WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Astrobiology and Extraterrestrial Intelligence: Search for Universe Intelligent Fundamental Life Sign

Amit Rastogi[1], Elena Baryshnikova[2]

[1]Research Scientist cum Research Assistant Professor cum CEO cum Director Executive, Amit Biosciences & Bio Nanotechnology, An Autonomous Non Employed Research & Development

[2]Co – Founder, Amit Biosciences & Bionanotechnology

Mail id: amit010@yandex.com

ABSTRACT

Life is a cosmic phenomenon which is referred to as extraordinary hypothesis needed extraordinary evidence to define them. The Search for Extra-Terrestrial Intelligence (SETI) at the moment is 60 years old as a scientific discipline. Also extraterrestrial intelligence is associated with existence of life on another planet. Modern SETI focused mainly for the search of other civilizations in the MilkyWay. For this purpose around 1960 a Soviet astronomer, named Gennady B. Sholomitsky identified CTA-102 quasar as a super civilization. Recently, Scientists are using Macro-engineering approaches to explore advanced intelligent space exploration. Moreover, Microbial Flora in space is necessary for space exploration and planetary protection.

Advanced Introduction

Life is a cosmic phenomenon which is referred to as extraordinary hypothesis needed extraordinary evidence to define them. (https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=d4f7d61f8bdde7e4bc80313afb33fb9e50314b1a).

Mars Planet is always targeted to study extraterrestrial life from more than 200 years. However, recently moon, Titan and Europa gaining attention of scientists for the search for extraterritial microbes. (https://www.astronomy.com/science/is-there-life-on-mars-titan-or-europa/#)

We are not alone in the universe or cosmos, our universe is associated or communicates with extraterrestrial intelligence community & population. Mars Planet which is also called Red Planet is the most popular location for extraterrestrial life to be found on such as intelligent community and population (Arrhenius et al., 1996)

The Search for Extra-Terrestrial Intelligence (SETI) at the moment is 60 years old as a scientific discipline. Also extraterrestrial intelligence is associated with existence of life on another planet. Detecting the existence of life in planetary system elsewhere or beyond the planetary system will not be never simple, also artificial intelligence too. Life is originated from Mars Planet and transferred on earth & it is still going on. Moreover, spacecraft have sent to Mars Planet to detect to find life clews and also to analyse Martian meteorites to find possible evidence of life. However, no definite answer was found till now. NASA and ESA designed spacecraft to detect life on Mars Planet in form of water, probiotic chemistry or to detect biologically derived molecules which are the sign of life existence on Mars Planet. Proteins and enzymes are excellent target compounds to search for life on Mars Planet and elsewhere, also organic are targeted to search the same. For this purpose Mars Organic Detector (MOD) was developed to detect all those on the Martian surface. Also infrared based remote sensing technology was also incorporated to find the sign of life such as water molecule and gases such as carbon dioxide and ozone in the atmosphere of extra-solar planets (Bada, 2001).

The discipline of astrobiology includes two sections such as technological and philosophical. The technological section includes spectroscopes, telescopes and accessories to understand and research & development for astrobiology. According to technological section to make understanding and to perform research & development James Webb Space Telescope in 2021 was launched by NASA to detect Earth like atmosphere in the Earth sized exoplanets. Webb Telescope or similar spacecraft can detect atmosphere which is made up of Oxygen, Carbon dioxide and Methane, a strong indication of possible life. Future advanced telescopes will detect signs of photosynthesis which is transformation of light into chemical energy by plants. Light from the atmospheres of exoplanets can be linked to life clews (exoplanets.nasa.gov) search-for-life (http://exoplantes.nasa.gov).

The discipline astrobiology includes the search for life evidence beyond Earth elsewhere in the Solar System and also in exoplanets. The discipline of astrobiology explain what is life in the form of Physics, in the form of chemistry or in the form of biology, how and what conditions permits and constrains active life, how and why microbes determines planetary health which impact the biosphere (Hallsworth et al., 2021).

Furthermore, astrobiology is multidisciplinary fundamental science with how does life fundamentally begin and evolve, does life fundamentally exist elsewhere in the Universe, the future of fundamental life on Earth and beyond. Astrobiology approaches to understand the life in the Universe, SETI

explains understanding of who, what, and where intelligent life is, and how to find it. Moreover, How much abundant and diverse is intelligent life in the Universe. Furthermore, the ways by which intelligent life communicate, ways to detect it, and to make understanding how intelligent life interacts with its fundamental environment and communicates information is main to make understanding and develop technology towards it, is the core of the Search for Extra-Terrestrial Intelligence (SETI) (Cabrol, 2016).

