THE FLINT RIVER OBSERVER

NEWSLETTER OF THE FLINT RIVER ASTRONOMY CLUB

An Affiliate of the Astronomical League

January, 2017

SPECIAL REPORT

THE SEARCH FOR E. T.

by Bill Warren

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Is Earth the only place in the universe where life exists?

That question has both scientific and religious implications. It has sparked many a lively discussion on cloudy evenings at star parties – but it also has sparked less pleasant discussions in other places and other times.

In 1609 a.d., the Italian Dominican friar **Giordano Bruno** appeared before the Inquisition, where he was tried, convicted of heresy and burned at the stake. His crime? He dared to suggest that the universe might be teeming with life.

During the Middle Ages, official Church doctrine decreed that life does not exist anywhere but on Earth, or else God would have told us. Any other belief was considered heresy, and punishable by death. But that line of reasoning was flawed – fatally, in Fr. Bruno's case -- because it assumed that an all-powerful, all-knowing deity is somehow obligated to share His knowledge with us.

Maybe life doesn't exist out there – but maybe it *does.* And maybe He wants us to find out for ourselves.

And that brings up another interesting – and challenging – question: *If there* ***is*** *life – especially intelligent life -- elsewhere in the universe, how will we find it?*

X-ing Out Our Solar System. Before speculating on where and how intelligent life might be found, let's consider where it does *not* exist, i.e., anywhere in the solar system besides Earth.

Aside from Earth, **Venus** and **Mars** are the only places in the solar system where conditions might have been capable of supporting life forms more advanced than microbes, bacteria or **Tom Moore**. (*Sorry, Tom, da debbil made me write that!*)

Intelligent life may have existed on either or both of those planets millions of years ago, but not now. If even a single civilization were to exist anywhere in our solar system, we'd have detected signs of its presence by now. Even if you're living underground, it's hard to hide evidence of a thriving civilization.

We've sent spacecrafts to all of the planets and many other places in the solar system. But those probes don't search for alien civilizations, they look for conditions where basic life forms such as microbes might exist. We may eventually find evidence of such primitive life forms somewhere – but we certainly won't be able to communicate with them.

If intelligent life exists, it lies somewhere far away among the stars.

Proxima Centauri is the **Sun's** nearest stellar neighbor, 4.2 light-years away. Recently,

astronomers announced the discovery of an exoplanet, **Proxima Centauri b**, orbiting it. **PCb** lies in the habitable zone where conditions such as water, breatheable atmosphere, moderate temperatures and a rocky surface to stand on might exist. Suppose we were to decide to visit PCb to see for ourselves whether life exists there. Here are the hard facts about space travel:

*The greatest velocity ever achieved by a man-made object is 165,000 mph. Since light travels at a speed of nearly 670 million mph, we would have to travel four thousand times faster than the *Juno* spacecraft to approach the speed of light – and even if that were possible, the trip to Proxima Centauri b would take us more than four years.

*Most of the stars in the **Milky Way** are much farther away than Proxima Centauri. There are an estimated 400 billion stars in our galaxy, but only about 1,600 of them lie within 50 light-years of us. Not all of them are known to have exoplanets circling them – and of those that we know of, few of their exoplanets are in the Goldilocks zone where life as we know it might arise. Most of the exoplanets we have discovered so far are gas giants like **Jupiter** and **Larry Higgins**. *(Sorry, Larry, da debbil is workin' overtime today!)*

Given those facts, there are two other ways to find out if life exists elsewhere in the universe.

The E. T. Connection. The most economical way to discover alien life would be to wait for it to come to us.

Many people believe that Earth has already been visited by aliens from space. Various sources such as the *Bible* (Ezekiel, Ch. 1 – which, by the way, is fascinating if you read it from the standpoint of an ancient Hebrew describing a UFO and its passengers) and the mythology of the Incas, Mayas, Aztecs and Toltecs have told of what may have been ancient astronauts visiting them from the sky.

