



NAAPO (North American AstroPhysical Observatory)

"Signals"
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Editor:

Earl W. Phillips, Jr.
7893 Thornfield Lane
Columbus, Ohio 43235
614-764-0476

NAAPO Coordinator:

Dr. Philip E. Barnhart
Dept. of Physics/Astronomy
Otterbein College
Westerville, Ohio 43081
614-898-1516

Gleanings From the E-Mail Bag **(Compiled by Earl Phillips)**

From: Bob Dixon

Subject: The SETISAIL Project

Date: 5 Aug 1992

A conference was held recently in Italy on a new concept called the SETISAIL. A solar sail powered spacecraft would be launched to a point far beyond Pluto, where the Sun can be used as a lens for electromagnetic radiation. The sail would then change its function to that of a parabolic reflector for radio waves, still pointed back at the Sun. The solar lens provides a gain of about 57 dB at 1420 MHz, in the direction opposite to where the SETISAIL would be located. The distance must be at least 12 times that of Pluto from the Sun, but beyond that it is not critical, so the sail could keep on going and still work fine. The most likely direction to launch the sail is toward the galactic anti-center, so that reception would be toward the galactic center, as that is a very interesting region. An optimistic estimate of 12 years for such a flight is made, after launch. That would use a solar close-approach first, to gain high speed via the gravitational slingshot effect. They did not discuss the navigational and communications problems in using this receiver system at such a large distance, but it does sound like an interesting idea.

From: Bob Dixon

Subject: New Ideas on "Where Are They?"

Date: 5 Aug 1992

A recent abstract explains some new ideas on where intelligent civilizations are likely to be located in the galaxy. According to this abstract, galactic rotation consists of two different components:

1. The motion of the stars, which is fast near the center and slower toward the outer edge of the galactic disk, sort of like a whirlpool. The stars are relatively uniformly spread out everywhere.
2. The motion of the spiral arms, which is a "density wave" that passes right thru all

the stars, and excites the gas and dust, making it glow and hence be visible. This motion is as it moves faster at the outside than at the inside.

The effect of these two motions is that the spiral arms pass the stars near the outer edge of the galaxy, but the stars pass the arms near the inner part of the galaxy. There is a critical radius where the two rotation velocities are the same, and hence there the stars and arms do not pass each other. New stars are born within the spiral arms, but then leave the arms later due to their different rotation velocity, and eventually pass thru other arms etc.

Now comes the SETI part. When an existing star (and planetary system) passes thru an arm, any life that may have evolved is likely destroyed. This means that the lifetime of any civilization is limited by the time it takes the parent star to go from one arm to another. Hence to maximize longevity, it is best to live near the radius where the stars and arms pass each other only very slowly, or not at all. Very interestingly, our Sun lies very near the critical radius, which perhaps explains why we are here at all. So the best place to look for other civilizations is along this "belt", where life has a long time to evolve. At short range, the best directions to look are hence directly ahead and behind of us along the direction of galactic rotation. This can be refined even further to find the oldest possible civilizations, knowing whether they are just inside or outside the critical radius, and hence knowing whether to look forward or backward for them. This prompts me to suggest that an advanced civilization may seek to preserve itself by altering its galactic radius location so as to be closer to the critical stationary radius.

From: Tom A Hanson

Date: 12 Aug 1992

Tom VanHorne enlivened Tuesday's meeting with anecdotes and commentary about the recent message posted by Dr. Dixon, about the possibility life may exist only at a certain radius from the galactic center.

Otherwise, the meeting consisted of reports by Steves: Janis and Brown, and a summary of the status of the card project.

Steve Brown has been making progress in determining the failing component in the

11/23 which has been down since a severe electrical storm caused numerous power outages in a short interval. Steve has received replies from several people on Internet, where he had posted an inquiry. Several of the replies suggested looking at the system clock, which I regard as a non-obvious cause of the reported symptoms.

After the meeting, Steve Janis worked on postread processing of Box 131 ("Jaws"), and we succeeded in putting it to bed after covering problem solving modes in considerable detail. Steve will try to process Box 132 sometime this week. I hope that the annoying characteristics of Box 131 do not extend to its immediate successor, but suspect that they will, since it too is one of the boxes tried and rejected by the previous card reading team.