Telescopes for Astrobiology

For astronomical observatories, science grade instrumentation and remotely or robotically operated telescope systems are required. General Telescopes used in astrobiology are table top telescope, celestron star sense explorer DX 130 AZ, sky watcher star quest 130 P newtonian reflector, acular voyager MAK 80 telescope, celestron star sense explorer LT 70 AZ refractor, sky watcher heritage 100 P tabletop dobsonian, celestron omniXLTAZ10L refractor or basic mount, brazzer messier AR 801640 AZ NANO telescope, celestron inspire 100 AZ refractor, meade light bridge mini 130 dobsonian, sky watcher Evostar 90 basic scope or mount, sky watcher sky hawk 1145 P syn scan altaz GO – Newtonian, celestron 114 LCM computerised telescope, sky watcher heritage 150 P flexible dobsonian, sky watcher star discovery P 150 Wi-Fi telescope, starbase 80 refractor & mount package, sky watcher explorer 130P AZ GO – 2, unistellar eV scope e quinox digital telescope. Advanced telescopes tool are discussed below.

Spitzer Space Telescope

The Spitzer Space Telescope in 2003 was designed and fabricated by NASA to understand infrared astronomy and to perform research & development in the same field. Moreover, Spitzer Space Telescope (Spitzer) provides most powerful tool for astronomical explorations between 3.6 and160μm (Michael Werner, 2012). The Spitzer Space Telescope returns excellent scientific data from its Earth-trailing solar orbit. The Spitzer Space Telescope (Spitzer) combines the intrinsic sensitivity which is achievable with a cryogenic telescope in space with the high quality imaging and spectroscopic power to provide the user community to explore the cosmos in the infrared (Werner, 2004).

James Webb Space Telescope

The James Webb Space Telescope (JWST) is the Infrared successor to the Hubble Space Telescope with cryogenic infrared space observatory. The James Webb Space Telescope (JWST) contains a telescope, an instrument package, a spacecraft, and a sunshield. The James Webb Space Telescope (JWST) was invented to understand first galaxy or galaxies in the universe or cosmos or any other universe out of the universe (Jonathan P. Gardner et al., 2006).

Ritchey-Cretien Telescope

The RC design was created by George Ritchey & Henri Chrétien in 1910 as a variant of the Cassegrain telescope with hyperbolic primary and secondary mirror having compact layout. The spectral range of Ritchey-Cretien Telescope is 400-900 nm where as filter band is 2 Panchromatic + 6 Multi-Spectral (Sheng-Feng Lin et al., 2020).

Large-Aperture Space Telescope

Large-Aperture Space Telescop follows the principles of next generation of Ultraviolet/Optical/Infrared Surveyor (UVOIR) space observatory (Trumper et al., 2018).

SETI and Multivese

The scientists are working on to solve the problem of contacts with extraterrestrial civilizations that exist in outer space from 1959 within the banner of SETI project (Search for Extraterrestrial Intelligence). (https://www.scirp.org/journal/paperinformation.aspx?paperid=75191). It has till at to be proven that space intelligence in terms of fundamental has any survival value. However, it exists in terms of survival which is sometimes called alien intelligence in multiverse either or in universe. Modern SETI focused mainly for the search of other civilizations in the MilkyWay. For this purpose around 1960 a Soviet astronomer, named Gennady B. Sholomitsky identified CTA-102 quasar as a super civilization. Recently, Scientists are using Macro-engineering approaches to explore advanced intelligent space exploration. The multiverse concepts are used in to search for both life and intelligence to/of other universes. (https://arxiv.org/ftp/arxiv/papers/1607/1607.06114.pdf)