For example, the Incas were not surprised when **Francisco Pizarro** arrived in the early 1500s: they had been expecting him for a very long time. (One envisions them saying, *What took you so long?*)

According to Inca legends, sometime in the distant past they were visited by a man who came to them from the sky. The stranger was a bearded white man, while the native Indians were dark-skinned and beardless. His name, the legends said, was **Viracocha,** and he possessed great wisdom that was unknown to them. (For example, he was said to have taught them the basics of agriculture.)

Before leaving, Viracocha told them that he would return someday. So when Pizarro arrived in Peru hundreds (or maybe even thousands) of years later, the Incas thought he was Viracocha. They treated him with god-like respect, which explains at least in part how Pizarro and 180 Spanish conquistadors were able to conquer an empire of 11 million Incas. (Of course, it also helped that Pizarro and his men brought with them to the New World cannons, pistols, horses, smallpox, influenza and syphilis. And as a result of Pizarro's influence, cocaine use was made available to everyone, not just the ruler and priests. [They chewed the leaves of the coca plant.])

The Mayas of what is now Central America and the Aztecs and Toltecs of Mexico had similar legends that told of benevolent, god-like white men who visited them in antiquity and helped them establish their civilizations. Their names were **Kukulkan** (Mayas) and **Quetzalcoatl** (Aztecs and Toltecs).

I'm not saying that the legends had any basis in fact. But the Incas, Mayas, Aztecs and Toltecs believed them. And when, much later, Spanish conquistadors such as Pizarro and **Hernando Cortez** arrived, their rulers made decisions based on those legends that led to the downfall of their empires. That's why their descendants today are Spanish-speaking.

Ezekiel, on the other hand, was describing the arrival of one or more angels sent by God.

Since then, mankind's history is riddled with accounts of UFO appearances, up to and including modern times. Some people have told of being taken aboard alien spacecrafts where they were given medical tests and then released, after which the aliens departed. However, most UFO encounters have not been so close. Most of them have involved eyewitness accounts of unexplained lights or saucer-shaped objects in the sky.

In 1947, the U. S. Air Force conducted the first of three investigations of UFO sightings. The studies, known collectively as *Project Blue Book,* investigated a total of 12,618 UFO reports. Most of them were found to have been natural phenomena

such as stars or planets – usually **Venus,** which is easy to mistake for a UFO, especially when viewed from a vehicle in motion. Some of them were weather balloons or conventional or experimental aircrafts; and some of them were reconnaissance aircrafts (read: *spy planes*). A few of the sightings – less than 10% -- remain unexplained.

Project Blue Book shut down in 1969 when the USAF concluded that, whatever the UFOs might have been, none of them represented a threat to national security. But they still investigate sightings by military pilots as part of their ongoing security measures.

When it comes to UFOs, most people are not reliable witnesses. They do not spend much time looking at the sky, so they are likely to misinterpret what they see. However, there are two groups whose experiences with unexplained phenomena cannot be so easily discounted.

Astronomers. Both individually and in groups, astronomers spend a lot of time looking at the sky. As a result, we recognize stars and planets as such when we see them. We have binoculars and telescopes with which we can zoom in for a closer look at aircrafts, satellites, weather balloons and anything else up there.

Still…Our universe – and our own planet, for that matter – is filled with mysteries. I've written in the *Observer* about our occasional sightings of unexplained phenomena at club observings. I don't describe them as "UFO sightings" because, in the public's mind, UFOs are associated with alien spacecrafts, not unexplained mysteries. But many of us have seen things that we couldn't explain.

In preparing this report, I asked our members to tell me about their own encounters with the unknown. Here are their responses:

***Aaron Calhoun**. My UFO story occurred on the night after 9/11 when I saw two bright lights in the sky. One of them seemed to be following the other, but could not catch up with it. It was almost as if the one in front was playing with its pursuer. I thought: *Those lights are **not** passenger planes! What are they?*

Suddenly, the one in front zoomed across the sky. After that, the other one did a 180^{o} turn and raced away in the other direction. I still wonder what I saw that night.

***Stephen Ramsden.** I was in Australia in 2014 to deliver telescope equipment for our Charlie Bates Solar Astronomy Project chapter there. I stayed at a motor inn in Home Hill, a small town in NE Queensland. I spent many nights out in the sugar cane fields behind the motel, just staring at the **Magellanic Clouds**, the **Milky Way**, the **Southern Cross** and other beauties of the southern hemisphere night sky.