From: Stephen B. Brown

Subject: 11/23

Tuesday afternoon I did some archeology in DL 805 and found a DEC diagnostic pack which had some useful diagnostics on it, i.e., the instruction set and MMU diagnostics for the 11/23 processor. (This was part of a recent donation from McClellan Construction, on a disk labeled '11/23+ Diagnostics'.) Together with some helpful advice from the readers of vmsnet.pdp 11, I was able to use this to determine that the 11/23 in the focus room was indeed having MMU problems. To make a long story short, I replaced the CPU card with one that passed the MMU diagnostic and, by degrees, reassembled the system. As of 1630 8/12/92, the 11/23 is running again. I have tested the hardware as well as I can, and, pending a few days of crossed fingers to burn it in, I'm ready to pronounce it fixed. While I had the 11/23 in pieces, I took the opportunity to jack the console port speed up a little. Many moons ago, we replaced the Decwriter IIs with Decwriter IIIs so they could run at more than 300 baud. However, because I don't like to disassemble that system without good cause, I had never changed the jumpers in the computer that set those speeds. So we were running the fast Decwriter IIIs slowly. Every cloud has a 1200 baud lining. The only remaining unresolved issue is an RL02. Recall that in a previous post I told that I had discovered one of the RL02s on that system has a bad fan (oh, bad fan!, naughty, naughty fan!) The drive seems to be working, except that it runs much too warm, of course. I was able to temporarily deal with this by rearranging the logical order of the drives. We only use three of the four drives in normal operation, so that if a drive needs to be serviced, I can shuffle the ones in us

and keep the system running. However, the fourth drive is important for doing backups and as a spare, so I regard repairing it as a fairly high priority. We also have a bad RL02 drive in the Dreese 11/23 (formerly the office building 11/23.) While this is not important in day to day operations, it was extremely inconvenient not to have it working while I was trying to diagnose the focus room system. So I also want to fix that soon. We also have an 11/23+ system taking up an awkward amount of space in the focus room. It has usually been justified by the eventuality of upgrading the 11/23 there to an 11/23+ or an 11/73, but this may be a long way off and we need the space. I propose to gut that system for parts. The RL02 drives will be brought to Dreese and given a thorough check out on the 11/23 there. Depending on whether they pass, they will be stored in Dreese (sigh!) or discarded. Some of the spare RL01 or RX02 drives in Dreese may be discarded to make room for the RL02s. The circuit packs, cables, backplane, &c. from the 11/23+ will be sorted, tested if possible, and stored with other spares in Dreese. The empty cabinet will go into our new trailer. Another possibility is that the trailer could be used to store some of the stuff now in focus room hallway, and the hallway could be used to store a couple of racks of spare computer parts. I put an emphasis on testing these components because that system had a rough ride from Florida to here. It was clearly not prepared for shipping by professionals, and I don't wish to rely on any of it without thorough checking. ("Trust, but verify".) If and when we decide to upgrade the processor in the focus room system, we will begin with the 11/23+ in Dreese (recently donated by McClellan Construction,) which has a less suspect history. I would also like to begin a discussion on the priority which should be assigned to upgrading the focus room system. This has pros: Faster CPU; More memory; There is a possibility we could run RSX11M-PLUS on an upgraded system, which would enhance performance; and cons: The operating system would have to be rebuilt, together with all the idiosyncracies that have been built in over the years. This is can be done, but will involve considerable effort and time; There is some technical risk involved in getting the hardware together and working; The computer would be down (i.e., not observing) for some time; We have fewer spares for the 22-bit bus components. The discussion must also address the following issues: What will the role of the 11/23 be with a He-cooled front end and a 1,000,000 channel spectrum analyzer sitting around? Will its load be greater or lighter? Upgrading to an 11/23+ or 11/73 will still leave us behind the times (we'll have gone from c. 1979 to c. 1983.) The upgraded system will still be an order of magnitude poorer in performance than state-of-the-art desktop PCs. Perhaps we should be looking at ways to upgrade to 1992 performance instead.

From: Stephen B. Brown
Subject: Re: Deadly Arms
Date: Thu, 13 Aug 1992

Bob Dixon: Now comes the SETI part. When an existing star (and planetary system) passes thru an arm, any life that may have evolved is likely destroyed.

Steve Brown: Why?