Communication with Extraterritial life in universe

The nearest neighbor to our solar system is Alpha Centauri whose planetary system is probably too young for the emergence of life to understand and observe. There are two another heavenly friends, Epsilon Eridani and Tau Ceti are stronger contenders to understand and observe accommodation of extraterrestrial life. Epsilon Eridani and Tau Ceti were targeted to study by Dr. Drake in 1960 in Project Ozma to detect possible intelligent signals from outer space. The frequency selected for listening the signal from outer space was selected and set 1420.405752 megacycles per second with wave length of 21 cm. Moreover, this frequency was within the range of radio frequencies which was able to pass through the earth's atmosphere to detect alien signal. The significance of this frequency would be known to other intelligent life in the universe who understands radio theory. Moreover, as radio waves are

communication medium to detect signal from outer space another possible medium to detect signal from outer space are MASER, LASER, RASERS and beam of neutrinos were tested in labs for the same purpose. In any circumstances another civilization will try to establish communication with us, it would first launch on attention-getting signals to receive a recognizable signal which interpret good chance of understanding the message from outer space. These attention-getting signals are followed by "language lessons," to be combined with the elements of technical information to help to bring us up to the level of our superior to them. (https://www.nsa.gov/portals/75/documents/news-features/declassified-documents/tech-journals/communications-extraterrestrial-intelligence.pdf)

For the communication and the number of directions in which signals to be sent and searched for extraterrestrial communication are assumed to be fixed at 203.385 GHz where as optimal wavelength region for communication with extraterrestrial intelligence is $\lambda = 1.5$ mm (Kardashev , 1979).

How to Claim Life & Its Detection

Recent discoveries shows that early Mars was habitable for life as discussed above. Moreover, Enceladus, sixth largest moon of Saturn, might be habitable for life such as extraterristial life and many stars who have Earth-sized exoplanets whose insolation favors surface liquid water which may be habitable for life such as extraterristial life. (http://geosci.uchicago.edu/~kite/doc/Kite_Gaidos_Onstott_Astrobiology_2018.pdf). Criteria for a detection of life define the proof related to it which are cause of discoveries. These criteria depend on the community of clews related to life sign and the discoveries related to its which become established as a claims for life sign and debated in Science conferences worldwide. Life-detection measurement must be sensitive or sensitivity, contamination-free, repeatable as one or more features must be sufficiently, detectable, preserved (survivable), reliable (measurably different from expected abiotic signals), compatible with life sign as we know and the biological interpretation. (https://www.liebertpub.com/doi/10.1089/ast.2017.1773). Scientific values for life detection are reach, grasp, certainty and payoff which are discussed below. First measure of life detection is a reach which defines how many independent opportunities to find life are there at the specific place to be investigate to identify the sign of life which depends on the size and diversity of the target environment such mars surface and the fraction of the target environment that will be effectively sampled by the team. Second, grasp can be defined as equal to one minus the probability false negative where as false negative probability is defined as which is relative to the best available pre-launch understanding of the distribution of bio-signatures or bio-cosmos in which the specific materials to be actually investigated such as rock-hosted soil, water etc. Third detection measure is certainty which is equal to unity in conditions where the post-detection probabilities of a false positive is low enough which permits scientific consensus, and sometimes zero (https://www.liebertpub.com/doi/10.1089/ast.2017.1773). Recent examples of scientific certainty include the discovery of Neanderthal DNA and gravitational waves. To find an independent origin of life is always scientific breakthrough where breakthrough must have a payoff that will depends on the nature of the evidence of life sign. (http://geosci.uchicago.edu/~kite/doc/Kite_Gaidos_Onstott_Astrobiology_2018.pdf).

Largest Identified Extraterrestrial Molecules

The largest known molecules on Earth and in universe or at planetary bodies or in their surrounding or far environment is genetic DNA or RNA blueprint which means the information required to build and maintain an organism from this genetic DNA and RNA blueprint. In this paragraph we are talking about Male and Female DNA & RNA along with alien DNA and RNA with beneficiary microorganism genetic material for both of them. In 2005 a molecule 1,3-Dihydroxyacetone ($C_3H_6O_3$) from the cloud located near the centre of the Milky Way galaxy was detected and identified which was known as Extraterristial molecules. Moreover, in 2010 $C_{100}H_{70}O_{12}N_3S_2$ was also considered as Extraterrestrial molecules. Furthermore, protein glycine ($C_2H_5NO_2$), and the sugar ethylene glycol ($C_2H_6O_2$) was also considered as Extraterrestrial molecules.

(https://www.nasa.gov/pdf/637832main_Astrobiology_Math.pdf).

