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## SETI SNEAK ATTACK: LESSONS LEARNED FROM THE PEARL HARBOR HOAX

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### ABSTRACT

On December 7<sup>th</sup>, 2002 (a date that will live in infamy), the nonprofit SETI League received a terse email from a person not known to us, reporting the apparent detection at Pearl Harbor, Hawaii of a microwave signal of intelligent extraterrestrial origin. During the following twenty hours our members analyzed the claim, corresponded with the claimant, attempted (unsuccessfully) to independently verify the signal, and ultimately unmasked the claim as completely fraudulent. This episode gave the SETI community its first opportunity for real-time application of the Rio Scale, an analytical tool for quantifying the societal impact of a claimed SETI detection. The Pearl Harbor Hit started out at a one on the zero-to-ten ordinal Rio Scale, rose to a high of four, and then quickly fell to its ultimate value of zero, validating the utility of the Rio Scale.

*The Rio Scale is more fully explained on the IAA SETI Permanent Study Group website, at <<http://iaaseti.org>>.*

### INTRODUCTION: THE FIRST EMAIL

At 0841 hours UTC on Saturday, 7 December 2002, while I slept (it being 0341 hours in the eastern US), a terse and cryptic email was sent to a public information email address at SETI League headquarters. Its subject line read:

“Check Signal--Read Me Please!!!!!!”

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and the entire text of the message was:

“20hr51'53 RA +9deg43'47"dec

1.420957031 GHz +-1.12217 MHz

Found Carrier and Intelligence-- NO

SATELLITES ALOFT in location--

Not congruent with ISS orbit.

Filter pulsar interference, what remains appears to be an audio waveform.”

The email address to which the above message was sent is normally routed to the Secretary of The SETI League, Inc. However, as it happens, our Secretary was on holiday in Australia at the time, so the message forwarded to me. However, I did not actually see it until awakening perhaps two and one half hours later. Although the message came from a non-member, a person not known to The SETI League, owing to the inevitable delay in receipt of the email (and because I found its implications intriguing), it was decided to immediately initiate an analysis and verification attempt.

### RIO TO THE RESCUE

Since the detection of the first tantalizing yet enigmatic candidate SETI signal at the Ohio State University in 1977 <sup>1</sup> the world SETI community has been striving to develop an analytical tool for classifying and quantifying detection claims. Over the past several years, Drs. Jill Tarter, Ivan Almar and Seth Shostak of the International Academy of Astronautics' SETI Permanent Study Group have been developing just such a tool. <sup>2, 3, 4</sup>

The Rio Scale, an ordinal scale with integer values from zero to ten, quantifies the societal impact or importance of any claimed SETI detection. It was formally adopted by the IAA

SETI study group at the World Space Congress in Houston TX in October 2002.<sup>5</sup> Though it had been applied *post-facto* to both historical and fictional detections, this was the SETI community's first opportunity to exercise it in real time, during analysis and attempted verification of a detection claim.

The Rio Scale is a dynamic tool, intended for application at every juncture as SETI detections are analyzed. The presence on the Web of a real-time interactive Rio Scale Calculator<sup>6</sup> enables changes in the Rio Scale score to be computed continually as a given scenario unfolds, and more information becomes available.

Applying the Rio Scale requires that we know (or make guesses about) four factors: three descriptors as to the nature of the detection, and one relating to the credibility of the claimant. With very little detail on which to base a calculation, a number of initial assumptions had to be made.

**Class of Phenomenon:** With no further information than the reported "carrier and intelligence" and "audio waveform", we cannot initially assume an Earth-specific message, omnidirectional message, or omnidirectional beacon. Thus, the most likely first guess is that the signal, if real, represents intercepted leakage radiation.

**Type of Discovery:** No evidence was presented nor claim made that the observation was associated with any organized SETI or SETA activity, nor was it yet known whether the phenomenon was steady and verifiable. Thus, we initially assume this claim to be the "result of any other kind of observation; a transient phenomenon, reliable, but never [yet] repeated".