One night during my second week there, I watched a four-engine, propeller-driven passenger aircraft fly N-S from one horizon to the other at an altitude of about 10,000 ft. About 1/3 of the way across the sky, an orange rotating object began to brighten the sky about 10^{o} behind the aircraft. The lights on the object were in a circular configuration, and they rotated around a whitish center. I could see the size of the lights increasing or maybe brightening as the object got closer to the aircraft.

Whatever it was, it fell in behind the passenger aircraft and followed it silently the rest of the way across the sky. I could easily hear the engines of the leading aircraft but could not make out any sounds from the other one.

There were three locals with me on this particular evening; they all saw it, and no one knew what it was. By definition, then, it was an Unidentified Flying Object.

***Bill Warren.** During the years while I was pursuing A. L. observing pins, I was so focused on my searches that I probably wouldn't have noticed a planet-killer asteroid's fiery approach until it hit. So aside from an occasional adventure with other observers at Cox Field or JKWMA, I've never seen a UFO.

Normally I take sightings by non-astronomers with a grain of salt. But that wasn't the case when my late ex-wife **Carole** saw one. Carole was one of the most rational, level-headed people I've ever known, and I believe her story. She saw what she saw, and it was *real*, not a mirage, hallucination or optical illusion.

In 1966, I was working on my master's degree at Auburn University and Carole was teaching at a high school in Smith's Station, AL. Carole and three other teachers were carpooling home to

Auburn one winter afternoon when they saw a very bright light hovering a few feet above an open field. It was about a hundred yards away from them, and circular, Carole said, and about the size of a Full Moon in a dark sky, but brighter than that. (In a later day and age, it might have looked like one of the small, circular lights that accompanied the Mother Ship in the movie *Close Encounters of the Third Kind*.) They pulled over to the roadside and watched it.

Suddenly, the object zipped upward and out of sight like a yo-yo on a string. They rolled their windows down to look for it, but it was gone. By the time they got out of the car, it had vanished. They never saw it again. And they wondered: *Did it leave because we stopped to look at it?*

Was it a UFO? Who knows? But they saw it, couldn't identify what they were seeing, and it flew away (or at least disappeared). That pretty much fits the description of a UFO.

Airline pilots. The other group of people whose sightings of UFOs cannot easily be discounted is *airline pilots*. They spend thousands of hours studying the sky, so they are intimately familiar with what's up there under all kinds of conditions. When a pilot says that he's seen something inexplicable, he risks losing his job by announcing publicly that he saw a UFO. (Do YOU want to fly with someone who literally holds your life in his hands and sees things that aren't there? And if you were an airline executive, would you want to employ someone who sees UFOs?)

Whether you believe that extraterrestrial beings have visited us is immaterial to me. In fact, I might believe it myself, except for two questions I can't get past:

Why would aliens who possess the vastly advanced knowledge and technology required to get here from immense distances away want to come to Earth and then leave without learning more about the state of mankind's science and technology?* If the aliens were friendly like **E. T., they might want to help us or at least get to know us; and if they were unfriendly, they would certainly be capable of enslaving or destroying us. Instead, they come and go like ships passing in the night, leaving behind a few scattered and generally unreliable witnesses.

**If aliens have visited (or are visiting) our planet, why is there no physical evidence of their presence?* UFOlogists contend that such evidence does in fact exist (i.e., a spaceship and preserved alien bodies stored at Area 51), but the government has carefully hidden them from public scrutiny for many decades. (The so-called "Roswell Incident" occurred in 1947; it purportedly involved the crash of an alien spacecraft near Roswell, N. M.) But of all the thousands of reports of UFO activity over the years, none has produced tangible evidence of their presence except photos of objects or lights in the sky.

The bottom line: E. T. may have phoned home, but he hasn't contacted *us*. And that may be a good thing, as you'll see below.

