SearchLites

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The Quarterly Newsletter of The SETI League, Inc.

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Help Wanted, Part-Time

by H. Paul Shuch, Executive Director Emeritus

You may have seen that issues of SearchLites, The SETI League's quarterly newsletter, have been getting rather thin lately. And if you happen to be a regular visitor to our website or Facebook page, you will have noticed that their content has become quite sparse as well. If you're a SETI League member (or even if you're not), you have nobody but yourself to blame for this dearth of content.

When Richard Factor and I founded The SETI League some 27 years ago, we enjoyed generous financial support from our Charter Members, allowing us to boast a paid staff of two whole fulltime employees. This luxury gave us the resources to generate content for our website and newsletters (Facebook came along some years later). Those of you who have been with us from the beginning may recall monthly editorials, frequent technical articles, several active awards programs, and regular Photos of the Week posted to our website. This wealth of new content attracted numerous new members, as well as copious grant funding. Success bred further success.

Alas, those days are long past. As your SETI League weathered recessions, pandemics, and countless other worthy causes vying for your financial support, we ultimately morphed into an all-volunteer organization, fully dependent upon our members for content and contributions. We founders have continued to contribute our efforts and dwindling resources (including working from home for this past year). But, let's face it, we're growing older, and as our energy wanes, we could surely use some help.

Looking at the website, I am embarrassed to see that we've skipped quite a few monthly guest editorials of late, it's been the better part of a year since we've posted a fresh Photo of the Week, we've issued merely three of our monthly SETI SuperStar Awards in the past two years, not one member has qualified to join our ExtraTerrestrial Century Club in a year and a half, and the last of our annual Bruno Awards was announced way back in 2013! Not only are we lacking contributions, but we're not even receiving nominations for the various prestigious honors we have previously been proud to bestow upon worthy SETIzens. Alas, both membership and participation are dwindling.

But, you can change all that! If you are operating a personal radio telescope, or have attended any interesting scientific meetings, why not send along some pictures? If you're doing anything new with software, a screen shot would be appreciated. If you have a new design, or a new idea, write it up for the website and newsletter. Maybe you care to suggest a worthy recipient to honor with our technical Bruno Award, or the Orville Greene Service Award. And, should you happen to browse an intriguing SETI-relevant website, why don't you nominate it for a SuperStar Award?

I'm here to assure you that your SETI League is not dead. Like the unfortunate parrot in the Monty Python sketch, it's merely pining.

Guest Editorials:

What Is An Exoplanet?
by Val Klavans, SETI Institute

From SETI Institute *Journey* eNewsletter, 12 November 2020, used by permission

Simply put, exoplanets are planets that lie beyond our solar system. So first, we have to understand the definition of a planet.

Planets are worlds that orbit our Sun, like Mars, Jupiter, and of course, our own Earth. In 2006, the International Astronomical Union adopted the infamous new definition of planet, which left out Pluto (now a dwarf planet):

- Planets must orbit our Sun
- Planets be large enough that their gravity forces their shape to be spherical
- Planets must clear their orbits of other material, so they are the largest body near their orbit

The prefix exo is short for extrasolar, meaning beyond the Sun, so exoplanets are just planets that orbit stars other than our Sun. As of October 1, 2020, we've discovered 4,354 exoplanets in 3,218 planetary systems. About 22% of those systems have more than one planet.

The main types of exoplanets we've discovered so far:

- Gas Giants: large planets with thick gas atmospheres, like Saturn and Jupiter
- Neptune-Like: ice giants with cold gas atmospheres, similar in size to Uranus and Neptune
- Super-Earths: a mix of rocky and gas-shrouded exoplanets, bigger than Earth, but smaller than Neptune
- Terrestrial: rocky, similar in size to our own Earth

You may have heard of Hot Jupiters, a commonly found type of exoplanet. They have the properties of gas giants, but orbit very close to their stars, giving them high surface/atmosphere temperatures. They also orbit around their star very quickly – in some cases, less than 1 day.

Another interesting example of exoplanets are known as lava worlds, Earth-sized exoplanets with extremely high temperatures. One example is known as Kepler-78b, which orbits its star at only 1% of the distance from Earth to our Sun. Kepler-78b's surface temperature most likely reach higher than 3,680 °F / 2,000 °C!

Habitable Planets

In our solar system, Earth is the only world that has been proven to have life. There may be life beneath the icy surfaces of moons orbiting Saturn and Jupiter, but we haven't discovered it yet.

Do habitable exoplanets exist? We don't know for sure, but there is a growing list of candidates. The closest discovered exoplanet which could possess life is just 4 light years away! Known as Proxima Centauri b, this Super-Earth is slightly larger than Earth and inhabits the closest planetary system to us. It orbits Proxima Centauri, a red dwarf star that is part of a triple star system called Alpha Centauri.

