2021 Space Renaissance – The Civilian Space Development
Space Renaissance International 3rd World Congress – June 26th – 29th 2021

At the Intersection of an Evolutionary Singularity, Space Migration and Intelligent Panspermia

Charles Ostman Email: charles.ostman@historianofthefuture.com

Symposium 4 SYMPOSIUM ON THE CONGRESS THESES
Theme 4.1 Congress - Status of civilization and perspective of expansion into outer space

☒ this paper was not published before

☒ I agree that Space Renaissance International will publish this paper on their websites and publications

Abstract

Often the question has been asked, what is or are the primary motivations for exploration of, and eventual migration into space beyond the boundaries of the home planet. Various definitions of an approaching evolutionary "singularity" have been offered, most notably a threshold when "artificial intelligence" and human intelligence merge into an indistinguishable continuum. Suggested here, however, is that rather than the singularity in this context being a definable, singular event horizon, is instead an evolutionary transition era. The definition of being "human" itself is in a state of flux, as various aspects of what is commonly referred to as "transhumanism" are already becoming apparent, and will continue to accelerate as a form of artificially enhanced evolution. A metric indicative of the planetary civilization and representative examples of its "intelligent" lifeform type, would be not only having crossed the threshold of a unified AI and transhuman co-evolutionary symbiosis, but that this symbiosis is paralleled by and amplified with an accelerating exploration of and migration into extraterrestrial locales. Taken to a next stage logical outcome, this propensity for migration beyond the home planet spawning grounds into locales throughout the local solar system and eventually beyond translates into a what could be termed as a form of "intelligent panspermia", condensed genomic content mapped into an information matrix to be decoded elsewhere in the cosmos, even if its contextual inception was consciously unintentional. Outside the parameters of the usual reasons for justifying a seemingly unquenchable thirst for exploring our surrounding universe, there may be a grander, subliminal scheme at work here, that being a contributor to the intelligent panspermia information matrix that countless other planetary civilizations and lifeform types have already, and will continue, to participate in.

1 In the beginning . . .

Initially, the generally accepted theory about how life started on Earth (and by implication, on other worlds) was centered around the model of various organic molecules, being subject to specific conditions, would result in the formation of more complex organic compounds, eventually forming into amino acids, proteins, and eventually RNA and the building blocks of life as it is currently understood to be. This mechanism is referred to as abiogenesis.

In 1952, the famous Miller-Urey experiment showed clear evidence for this concept being possible [fig 1]. The experiment consisted of creating a sort of primordial environment, with methane, ammonia, hydrogen and water, inside a sealed apparatus that was then subjected to electric energy (simulating lightning), resulting in the formation of specific amino acids which are among the molecular building blocks for creating more complex, potentially life bearing molecular structures, including RNA. This was a ground breaking experiment, which went on to further the validity of the abiogenesis model.

It was against this backdrop that another theory was postulated, that being the concept of organic compounds, or even entire microscopic lifeforms, various bacteria and other extremophiles, organisms which could survive in stasis in the harsh conditions of space, brought to Earth via comets or meteorites.

This became known as the panspermia theory, which understandably fostered much debate and controversy between these two theories, in the context that these were seen as mutually exclusive models.

A different perspective, suggested here, is that neither of these have to be mutually exclusive, but rather that life on Earth began as a mixture of different circumstances, where organic molecules and eventually primitive single celled organisms formed here over an extended period of time (billions of years), in various locations, and in other locations, there were comet and meteorite impacts which carried these materials to the Earth. There is nothing to suggest that both of these two different models could not have been occurring over the extreme time scales from which various lifeform types emerged and symbiotically flourished

Given the frequency of impacts during the earlier, formative years of the Earth and solar system, it is not unreasonable to suggest that this panspermia process could have been part of the formation of life that occurred here. Essentially, this debate between panspermia vs. abiogenesis is an argument about points of origin, but does not necessarily define how life itself started. Experimental and observed evidence has supported the general concept of how life might have originated via the combination of potential organic molecules into more complex biomolecular structures leading toward the formation of primordial life, but does not confine the origins of life to either of these two distinct models.