Artificial Intelligence. In the Oct. 2016 issue of *Astronomy* (p. 16), columnist **Jeff Hester** pointed out an often-overlooked notion: *The same difficulties that we would face in sending humans beyond the solar system also apply to whatever alien beings might inhabit other star systems.* Even traveling at the speed of light, interstellar flights across the Milky Way or beyond would take, not just lifetimes, but many generations of lifetimes. It "isn't worth the effort," Hester wrote, adding that "any civilization of biological organisms might reach that (same) conclusion." He's probably correct.

Subject closed, right?

Wrong. Hester went on to wonder about the possibility of non-biological entities – *artificial intelligence*, or technological life forms such as robots or machines that possess the ability to make decisions, solve problems and set their own goals for space exploration, independent of their creators. Such entities would not be deterred by the kinds of problems and challenges that carbon-based life forms face.

If that concept is – well, *alien* to you, consider the **Will Smith** movie *I, Robot* (based on the sci-fi novel of the same name by **Isaac Asimov**): although fiction, it tells of humans building robots capable of thinking for themselves. Hester took that concept a step farther by suggesting that, once created by a life-form, whether human or alien, those robotic creatures might be capable of

reproducing themselves to become "a society of intelligent, sentient machines."

Hester envisioned severe problems in store for us if a robotic society "armed with digital intelligence" comes calling. Like computer viruses, they would "have no consciousness, no ethics, and no remorse. The logic that compels them (might be) simple: 'Seek a host. Infect that host. Reproduce using the resources provided by that host. Repeat.'"

Whether such beings would be a threat to us would depend on whether we (or our planet or solar system) are the hosts or resources they are seeking. Hester concluded that "Machine intelligence need emerge only once to give birth to galactic civilization."

The good news: They haven't come calling.

Yet.

Seti: the Search for Extraterrestrial Intelligence. *(Editor's Note: From this point on, "Seti" will refer to the search for extraterrestrial intelligence, and "SETI" to the SETI Institute, one of several groups that conduct Seti research.)*

To paraphrase the fictional detective **Sherlock Holmes,** *When you have eliminated all other possibilities, whatever remains must be the correct solution*. If we can't go to where the aliens reside and they haven't come to us, in order to find them we must search for each other from a very long distance away. But finding them is a very real possibility, especially if they too have been sending out signals, hoping that someone like us will find them. We have in fact been searching for those signals without success for more than half a century.

What Does E. T. Look Like? We'll never know unless we see him. Almost without exception, the people who claim to have been taken aboard alien spaceships have described their abductors as basically humanoid (i.e., two arms, two legs and usually having an oversized head [presumably to accommodate a larger brain].) But to accept those descriptions as valid, you'd have to believe that humans have been abducted by alien beings from outer space. That's a larger leap of faith than most of us are willing to accept. As Outreach Coordinator Maynard Pittendreigh put it, "Is it my imagination, or did aliens stop abducting earthlings after cell phone cameras became almost universal?"

It's a different story regarding the signals that Seti researchers are searching for. They already know what they're looking for.

When, in 1931, American **Karl Jansky** discovered radio waves coming from the Milky Way, he ushered in a new way of examining the universe around us. Seven years later, in 1941, another American, **Grote Weber,** used a home-made 34-ft. parabolic radio telescope to conduct the first sky survey of radio sources. And in 1964, Americans **Arno Penzias** and **Robert Wilson** discovered a persistent microwave "buzzing" signal that seemed to be coming from everywhere in the sky**.** It was the cosmic microwave background (CMB) – radiation echoing from the birth of the cosmos.

There are many other sources of radio signals in the universe (including terrestrial sources, of course); all of them generate a steady stream of emissions, 24/7. Seti researchers know this and discount them in their work. Their vision of E. T. – or at least the signals he might send – differs from everything else out there, the way that American plains Indians' smoke signals differed from clouds in the sky.

If E. T. is trying to contact us, his signals will differ from normal emissions in two ways. Taken together, they will identify him as surely as fingerprints left at the scene of a crime.

Seti's detectives are searching for a signal that, at least briefly, is more *focused* than what they're used to receiving, since someone (or something) is sending it out like a searchlight beam, hoping that we'll see it. And it will be *sporadic* (but ongoing), in order for us to distinguish it from the constant hum of radio waves emitted by the rest of the universe.

