the focus room, but only wiring within and near the focus room tunnel.

However, the AC main for the focus room runs through the conduit in which arcing was occurring. It is likely that insulation on that wiring was damaged and will short in the near future. Obviously that cable must be replaced. I also intend to replace the wiring in the crumbled conduit between the A/C and the focus room, because I feel that the present wiring is unacceptably dangerous. Because most of the new wiring will be sheltered, conduit will probably not be necessary. However, we need a considerable length of 4-conductor 8-gauge cable, with tough and waterproof insulation. It will be mechanically supported by fastening to focus room wall. I am also going to look into putting breaker boxes at the point where the 60-amp circuit enters the focus room and is split into 15-amp circuits for the focus room, the A/C,

and the compressor hut. Given light in the focus room, I went back to work on the 5110B synthesizer driver. It only took about 30 screws (don't laugh — I was expecting more) to get it far enough apart to get the defective capacitor out (I also removed its mate.) I will be replacing both of them ASAP. As a bonus, I got access to the front panel and will be able to replace the indicator lamps which have been burned out since time immemorial. Further news as it happens.

From: HANSON-T (Tom Hanson)
Subject: Tuesday Night Meeting at Dreese
Date: 3 Oct 90

Nice turnout. Tom Van Horne conducted the meeting, which started shortly after 17:30. Bill Garber brought in a transcription of the video interview of Dr. Dixon, made from the station master. Steve Brown reported at length on finding what appears to be a defective component on the synthesizer power supply. He will replace the part and test for improvement. Russ Childers and Steve discussed the signal squinter which continues to put out too much signal. An idea of reducing signal output by varying time of output was discussed.

Dave Langford has loaded a total of 9 boxes of cards, to date. Dave has requested an additional week to develop procedures for working with the mag tapes assigned to him, before we switch to use of those tapes for daily work.

Bill Mook is continuing his research, and is looking at hardware options at this point. Bill led animated discussions of a variety of subjects generally relating to space, including transport methods and communications.

A cable to connect the VT100 at Jones Middle school was delivered today, along with a fresh ribbon for the LA36. Susan Snyder was attending a teachers' meeting, so the ribbon will be installed later.

From: PHILLIPS-E (earl)
Subject: romanoff elec.
Date: 22 Oct 90

As per our part of the bargain with Romanoff Electric, I spoke with their PR man today regarding getting some written material from them to piece together an article on the company and what they're going to do for us for Signals. If anyone can offer any information as to the specifics of the wiring job, please either post it here or send me a message e-mail. I'd really appreciate such info, as it'll help get the article together sooner.

Hunt for extraterrestrials now covers sky in both hemispheres

A new radio receiver in Argentina gives scientists another ear to seek out alien life

LOS ANGELES (AP) — The search for alien civilizations in space expanded to cover the entire sky as a new radio receiver started running in Argentina yesterday, the anniversary of Columbus' discovery of the new world.

"Today represents the opening up of half of the universe to the search by the human species for extraterrestrial intelligence," said astronomer Carl Sagan, president of the Planetary Society.

"You have to be made of wood not to be interested in knowing whether we're alone in the universe," Sagan said by phone from Ithaca, N.Y., where he is a professor at Cornell University.

"Here we are for the first time in human history when it's technically possible to find out, and it's very cheap."

"Wouldn't we be ashamed of ourselves if the answer was there for the taking and we were too shy to look?"

The Pasadena-based Planetary Society, which advocates space exploration, financed the supercomputer-controlled radio receiver and signal analyzer with \$150,000 raised from its 125,000 members in more than 100 nations.

The 8.4 million-channel receiver, about the size of two large refrigerators, is called Megachannel Extraterrestrial Assay II, or META II. It is located at Argentina's Institute of Radioastronomy, 30 miles southeast of Buenos Aires.

It is identical to META I at Harvard University's Oak Ridge Observatory in Massachusetts. Since 1985, that receiver has listened to Northern Hemisphere skies for signals from aliens.

Steven Spielberg, who directed the films *Close Encounters of the Third Kind* and *E.T., the Extra-Terrestrial* donated \$100,000 for META I.

The META project is the world's most powerful operating search for alien radio signals. Nothing has been heard so far.

About 100 people watched as the institute's director, Raul Colomb, pointed one of the institute's 98-foot-wide radiotelescope dish antennas toward the Southern Cross, a major Southern Hemisphere constellation, as the receiver was switched on yesterday morning.

If either receiver ever detects radio signals intentionally sent by aliens, it means "that it's not inevitable civilizations in their technological adolescence destroy themselves," Sagan said.

The United States celebrated Columbus Day on Monday, but yesterday was the anniversary of Christopher Columbus' arrival in the Caribbean from Spain on Oct. 12, 1492.

Sagan, who was host of the popular public television series *Cosmos*, said the discovery of extraterrestrials "would be still more powerful and significant and historical. It would be a turning point in the history of civilization. Every field of human endeavor will gain something."

"The development of technical civilization is likely to happen on countless other worlds."

"Our galaxy alone contains 400 billion stars and evidence suggests many have planets, and studies show carbon — the basis of life — is abundant in space", Sagan said.

More than 50 limited searches for extraterrestrial intelligence have been conducted since the 1960s.

REQUEST (PLEA!)

WE CAN USE SOME LETTERS TO THE EDITOR! GIVE US SOME INSIGHT INTO WHAT OUR READERS ARE UP TO AND THINKING ABOUT WHAT IS GOING ON.

WE ARE ALSO IN NEED OF CURRENT UPDATES ON CHANGES OF ADDRESS OR THINGS YOU WOULD LIKE TO DO FOR US.

NEXT ISSUE WE WANT TO PROVIDE A LIST OF VOLUNTEER NEEDS AND SPECIFIC ITEMS THE OBSERVATORY CAN USE.

DON'T FORGET — **SIGNALS** IS NOT A SUBSCRIPTION JOURNAL. ANY HELP TO THE RADIO OBSERVATORY, **NAAPO**, INDIVIDUAL PROJECTS OR THE WHOLE SETI PROGRAM OF **BIG EAR** WILL GET YOU ON THE MAILING LIST.

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