**Apparent Distance:** From the initial data, we have absolutely no way of knowing whether the signal emanated from within our solar system, stellar neighborhood, galaxy, or from beyond our galaxy. As it happens, any of the four possibilities yielded the exact same Rio Scale value, attesting to the robustness of the analytical tool in this preliminary analysis phase.

**Credibility of Report:** Since the claimant

was not known to us, and presented us with no information about his identity, background, or expertise, we selected "very uncertain, but worthy of verification efforts"

Based upon the above assumptions, the Rio Scale Calculator yielded a value of 1, and an Importance designator of "Insignificant." Nevertheless, follow-up analysis was indicated, if for no other reason than to allow us to refine our somewhat arbitrary assumptions.

### CLARIFICATION: FURTHER EMAILS

At 1221 hours UTC I forwarded the entire message to HITS, The SETI League's closed signal verification email list. Access to this secure avenue for communication and collaboration has, ever since the EQ Pegasi hoax<sup>7</sup> of October 1998, been restricted only to registered and verified Project Argus stations. Twenty minutes later, in the interests of initiating a constructive dialog, and possible collaboration, I also sent a brief reply to the claimant, informing him that I had initiated a process for securing independent verification of his detection, and requesting that he provide documentary evidence, in the form of a computer file in whatever format he found convenient. Less than a half hour later, he responded:

"I have a recording on DAT (since I was using communications equipment when inadvertent signal acquisition was made), would that form be acceptable to you, since I currently have no means of transferring to other media?"

The term 'inadvertent' along with the reference to communications equipment confirmed our assumption (applied in preliminary Rio Scale analysis) that this detection was not a result of a SETI or SETA activity, leaving still undetermined whether the phenomenon was transient or steady. But the claimant's responses to emails, his apparent willingness to cooperate in our analysis, and reports trickling in of follow-up efforts from Project Argus stations, raised the Credibility factor to "Possible, but should be verified before taken seriously",

and its Rio Scale value to 2, an impact score of "Low".

I requested that the claimant send his DAT evidence to SETI League headquarters, and then provided him with a link to our Project Argus signal verification protocols online, so he would be aware of the procedures we were following.

### **SUSPICION: A DETAILED EMAIL**

Many of The SETI League's Project Argus stations operate in drift-scan, Meridian Transit mode. Several Project Argus participants tuned their receivers to the indicated hit frequency, set their antennas to the reported declination, and waited for the source to drift into view.

At 2105 UTC I received a lengthy email from the claimant, providing a wealth of technical detail absent from his initial correspondence. Because it formed the basis for revising both our Rio Scale estimates and our follow-up detection activities, I reproduce it here in its entirety:

"Your problem being understood, I will send a copy while finding a method locally of converting the original.

"In the meantime, I have read and understood your protocols, and will provide as much information as I am permitted by contract.

"Yesterday, I was heading a team of repair technicians just outside of Pearl Harbor, HI working on faulty discriminator equipment attached to a 48' dish which communicates via microwave frequencies with orbiting satellites. After completing repairs (appx 22:00 GMT), I had instructed that the dish be pointed at radio "dead space" for calibration against atmospheric and other earth-based distortions (specifically, 20 hr 51' 53" RA, +9 deg 43' 47" dec), an area commonly used to perform such functions. Instead of "dead air", we found a definite carrier signal. Feeling originally that we had another equipment malfunction, I had the reception facility record what we had received for later use in the troubleshooting phase, however

we found no malfunctioning equipment. When this was determined, we made an additional recording of appx 300 seconds in length.

"At that point, I had a friend of mine located in Puerto Rico (using military equipment, so I cannot divulge it's nature at this time) point the equipment at his avail at the same point in space. He, as well, received a carrier signal, calculated a Doppler drift rate of 1.117 MHz/sec... and had determined that 2 separate signals were being received: one carrier (w/intelligence [pulse power 1.8, tc .125 sec]) and a standard microwave emission consistent with pulsar activity.

"He then sent me the waveform for the second signal, and after reprogramming our filtering equipment to take out that distortion... what was remaining was a definite carrier signal with an undecipherable intelligence. To me, the intelligence is not consistent with any known encoding formats for earth-based microwave transmissions... although I will concede that anything is possible.