Searching for E. T. is, of course, a modern phenomenon – more modern, in fact, than most people realize. Prior to 1959, there were only a couple of (failed) attempts to find E. T. or let him know where we are.

In 1959, however, *Nature* Magazine published an article, "Searching for Interstellar Communications," by **Philip Morrison** and **Giuseppe Cocconi**. That same year, a young man

named **Frank Drake**, perhaps inspired by reading the article, conducted "Project Ozma," the first organized search for alien intelligence.

Drake thought that extraterrestials living beyond our solar system might be trying to contact us by broadcasting radio signals at certain frequencies. He rented time on the National Radio Astronomy Observatory's radio telescope and scanned a 400-kilohertz radiation band from two nearby Sun-like stars. He found no evidence of alien transmissions during his year-long search. Project Ozma shut down after one year due to lack of funds, but the seed was sown.

Well, sort of…

Seti-type thinking faced severe religious opposition during the Inquisition years. An almost equally formidable – and unexpected -- opponent arose in the 1960s: *astronomers,* many (if not most) of whom linked Seti with the lunatic fringe of UFOlogists who were convinced that aliens walk among us. Many astronomers scoffed at the idea of wasting money on "fairy-tale" research that could be better spent on *real* research (i.e., their own research projects). It was a strange position for them to take. After all, science involves the pursuit of unanswered questions, and the question of whether life exists anywhere else in the universe has been around since humans first realized that those lights in the sky are other worlds.

There were other objections regarding Seti. Astronomers resented having to share radio telescope time with Seti researchers – and since the earliest Seti workers were not professional astronomers, their methods and search strategies were often questioned.

Early researchers also faced other problems: funding their research; scanning the broad range of radio frequencies at which aliens might broadcast signals of their presence; acquiring telescope time to monitor those frequencies and collect data; and analyzing the mass of data received by those telescopes. Here's an example of how these problems intersected:

Let's say that you were a lone Seti researcher, and you were able to raise funds to purchase a given amount of time with a radio telescope. In order to intercept an alien transmission, you would need to be on the same frequency they're using – and you'd need to be using the telescope *while they are transmitting signals.* And regardless of how many frequencies you were monitoring, you'd wind up with a mountain of data that needed to be examined if you were going to find that single "Aha!" moment that **Jodie Foster** had in the 1997 movie *Contac*t when she detected the alien signal. (Could that scene possibly have been more ridiculous? What are the odds that a Seti researcher wearing headphones and lying on the hood of her car one evening would suddenly hear an alien transmission? Still…I probably shouldn't complain, because the movie brought Seti to the public's attention. It showed people what Seti research was trying to accomplish.)

On the other hand, there *was* such a moment in real life: While using Ohio State University's "Big Ear" radio telescope in 1977, Seti volunteer **Jerry Ehrman** recorded what is now referred to as the "Wow!" signal.

While monitoring 50 frequencies, Ehrman briefly detected a new signal that was strong, focused and intermittent – precisely what Seti researchers look for. Ehrman wrote "Wow!" in the margin of the data sheet.

Unfortunately, the signal – which did not originate anywhere on Earth -- has never been repeated since then. Astronomers now think it probably was a brief transmission from a defunct space probe that was thought to be no longer capable of transmitting data.

With exceptions that you'll see later, there have been no more "Wow!" moments in Seti research since 1977. (Of course, there was the time a few years ago when researchers at an Australian facility recorded a strong signal every day at the same time. Excitement ran high until they discovered that a worker was heating his lunch in a microwave in the basement.) But the search goes on in a dramatically expanded fashion.

Turning the Tide. Here's how difficult it was for early extraterrestrial researchers to establish their field as a legitimate mode of scientific study:

*The SETI Institute (which popularized the acronym "SETI") was not founded until 1984, a quarter century after Frank Drake conducted his ground-breaking – but small and ultimately fruitless – search for E. T.'s whereabouts. During those intervening years, most searches were individual,

privately-funded efforts. The results of those scatter-shot projects was predictable: They were simply too small to have any hope of producing meaningful results.