International Space Station Space Microbiology

Extremophiles and extrmotolerent are understand extraterrestrial microorganism or originated from them in most literature. Extremophiles and extremotolerant microorganisms were isolated from Low Earth Orbit by the International Space Station (ISS). The ISS is international space station with application in microbiology research as 'microbial observatory' to study the effect of space conditions on microbial flora. According to Astrobiology, the study of microbial life in space to understand the phenomenon and fundamental of origin of life is necessary. Microbial Flora in space is necessary for space exploration and planetary protection. Moreover, many terrestrial microorganisms was/are being study for their applications in space. Furthermore, CRISPR in space microbiology have significant application. The ISS-Kibo facility was introduced by Japan to study microbial life in space stress. However, scientists are working on to understand molecular mechanism of the survival of microorganisms in the space in harsh stress condition which is poorly known (https://ntrs.nasa.gov/api/citations/20210025473/downloads/Chapter%208-%2002.12.21_Final%20Copy.docx.pdf).

Concluding Remark

As astrobiology is the search of life in space in the form of light, microbial flora, or in the form of extraterrestrial molecules such as DNA, RNA. For this purpose The Search for Extra-Terrestrial Intelligence was introduced. To develop astrobiology and Search for Extra-Terrestrial Intelligence research there is a great requirement to develop advanced telescope to finds fundamental life clews. Moreover, advanced AI and bioinformatics tool will also play an important role in the development of astrobiology research. To develop astrobiology research there is a great requirement to search new space territory

such lake, mountain, rivers and new planet discovery will also play an important role to develop astrobiology and SETI research. To established astrobiology and SETI research there is a great need to open astrobiology and SETI lab worldwide.

References

[1]https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=d4f7d61f8bdde7e4bc80313afb33fb9e50314b1a).

[2]https://www.astronomy.com/science/is-there-life-on-mars-titan-or-europa/#)

[3]Gustaf Arrhenius and Stephen Mojzsis, 1996, Extraterritial life: Life on Mars- then and now, Current Biology, Vol. 6, No. 10, pp. 1213-1216

[4]Jefferey L. Bada 2001, State of the art instruments for detecting extraterrestrial life, PNAS, 98, (3), 797-800.

[5] (http://exoplantes.nasa.gov)

[6] Hallsworth et al., 2021, Astrobiology of life on Earth, Environmental Microbiology, Environmental Microbiology (2021)23(7), 3335–3344

[7]Nathalie A. Cabrol, 2016, Alien Mindscapes—A Perspective on the Search for Extraterrestrial Intelligence Astrobiology,16(9): 661–676.

[8] Michael Werner, 2012, The Spitzer Space Telescope, Optical Engineering 51(1), 011008-1-7

[9] M. W. Werner, The spitzer space telescope mission, The Astrophysical Journal Supplement Series, 154:1–9, 2004

[10] Jonathan P. Gardner et al., 2006, The James Webb Space Telescope, Space Science Reviews (2006) 123: 485–606.

[11]Sheng-Feng Lin , Cheng-Huan Chen 2, and Yi-Kai Huang, Optimal F-Number of Ritchey–Chrétien Telescope Based on Tolerance Analysis of Mirror Components, Applied Sciences, 2020, 10, 5038, pp. 1-9.

[12]Isaac Trumper, Pascal Hallibert, Jonathan W. Arenberg, Hideyo Kunieda, Olivier Guyon, H. Philipstahl, and Dae Wook Kim, Optics technology forlarge-aperture spacetelescopes: from fabricationto final acceptance tests, /Advances in Optics and Photonics, Vol. 10, No. 3, September 2018. 644-701.

[13] https://arxiv.org/ftp/arxiv/papers/1607/1607.06114.pdf

[14] https://www.scirp.org/journal/paperinformation.aspx?paperid=75191

[15]https://www.nsa.gov/portals/75/documents/news-features/declassified-documents/tech-journals/communications-extraterrestrial-intelligence.pdf)

[16] N. S. Kardashev , 1979, Optimal wavelength region for communication with extraterrestrial intelligence: λ = 1.5 mm, Nature , volume 278, pages 28–30

[17] http://geosci.uchicago.edu/~kite/doc/Kite_Gaidos_Onstott_Astrobiology_2018.pdf

[18] https://www.liebertpub.com/doi/10.1089/ast.2017.1773).

[19]https://www.liebertpub.com/doi/10.1089/ast.2017.1773.

[20] http://geosci.uchicago.edu/~kite/doc/Kite_Gaidos_Onstott_Astrobiology_2018.pdf).

[21]https://www.nasa.gov/pdf/637832main_Astrobiology_Math.pdf).

[22](https://ntrs.nasa.gov/api/citations/20210025473/downloads/Chapter%208-%2002.12.21_Final%20Copy.docx.pdf).