"Using basic geometry, I have calculated the possible distance of signal emanation at appx 5047 ly.

"I have already done some of the footwork (honestly, to avoid looking like an idiot), and checked with NASA for ISS orbit and friends in the US military for known satellite orbits, and, as assumed for the purposes of testing in the first place, there are no known birds aloft in that location. That, plus the length of reception and the (although not scientifically) confirmation of signal between points over 4000 miles apart have caused me to turn this matter over to you for further investigation. No other source has been notified of this reception, as even I can dream about 100 different ways this could be earth-based... and I believe that the equipment you employ to be much more sufficient to the task.

"Please let me know what you find, as I will hold all information confidential and I am understandably curious. Thank you very much for your time and good luck."

## MUSTERING THE RESERVES

A number of the technical details provided in this email just didn't ring true, and Project Argus participants began picking it apart in their HITS list dialog. Meanwhile, IAA SETI Post-Detection Committee chairman Dr. Ray Norris was playing devil's advocate. On his urging, I recomputed the Rio Scale value, based upon an assumption that all the information being provided was honest, complete, and correct. The results were startling.

Absent any information to the contrary, the Class of Phenomenon estimate remained unchanged. The claimed military verification, if accepted, raised the Type of Discovery designator to "Result of other kind of observation; a steady phenomenon, verifiable by repeated observations/investigations". The claimed triangulated distance set the Distance parameter to "Within our Galaxy", and the Credibility factor, if we believed the data provided, became "Very probable, with verification already carried out".

These optimistic assumptions resulted in a computed Rio Scale value of 4, with a corresponding Importance of "Moderate."

Only, one by one, the claims collapsed under the pressure of critical analysis. The number of discrepancies quickly became too great to overlook. A partial sampling:

All HITS List participants agreed that the method of triangulation being claimed to determine distance was seriously flawed, that such a measurement could not be made from two antennas only a few thousand kilometers apart, unless each antenna was several kilometers in diameter! It was quickly pointed out that a 48 foot diameter dish has a half-power beamwidth at the hydrogen line on the order of just under one degree -- but that the source was being localized to the nearest arc-second. The claimed Doppler shift indicated a relative velocity on the order of 0.625% C (10.8 AU/day), surely not consistent with sidereal motion. The region of sky being surveyed was

far too noisy to use as a Cold Sky reference for Y-factor or G/T measurement, and in fact was on the horizon from Hawaii at the time of the claimed detection (where any attempted cold-sky measurement would have been masked by ground noise). There was no logical reason for a satellite communications facility to be monitoring the hydrogen line at all, and likely no capability for doing so at the claimed station. Pulsar interference was claimed while the nearest of the more than 1,000 known pulsars was more than 25 degrees away from the hit coordinates. And so on.

Nor was it lost on us that this claim of a detection, ostensibly from a radio telescope in Pearl Harbor, Hawaii, reached us on December 7<sup>th</sup>: Pearl Harbor Day.

The final nail in the coffin of credibility came as the reported right ascension drifted into view of one Project Argus station after another. All Argonauts reported the same thing: no pulsar, no signal, no anomaly.

## DENIAL: THE FINAL EMAIL

At Ray Norris' request, I sent the claimant an email, confronting him with the results of our analysis, and inviting him to come clean. Instead of admitting his hoax, what we received was a complete denial that he had ever been in email contact with me! Again, for the historical record, here is the complete text of his response (sent from the same email address with which by now I had been corresponding for fully three days):

"Good evening Dr. Shuch,

My name is Xxxxxx Xxxxxxxxxx. I have received your e-mail, with quite distressful accusations of a communication with which I have no knowledge.

"As I have been able to confirm your identity as stated in your e-mail, I have chosen at this time not to immediately report this incident to local and federal agencies; pending, of course, receipt of all available information (times, dates, text and header information of all

electronically transmitted messages and a statement of any voice line or direct communication).