*More important, NASA didn't consider becoming involved until the 1970s – and even then it took two more decades of workshops, discussions and feasibility studies for NASA to decide to enter the chase.

MOP and Beyond. NASA came aboard in a big way in 1992, providing funding for an initiative called the Microwave Observing Project (MOP). Congress slashed its funding to the bone the following year – but MOP searched more of the sky during its first five minutes of operation than all of the individual Seti projects in the previous 30 years combined!

Trouble is, politicians want a quick return for their investment of taxpayer dollars, and that isn't possible with Seti research. The only way for Seti to accomplish its goal is to find E. T.

It's easy to fund ongoing research for cures for diseases: they have a direct, immediate and positive impact on mankind. But finding evidence of intelligent or even microbial life in the universe? Even if they are out there somewhere, So what? They will or will not still be there, regardless of whether we look for them. Many people regard Seti as an attempt to satisfy intellectual curiosity at the expense of funding more important research projects.

You can decide for yourself whether such thinking is justified. As for NASA – well, they still fund MOP research, although it accounts for less than 0.1% of their budget. But MOP is still operating, and it is helping to revolutionize the search process in ways that were unheard of a few years ago.

Ultimately, though, NASA'S greatest contributions to E. T. research may have been *credibility* and *acceptance*. Seti is no longer regarded by astronomers as a pseudoscience. Astronomers are participating in Seti research projects, and the public likes the idea of searching for life on other worlds. Along with movies like *E. T.: The Extraterrestrial*, *Contact* and others, NASA's involvement and support has legitimatized the idea of searching for life on other worlds.

While congressional funding for extraterrestial research by NASA has diminished, the research is ongoing and in fact expanding, thanks to the support of private organizations such as the Planetary Society and the SETI Institute, and individual contributors such as **Steve Jobs**, **Steven Spielberg** and other corporate and media bigwigs who provide millions of dollars annually for Seti research.

The SETI Institute, a non-profit research group, came up with a brilliantly innovative search technique: One of their initiatives, SETI@Home, parcels out data to millions of people around the U. S. Participants run a program that uses space on their personal computers to look for artificial signals in the data that SETI collects and sends them. The enticement for participating is powerfully alluring*: If YOU are the one who finds the looked-for signal, you will be forever known as the person who discovered extraterrestrial life!*

FRAC once had a member, **Neal Wellons** of Hampton, Ga., who participated in SETI@Home. Neal left his PC on when he went to work every morning and checked the data when he got home. If (as was always the case) he didn't find the hoped-for good news, he reported the results, erased the data from his PC and started over again the next morning.

Neal didn't find E. T. – but on the other hand, no one else did and he greatly enjoyed working with SETI@Home. He began in the late 1990s, and for all we know he's still doing it.

At any rate, the use of such programs permits SETI to use millions of computers to search for E. T., rather than relying on one or more super computers to wade through the data.

Enter the Digital Age. Originally, researchers could search only a few radio frequencies at a time, so they zeroed in on the ones they thought aliens might be using. Over time, however, the development of new technology and improved equipment permitted them to expand their searches to hundreds of frequencies simultaneously.

Today, armed with digital technology, custom integrated circuits and supersensitive receivers, programs such as MOP and others are capable of scanning tens of millions of frequencies

simultaneously. Today's receivers are so sensitive that the 1,000-ft. dish at Arecibo, Puerto Rico can detect a signal with no more strength than a rural radio station transmitter from aliens on the other side of the Milky Way.

Here are two of SETI's current projects:

*__The Allen Telescope Array.__ Once known as the One Hectare Telescope, the ATA is an array of connected radio telescopes located at the Hat Creek Radio Observatory, about 300 mi. NE of San Francisco.

Microsoft co-founder **Paul Allen** has donated more than $30 million to the ATA project, which, when completed, will consist of 350 three-meter dishes. (Only 42 dishes are presently in operation; the rest are under construction with funds provided by Allen.) SETI searches for alien signal transmissions between 6 p.m. and 6 a.m. every night, 7 days a week. Cloudy nights don't affect radio wave reception.