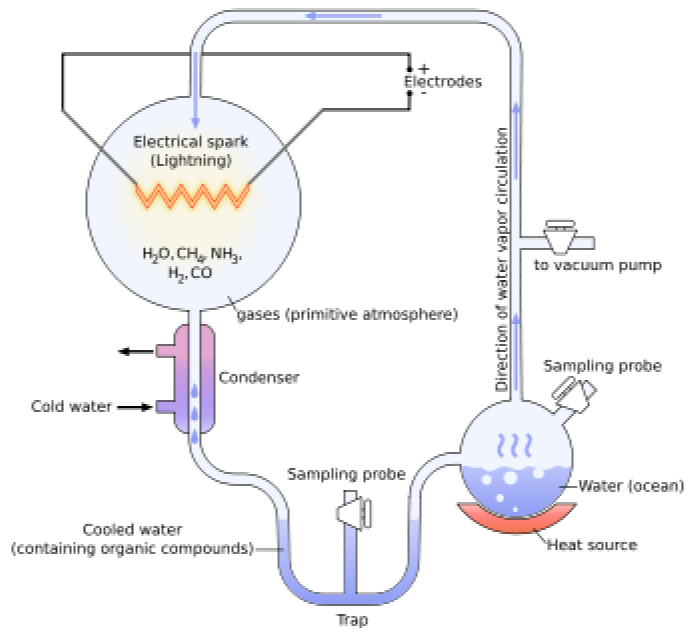

Fig 1 The Miller-Urey experiment, which simulated the environmental conditions of early Earth, which indicated the possibility of organic compounds being formed with electrical energy (lightning) catalyzing these chemistry reactions. This is considered a viable model of how abiogenesis may have originated.

The general consensus of the timeline for life to have appeared here on Earth ranges from 3.5 to 3.7 billion years ago, although there have been some recent discoveries that may set this clock back further, to 4 billion years and beyond.

That this process may have been accelerated or complimented with extraterrestrial input from impacting celestial objects is still a theoretical concept for consideration, but one of the more interesting versions of what could be termed as "extreme panspermia" being proposed suggests that the Earth was impacted by a moon sized planetoid which came into atmospheric contact, and exploded into a vast cloud of molten iron and other metals, along with other geological materials mixed into this atmospheric cloud which may have covered the Earth for centuries. A perpetual "storm" or radical alteration of the weather at that time would have resulted in these materials being rained down upon the Earth on a vast scale.

An early high density hydrogen atmosphere would have been an appropriate environment for the formation of proteins and other complex biomolecules from simpler molecular building blocks, eventually leading to the formation of RNA and the beginning edge of life formation [fig 2]. The concept with this model is that water here on Earth was broken apart into oxygen and hydrogen as a result of this extreme impact, the hydrogen remaining to form into a concentrated hydrogen atmosphere, and the oxygen being dispersed into space, a process which may have lasted for 200 million years or longer.

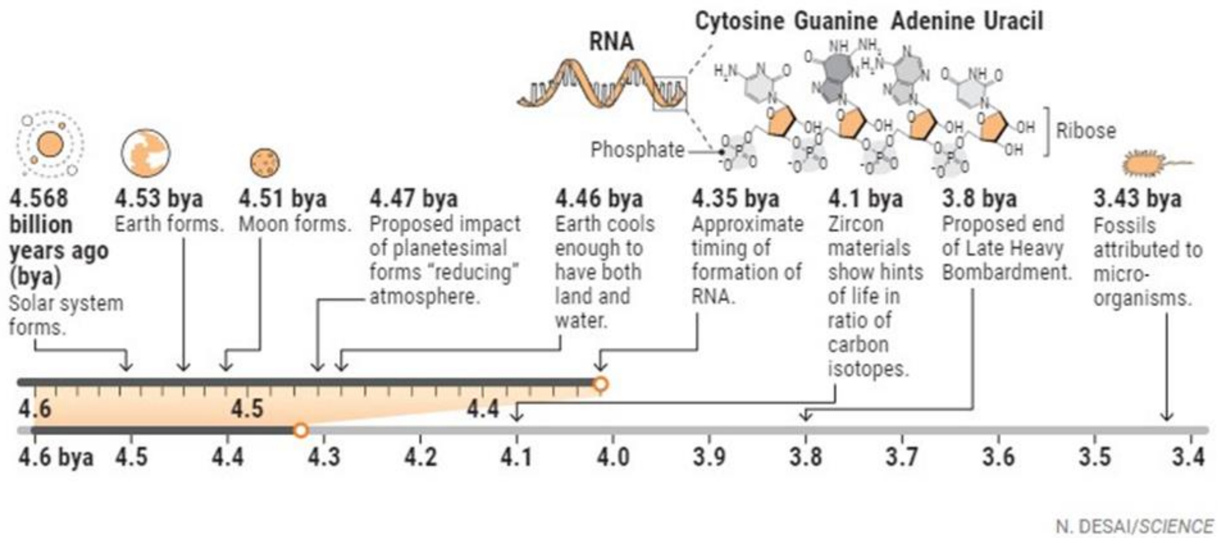

Fig 2 One of the proposed timelines for the formation of life here on Earth

To say the least, this was and still is considered a highly controversial concept, but does add another layer of quasi panspermia mechanisms into this debate.