If there are living beings on Proxima Centauri b that have come to consciousness like us, they just might be looking back at us with their own telescopes wondering, just like we do, if they are alone in the universe.

How Many Alien Societies Are There?

by Seth Shostak
Senior Astronomer, SETI Institute

From SETI Institute *Journey* eNewsletter, 16 June 2020, used by permission

According to a new analysis from scientists at the University of Nottingham, we don't have a lot of alien company.

On June 15, two researchers published a paper in the Astrophysical Journal arguing that the Milky Way – which sports about 250 billion stars – could host as few as 36 alien societies. That's a small number, and rather less than the number of races that have appeared in Star Trek. The authors supplement their piddling tally with a second, more generous analysis in which they say that, OK, the count might be as many as a thousand.

Either way, their conclusion is that – like Michelin Star restaurants in Wyoming – extraterrestrial civilizations are few and far between. The implication is that our nearest cosmic chums are at least several thousand light-years away. If so, finding them will be hard, and having a conversation will be impossible.

So how did these British boffins arrive at such a depressing estimate? After all, there have been enough previous studies on this topic to fill a small horde of hard drives. Some of these conclude that the Milky Way houses millions of societies. Others claim that, nope, Earth is special and alone.

The Nottingham authors arrive at their low-ball estimate by using their own variant of the Drake equation – everyone's favorite method to gauge alien head counts. This equation, which can be found in the final chapters of nearly any astronomy textbook, is a concatenation of seven parameters that, when multiplied together, yield the number of technologically adept societies in the galaxy. The parameters include the abundance of Earth-like planets, the fraction that spawn life, etc.

However, it's the equation's last term that really rules the roost. It's the number of years that a technological civilization maintains its mojo. For how long does a society that's mastered physics and technology continue to beam radio or light waves into space? After all, if they stop doing so, we may never find them.

In estimating the lifetime of a technological species, the Nottingham researchers make a big assumption. They note that we've been beaming signals into the ether for about a century. That's fair enough. But then they invoke what they call the Astrobiological Copernican Principle (what others modestly call the Principle of Mediocrity) and maintain that the universe is engaged in a massive "Simon Says" game. Whatever we on Earth have done, the rest of the universe also does, or has done.

So because we've had radio for about a century, the Nottingham duo assume that all technological cultures will also use such technology for a century. But no longer.

You might not have any problem with that. After all, we haven't yet found any aliens. So if we don't know something – such as how long they might stay on the air once they invent radar, radio or television – it's tempting to take our own experience and apply it to everyone.

But that's like saying that, because we've had airplanes for a century, everyone will have airplanes for a century, and no longer. This is an astounding assumption. Radio can convey lots of information with a very low

energy cost. It may be a technology any society would use for much longer than 100 years.

Given the usefulness of radio, you could easily claim that the technological lifetime of societies is 10,000 years, not 100. If you argue for the larger number, the tally of inhabited worlds increases by a factor of 100.

In other words, this arbitrary assumption by the authors is largely responsible for their strikingly low estimate of the number of alien societies.

But wait, there's more.

A second premise in the Nottingham paper is similarly astounding: Namely, that every Earth-size planet in the habitable zone of its solar system will spawn life, and after about 4 – 5 billion years, intelligent life. (The habitable zone is that distance from a star at which an orbiting planet will be neither too cold nor too hot for water-based biology.)

Now of course most scientists nod their heads if you state the obvious: that Earth-like worlds can spontaneously generate living organisms. Many (but not all) would also concur that some will eventually evolve an intelligent species. But surely not all cousins of Earth are so blessed. That's like saying that every kid who takes piano lessons will inevitably win the Van Cliburn Prize. Each and every one.

There's even a handy counter-example nearby. The habitable zone of our own solar system includes Earth of course, but also Mars and – depending on your personal predilections – Venus. Neither Mars nor Venus is observed to have life, let alone technically competent life.

The Nottingham paper has garnered a lot of attention because it says that the count of inhabited worlds is paltry. But don't be discouraged. You can make your own assumptions and derive just about any estimate you wish for the number of intelligent cosmic species. For myself, I figure that an absolute minimum would be 70, the number that managed to bag speaking roles in Star Trek.

Regarding Detection of Phosphine in Venus by Commission F3 (Astrobiology), International Astronomical Union, Masatoshi Ohishi, President

Astrobiology is the study of the origin, evolution, and distribution of life in the Universe. Astrobiology aims to answer the famous question, "Are we alone?" Commission F3 (Astrobiology, hereafter "the Commission") of the International Astronomical Union (IAU) was established in August 2015. The subject of astrobiology is an interdisciplinary subject, and our members come from diverse backgrounds, ranging from astronomy, biology, chemistry, Earth science, geology, and planetary science. The Commission has 206 members and one associate, as of October 5, 2020.