***Optical SETI.** Traditional searches for E. T. have involved the use of radio telescopes to search for unusual signals amid the normal stream of radio emissions coming from beyond Earth. In a radical departure from such methods, in the late 1990s SETI came up with a novel approach: combining traditional optical telescopes with hypersensitive pulse-detecting systems in order to search for brief but intense laser pulses that would announce the whereabouts of alien beings in other star systems who might be trying to contact us.

To conduct such searches, SETI is using the 40-in. Nickel Telescope at Lick Observatory, located a short distance E of San Jose, CA. It features three light detectors that search for brilliant pulses of light that last less than a billionth of a second.

When SETI first tried out pulse-detection experiments they used one light detector, resulting in frequent false alarms created by exoplanets' parent stars. Since they began using three detectors, their false alarm rate has fallen to about one a year. (The more light detectors you use, the less likely it becomes to record false-alarm laser pulses on all of the detectors simultaneously within the same billionth of a second.)

Thinking Bigger. It's a big universe out there, and SETI researchers have never been accused of thinking small. They wax enthusiastically about future projects they might be able to pursue someday.

One of their ideas involves sending a spacecraft beyond the solar system. (Hey, it's been done before with *Voyager I* and *Voyager 2*!) That spacecraft, equipped with a beacon and receiver, would use the Sun as a gravitational lens to broadcast signals across the cosmos.

Another item on SETI's bucket list is to use the increased resolving power of future space telescopes to analyze the spectra of light emissions reflected from exoplanets for signs of an alien civilization.

Conclusion. We haven't found E. T. yet. But the same could be said for heavier-than-air flight prior to 1903 when the Wright brothers made their historic flight at Kitty Hawk, N. C.

Nobody ever said that finding E. T. would be easy – and it hasn't been, and it won't be in the future. Radio telescope searches have to factor in (and filter out) things like the cosmic microwave background and terrestrial interference. Optical searches have to do the same with starlight, cosmic rays and other visual interference that can trigger false alarms.

Still…As someone (actually, me) once said, *Don't bring a cap gun to a gunfight.* In terms of Seti research, yesterday's cap guns are today's laser-guided smart bombs. Who know what tomorrow will bring?

If E. T. is out there, we WILL find him. As **Maynard Pittendreigh** put it, "I grew up at a time when we wondered if there were planets around other stars. No one asks that question now. I am convinced that my grandson will live in a time when no longer will anyone wonder if there is life in the universe, they will know. I am beginning to believe that that time will come in my lifetime." (*The Observer*, July 2016, p. 5.)

I'll wind this up with the thoughts of Philip Morrison and Giuseppe Cocconi, the men whose 1959 *Nature* article sparked the Seti movement into existence, regarding the search for E. T.: "The probability of success (of searches for extraterrestrial life) is difficult to estimate. But if we never search, the chance of success is zero."

P.S.: **Hot Off the Presses**: "The Murchison Widefield Array, a new (radio) telescope in Western Australia, has developed the first low-frequency capabilities for Seti, searching in the 103 and 133 megahertz band, which places it from the higher end of FM radio up to aeronautical bands. This range makes it easy to rule out terrestrial interference while providing opportunities to listen for Seti signals while gathering other astronomical data." (*Astronomy,* Dec. 2016, p. 8)

Also from that issue (p. 9): The media went berserk with eager anticipation when it was announced last August that a strong signal in the 11 gigahertz band was detected in 2013 by a radio telescope in Russia. *E. T. had been found!*

Nope. The signal hasn't been repeated since then, which means that it could have been almost anything. It will have to be repeated in order to be regarded as evidence that we have finally located E. T.

Can you say *"Wow!* Part Two*"*?

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(This Special Edition of the Observer *is dedicated to two of FRAC's finest,* ***Alan Pryor*** *and* ***Steve Bentley****. Alan sent me an e-mail awhile back regarding two Seti articles that he had read. His e-mail reminded me that, in all my years of writing articles for the newsletter, I had never written extensively about the search for E. T.*

When I sent Steve an early draft, he said he loved it but he wished it had been longer. So I lengthened it. I hope you've had as much fun reading it as I did in writing it.

Thanks, Alan and Steve.)

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