Mass spectroscopy analysis of the content in some meteorite specimens has indicated the potential existence of proteins that had formed in the early stages of the universe as it developed. Recently, the discovery of an entire protein, hemolithin, embedded into at least two currently known meteorite specimens, has further enhanced the viability of this concept.

By whatever combination of contributing factors may have instigated and catalyzed life, as it is currently known to be on Earth, the assumption proposed here is that some form of panspermia was included in this process. It is at this junction that the panspermia model can be further subdivided into two main categories of process dynamics, "primordial panspermia", and "intelligent panspermia".

2.1 Primordial panspermia:

Comets and / or asteroids, impacting the early Earth as the planet aged and cooled, intersecting with bodies of water that became available, instigated the formation of life via potentially organic compounds (or even entire microorganism in stasis) brought in with those impact events. This is not necessarily the only mechanism that facilitated the formation of primordial life, but can be reasonably considered as a contributing factor.

The model suggested here is that both processes, panspermia and abiogenesis occurred at various times and locations throughout the formative stages of life development here on Earth. It is further suggested that this same process has been and is occurring elsewhere throughout the cosmos, in this galaxy and countless similar galaxies.

2.2 Intelligent panspermia:

An “intelligent” planetary species type evolves to the point that early civilization begins to appear, and organizes into larger and more complex societal systems. Though slowly at first, the civilizations in question begins to cross evolutionary milestones, in successive stages of development of societal organization and complexity, governance, trade, education, planetary connectivity and economic systems, industrialization, applied science and technology, which synergistically accelerates this evolutionary process.

There comes a transition threshold where science and technology, complexity and connectivity radically increases, synergistically compressed into ever shortening time scales, which fosters the relatively rapid inception of a series of technical developments that collectively can be referred to as a “singularity” threshold.

Even though various versions of the “singularity” model have been proposed, it is the position here that the approaching singularity is not really a singular anything, but rather an evolutionary transition process, if the civilization gets that far. This can be interpreted as a type of evolutionary event horizon, and by implication, a type of test being encountered.

Evolution tends to favor the most adaptive, not merely the “fittest”. In this context, the approaching singularity transition, likely to be a 1st stage singularity in a series of successive singularity stages, can be considered as a type of evolutionary test. Either the planetary civilization successfully adapts to this singularity threshold as it emerges, or becomes mired in instability, chaos and uncertainty, perhaps entirely missing its “window of opportunity” to utilize its most advanced technologies and industrial developments to catalyze and accelerate its migration into space and the surrounding solar system.

3 The “Singularity”, what is it, why is it relevant to intelligent panspermia?

The definition of the “singularity” depends on which version is being referred to, and itself may be open to further interpretation, as an evolving work in progress. The basic overall concept defines a hypothetical threshold which the human civilization crosses, where various forms of “intelligence” are outsourced to AI (artificial intelligence) resources, not just for industrial, economic or strategic advantage, but as an irreversible requirement to interact with accelerating scales of complexity, compressed into ever shortening time scales that exceeds human capacity to effectively resolve.

The original concept started with John von Neuman, but was brought more into the public spotlight by Vernor Vinge in 1993 (essay on the Coming Technological Singularity). From that point onward numerous futurists, researchers and scientists from various disciplines and backgrounds have shaped and adjusted this concept, perhaps among the most often cited is Ray Kurzweil’s description of human and artificial intelligence merging to the extent that they are indistinguishable, and irreversibly integrated (the Singularity is Near, the Singularity is Nearer).

In more recent times, some have voiced the opinion that AI could eventually force an extinction event for what is currently the biological human species, most notably Steven Hawking and Elon Musk among others. The advent of ever evolving forms of strong and general AI, coupled into infinitely scalable networks of AI nodes (a mixture of specialized, and localized nodes of general AI), ubiquitously interfaced to the prevailing human population, begins to transfer what had been exclusively human thought processes and decision rendering into this emergent "post human" industrial and societal era.

This rapidly expanding and accelerating AI ecosystem becomes a self accelerating feedback loop, which begins to implement its own decisions and operational strategies, along with various channels of economic, industrial and technology development, of which the human population becomes irreversibly dependent upon. This has already become apparent in many application domains, and is rapidly expanding into the arenas of emotional intelligence, behavioral cognition and mimicry to intersect more directly with the human population.