“Until this day, the only known affiliation I have had with the S.E.T.I. program is a common hope and participation in the SETI@home project (which, at this point, I am seriously considering discontinuing).

“As I have been in the Rocky Mountains for almost the last week, and my computer kept on a triple-redundant firewall, and as I am not in an immediate position to question the veracity of your e-mail message, my only recourse is to believe we have both been played a hoax. one that I am very distressed that my name or resources has anything to do with.

“For further electronic communications, please use my only primary e-mail address for communications: xxxxxxxx@xxxxxxx.net

“I hope to a quick resolution to this debacle, as well as your finding out who might have pulled what I can only guess to be a hoax causing major expenditure.”

Needless to say, this message immediately reset the Rio Scale value to a zero.

### SHADES OF EQ PEGASI

Clearly, someone had been hoaxed. But was it The SETI League, the claimant, or both of us? Although we may never know for sure, our experience with an earlier, more widely publicized hoax allows us the luxury of conjecture.

In October of 1998, you may recall, an anonymous hacker broke into the then-less-secure HITS list, and posted a claim of a SETI detection emanating from the EQ Pegasi star system. Some minor detective work by SETI League members identified the claimant in that case as one Paul Dore, a name he signed to subsequent emails. Two weeks into what became a most convoluted scenario, a person whose name really *was* Paul Dore stepped forward, and presented convincing evidence that his identity had been hijacked by another per-

son, for the purpose of perpetrating a hoax.

The person from whose email address the present hoax emanated has presented no such evidence of identity theft, and our own detective work fails to substantiate the final claim of ignorance and non-involvement. It is possible (though unlikely) that a truly clever hacker could have hijacked this person's email in both directions, for several days. Occam's Razor suggests a more likely explanation: that once found out, the perpetrator of the Pearl Harbor Hoax tried to cover his tracks the only way he knew how.

Regardless of the intent of the claimant, the signal detection claim is now known to be fraudulent, and The SETI League enjoyed an opportunity to test its signal verification protocols, its follow-up capabilities -- and the Rio Scale.

### POSTSCRIPT: THE ARECIBO ANGLE

It wasn't until two weeks after the above events transpired, while preparing this manuscript, that I became aware of the peripheral involvement of the prestigious SETI Institute in this claimed detection. December 7<sup>th</sup> found SETI Institute radio astronomers at the Arecibo Observatory in Puerto Rico, for their semi-annual deployment of the Project Phoenix targeted search of nearby sun-like stars. Project Phoenix scientist Jill Tarter reports:

“I took the initial call from this guy in the Arecibo control room and sent him to you. I'm surprised/intrigued that he followed up on my suggestion.

“When I took the call, the individual talked to me about detection of a signal that was verified at multiple sites ... by he and his collaborators, military-involved-in-an-unspecified-and-unofficial-and-probably-unapproved-way. I have to say that my 'kook' radar went off big time here, from just the vocabulary of the dialog. Since rank and military environment were insinuated into the conversation, I told him that I would not divert the world's largest telescope

to his whim (I do not even know if it would have been possible to point Arecibo where he wanted to) until there had been some credible verification. I directed him to [The SETI League]. No records, no logs, just my sleep-deprived memory.”

Collectively, The SETI League’s 119 Project Argus participants<sup>8</sup> control what is presently the world’s largest coordinated network of radio telescopes. Dr. Tarter’s referral of a claimed detection to Project Argus for independent verification represents the very type of collaboration between amateur and professional observers which motivated the formation of the grass-roots SETI League. The performance of the two organizations in the present case is something of which the entire SETI community can be proud.

## CONCLUSION

The December 7<sup>th</sup> Hoax was a timely and positive experience, in that it provided the SETI community with its first opportunity for real-time application of the Rio Scale, an analytical tool for quantifying the societal impact of a claimed SETI detection. The Pearl Harbor Hit started out at a one on the zero-to-ten ordinal Rio Scale, rose to a high of four, and then quickly fell to its ultimate value of zero, validating the utility of the Rio Scale. This experience will help us to deal more efficiently with the analysis of future alleged (and, one hopes, eventual actual) SETI detections.

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