Bob Dixon: The author of the paper says that the spiral arms are lethal due to the radiation generated by nearby supernovae there. I am still skeptical. Tom Van Horne points out that Sol has passed into and out of the nearest spiral arm many times. We did a back-of-the-envelope calculation supposing Sirius went supernova. At the distance of Sirius (8.6 ly) an object would have to have 294×10^6 times the true luminosity of the sun, in order to have the same apparent luminosity. Supernovae have approximately the luminosity of a galaxy, say 10^{11} to 10^{12} stars, which puts us in the ballpark. A Sirius supernova would be like an extra sun for a few weeks. This would seriously disrupt the ecosystem, but I don't believe it would wipe out life. I'm not even convinced it would wipe out people, although drought, crop failure, and subsequent war and famine might set us back to the dark ages. I have assumed that the supernova's output is roughly thermal, at least at these ranges (after passage through the supernova's nebula and terrestrial atmosphere.) If the energy arrives concentrated in the X-ray spectrum, say, this might be different. I have also not done any calculation on the effect of the nebula eventually arriving here. Some more b-o-t-e: Suppose a star transits an arm in, say, 10^7 y. Suppose the lethal range of supernovae is 10 ly, and that the star experiences a lethal supernova (in that 10 million years) with probability 0.1. Then the overall probability of supernovae in the arm must be 2.4×10^{-12} per year per cubic ly. Now consider the visible range of supernovae (say 10,000 ly.) The star would experience visible supernovae at a rate of 10/year. This is much higher than the rate at which we experience them (and we're near an arm,) but would let 90% of the systems pass without lethal disruption.

From: Tom A Hanson

Subject: Tuesday Night Meeting

Nice turnout. A special guest this evening was Fai Yeung, a graduate student from Hong Kong who is assisting Dr. Klein with investigations of the KLT (? Karmen ? Louvre ? Transform) [actually: "**Karhunen-Loeve Transform**"]. Fai has spent a year at OSU already. Drs. Klein and Dixon, Steves: Janis and Brown, Russ Childers, Fai Yeung and Bill Miller filled the conference table to overflowing.

Dr. Dixon had brought a new (Copywrite 1993!) book from the library: *Zen and the Art of the Internet*, by Brendan P. Kehoe (\$22.00) (c) 1993 Prentice Hall ISBN 0-13-010778-6.

Russ Childers reported that the new OSU Big Ear sign is mounted, at the entrance to the long, winding drive up to the observatory. The new sign is on display just in time for a visit by a British television crew, who will be visiting the facility tomorrow morning at 9 AM. Russ and Bob Stephens, our onsite Canadian observer, have been collaborating on installation of replacement lighting, after the recent storm damaged a large tree, one of whose major trunk sections fell on the old power cord. The new lighting will avoid outside wiring altogether. Additional lamps will be installed on east and west ends of the garage, and new lamps will be installed on the power distribution pole, midway between the garage and the administration building.

Russ reported on work he has done to follow up on a series of observations he made in April of this year. He had prepared a number of graphs to accompany the raw data. While no conclusions were reached, it was theorized that a signal from a geosynchronous satellite may be participating in the signal entering the feed horns. Steve Brown presented a wooden house for the new three valve pneumatic valve assembly, which Steve had constructed of exterior grade plywood. The nails had been predrilled, and the entire construction had a sturdy appearance, appropriate to something which will soon begin a long life in Ohio winters and summer heat.

Steve has been able to spend some time working on theory relating to the Argus omnidirectional antenna concept, now that his repair of the PDP 11/23 came to a successful conclusion.

Bill Miller informed us that a course of instruction on Unix is available by entering the expression 'CTI' at a Unix prompt.

Box 132, captured by Steve Janis last week, was processed and packed away this evening. Steve will try another box or two in the next week or two, as he prepares to supervise student workers this fall.

From: Bob Dixon

Subject: NASA SETI Funding Status

Here is the latest news from Congress. The SETI Microwave Observing Program (MOP) as originally titled is dead. But Senator Barbara Mikulski of Maryland has inserted a new item into the NASA budget called "High Resolution Microwave Survey", in the Planetary division of NASA. The funding level is identical to the original plan that was in the Life Sciences division. These two projects are in fact identical. This was done in the Senate appropriations committee, and approved by them. It now goes to to to the floor of the Senate on Sept 8 to begin discussion on the entire budget. If the Senate approves this item in the NASA budget (the discussion may take all of September), then it will go to a joint House-Senate committee to work out the differences. It was the House appropriations subcommittee that originally zeroed the MOP budget. Even though the SETI budget is totally negligible compared to almost all other federal expenditures, it is seized upon by congressmen desperate to get reelected as evidence that they are saving the taxpayer lots of money. It works out to about 6 cents per person!!! That's far less than what it costs the taxpayer for a congressman to send a propaganda newsletter to his constituents.