Any astrobiology research is serious and challenging across diverse fields. It encompasses the search for extant life, evidence of past life, or evidence of prebiotic chemistry on solar system bodies, including Mars, Europa, Titan and Enceladus. It includes the search for planets around other stars and potential spectroscopic evidence of habitability and biological activity; the origin of the biogenic chemical elements and the study of biologically relevant molecules in the interstellar medium and in primitive solar system objects such as comets, undifferentiated asteroids and some meteorites. The search for intelligent signals of extraterrestrial origin and the study of the

origin, early evolution, and environmental constraints for life on Earth are important components of astrobiology. The Commission is charged with the coordination of efforts in all these areas at the international level and with the establishment of collaborative programs with other international scientific societies with related interest.

In September, 2020, a possible detection of a single phosphine (PH3) line in the Venusian atmosphere was published in Nature Astronomy (https://www.nature.com/articles/s41550-020-1174-4). The authors stated that the detected phosphine abundance could not be reconciled based on our current knowledge of abiotic chemistry on Venus. Consequently, the authors proposed a hypothesis that the phosphine could be formed through a biological process in microorganisms floating in the Venusian atmosphere. We are aware that there are interesting research results that have not yet been proven. For example, there was in 1996 a report on the possible discovery of micro fossils in the Martian meteorite, ALH84001. As soon as the paper was published, hot debate among relevant researchers erupted concerning many aspects of the claimed discovery and its interpretation. The Commission understands that the claimed discovery has still not been proven as of today, although the paper contributed much to the astrobiology community.

In this regard, the Commission is concerned with the way the potential detection of phosphine has been covered for the broad audience. It is an ethical duty for any scientist to communicate with the media and the public with great scientific rigor and to be careful not to overstate any interpretation which will be irretrievably picked up by the press and generate great public attention in the case of life beyond Earth. The way results about phosphine were reported lead some news organization to report that evidence for life in Venus was found. The Commission understands that such a reaction by the press would reflect high interest in astrobiology research by the public. Such a report, however, misleads the public, and might be harmful to the advancement of astrobiology research.

Finally the Commission would like to remind the relevant researchers that we need to understand how the press and the media behave before communicating with them. It is quite important for any researcher to keep a good relationship with the press since they have great power to disseminate our research results to the public. We, researchers, should provide the press with sufficient background information so that they can report our research outcomes as faithfully and scientifically as possible.

Disclaimer: The opinions expressed in editorials are those of the individual authors, and do not necessarily reflect the position of The SETI League, Inc., its Trustees, officers, Advisory Board, members, donors, or commercial sponsors. ❖

Event Horizon

SearchLites readers are apprised of the following conferences and meetings at which SETI-related information will be presented. League members are invited to check our World Wide Web site (www.setileague.org) under *Event Horizon*, or email to us at info@setileague.org, to obtain further details. Members are also encouraged to send in information about upcoming events of which we may be unaware.

January 28 - February 4, 2021: *43rd COSPAR Scientific Assembly*, Sydney Australia.

April 18, 2021, 1300 EDT: Twenty-Seventh SETI League Annual Membership Meeting, Little Ferry, NJ.

June 21 - 24, 2021: *Penn State SETI Symposium*, State College, PA.

August 25 - 29, 2021: *79th World Science Fiction Convention*, Washington, DC.

October 25 - 29, 2021: *71st International Astronautical Congress*, Dubai, United Arab Emirates.

2022 (dates to be announced): *72nd International Astronautical Congress*, Paris, France.

2023 (dates to be announced): *73nd International Astronautical Congress*, Baku, Azerbajian. ❖

SETI League members are encouraged to nominate SETI-relevant websites for our monthly SETI SuperStar Award. Nominating emails to our Awards Committee may be sent to: Awards_at_setileague_dot_org. Please be sure to indcate the URL of the candidate website you are nominating, and a brief explanation as to why you consider the site worthy of recognition.

Breaking News: Arecibo Farewell

The SETI League is saddened to report the demise of the Arecibo Radio Telescope on 1 December 2020. The 305 metre diameter dish, for half a century the world's largest, collapsed following structural failure of two of its receiver platform support cables. The archival photos below show Prof. H. Paul Shuch, our Executive Director, at the facility in July, 2007.

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SETI League memberships are issued for the *Calendar Year*. Please check the expiration date indicated on your mailing label. If it reads December 2020 or earlier, you have already expired, and *must* renew your SETI League membership **now!** Please fill out and return this page along with your payment.

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Annual memberships are issued for the calendar year. Those processed in January through April expire on 31 December of that year. Those processed in September through December expire on 31 December of the *following* year. Those members joining in May through August should remit half the annual dues indicated, and will expire on 31 December of the same year.

Order Your Membership Premiums:

	(u /c)*	(o)*
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