From: Tom A Hanson

Subject: SETI Midwestern Railroad

Date: Thu, 20 Aug 1992

In response to Dr. Dixon's call for railroad paraphenalia, including a genuine engineer's hat and a whistle (or horn, or bell), to celebrate the forthcoming completion of the railroad track for the horn cart, I stopped in this evening in the

railroad specialty store in City Center. They carry a gen-ewe-ine Osh Gosh B'Gosh engineer's hat for \$7.00. In addition, one of their employees is said to be an old timer who knows where to find used train whistles, horns, bells, etc, and so I left a request for his assistance when he comes to work tomorrow. It seems to me it's unlikely trains currently in use in this country employ 110 VAC for internal purposes, but I did indicated we can supply VAC from 110 to 440. The store carries a large collection of documentation from which ideas for props might be gleaned.

From: Tom A Hanson
Subject: The Great Train Store
Date: Fri, 21 Aug 1992

The Great Train Store in City Center has a train whistle as well as an engineer's cap. The train whistle is constructed of sturdy aluminum, and it consists of several tuned columns which, when subjected to a moderate air pressure, produce a remarkably authentic steam engine sound. The cost of this whistle is \$20.00. In order to make practical use of this whistle, we would need to invest in a small air compressor, or adapt an existing one. Some degree of ingenuity will be required to achieve a sufficiently interesting sequence of sounds, such as was generated in the store by the salesperson. With only a modest exertion, the sales person created a robust steam whistle emulation which evoked in my mind an image of a narrow gauge engine about to leave the station, on its way to a miner's camp high in the Colorado mountains. As a matter of interest, the sales person has configured one of these whistles as a door bell. He suggested the name of the ? Binks ? company (? Hilliard ?) as a source of a suitable small compressor.

From: Tom A Hanson
Subject: Saturday Morning Meeting
Date: Sun, 6 Sep 1992 19:14:25 GMT

We missed Dr. Dixon, and wish him a complete recovery from the pesky bug that's come to visit, just as swiftly as nature and modern medicine will allow.

The meeting was chaired by Dr. Barnhart, who has returned from his extended

vacation with Esther, looking fit and ready to tackle another academic year. Esther is progressing toward full recovery from a hip replacement, and is down to a single cane.

We were joined on this occasion by friends of Clive Goodall, Jennifer and Stanley Wiklinski. Stanley has just received his EE degree, and has embarked upon a job search. Jennifer is a student at OSU, majoring in english with a minor in philosophy.

Others in attendance included Steve Brown, Earl Phillips, Russ Childers, and Ang Campanella.

To summarize reports in one-liners: We have three display posters to illustrate SETI/Radio Astronomy concepts

We have two new Flags of Earth, one of which will be for ceremonial occasions

The British/Australian film crew were at Big Ear for nearly a full day.

The SETI EastWestern Railway is 3/4 complete. Quality welding by Bob S.

The SETI EastWestern Horn Cart is on rail and operational by computer.

The Otterbein 11/750 is available for pickup. A work party will be organized.

The noise on the continuum recorder has been removed by Russ Childers.

Steve Brown has agreed to build a new backup 11/23 in the Focus Room.

Steve completed painting a wooden house for the new flat move test valve set.

Two truck tarps were purchased but temporarily misplaced. To be located.

Russ Childers will contact the PhD candidate who inquired about volunteering.

Long discussion about building a database for real time data checking.

Long discussion about curved shields on horns. To be removed for testing.

Volunteers are needed for October 18th Open House.

Volunteers are needed for September 19th Flat Move.

PDP 11/34 will be donated to make room for Otterbein 11/750 at Dreese Hall.

Coordinator's Corner

Phil Bamhart

The Open House at Big Ear was a rousing success. Approximately 250 people paid a visit. The rain held off till the party was over and only a little snow fell.

A number of old friends of the telescope showed up. We will detail their comments in future issues of SIGNALS. I feel there must have been 70 some potential volunteers from the event. We may have to have a volunteer orientation next meeting. **(Big Ear, November 7, 10.00 am)**

It is time to get back to some old business. The rail system needs finishing, cryogenics needs exploration, search program needs tweaking and we need to look to ARGUS and calibration problems.

We have missed out on the two MicroVaxen we were beginning to drool over. The possibility of a Sun Station may make up for them.

The visit with Dr. Billingham was great. News from NASA was good/bad and I think the opportunity for him to experience the BIG EAR phenomenon left a good impression on him. Many thanks to John Kraus for the opportunity to gather so many luminaries together for the reception.

I would also like to welcome John Ayotte back to the newsletter production game. John has done so much for the project over the years. It is nice to have him setting up and laser printing SIGNALS again.

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Designed by Jerry Ehman

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