A logical extension of this trend could be anticipated as relegating the biological human population into ever diminishing roles of relevancy. This process dynamic is paralleled with (and accelerated by) emergent forms of transhuman development, in which the actual definition of a genetically defined, "organic" human is itself in a stage of transition. To some extent this is already occurring, at least in some highly developed, industrialized societies, and the trend is to further expand in this direction.

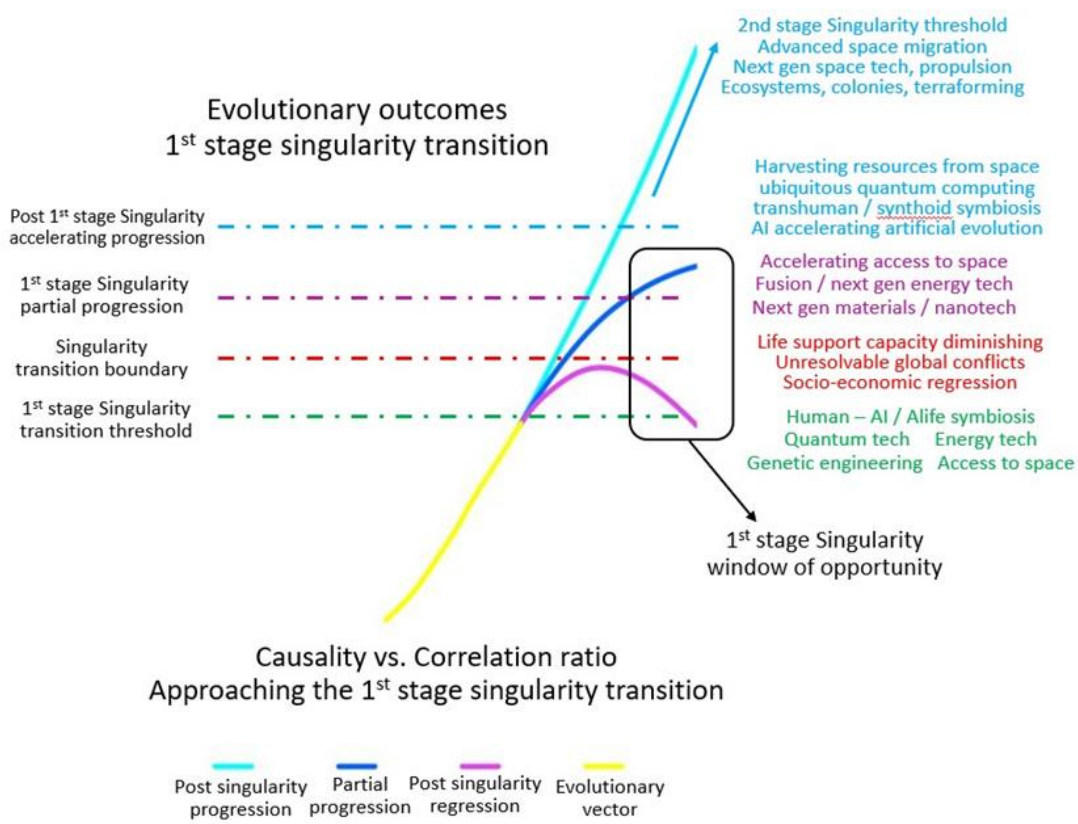

Fig 3 Singularity transition "window of opportunity" potential evolutionary outcomes

The technically and genetically enhanced humans obviously begin to have an "existence management" advantage over those not included in this transformation, and become integrated into specific channels of transhuman development (including military) of which they become evermore separated from the "general" human populations. In an increasingly competitive societal and geopolitical ecosystem, this creates an accelerating societal bifurcation, a recipe for disruption and potential chaos.

There comes a theoretical point where the relevancy of the general, unenhanced human population diminishes toward a planetary scale zero sum gain threshold, an unsustainable burden on the already strained life support capacity of the planetary resources (many have argued that we have already migrated far into that precarious territory).

The AI ecosystem as a whole, in various regions and populations, begins to take precedence over human instability and increasing irrelevance, and a post human, transhuman / AI symbiosis transformation is irreversibly instigated.   Particularly if this extends into military conflict and enforced governance favoring this perceived advantage over the "irrelevant" human populations, this could quickly descend into what would be reasonably argued as an extinction event for the original, unenhanced organic human species as it is currently known to be.

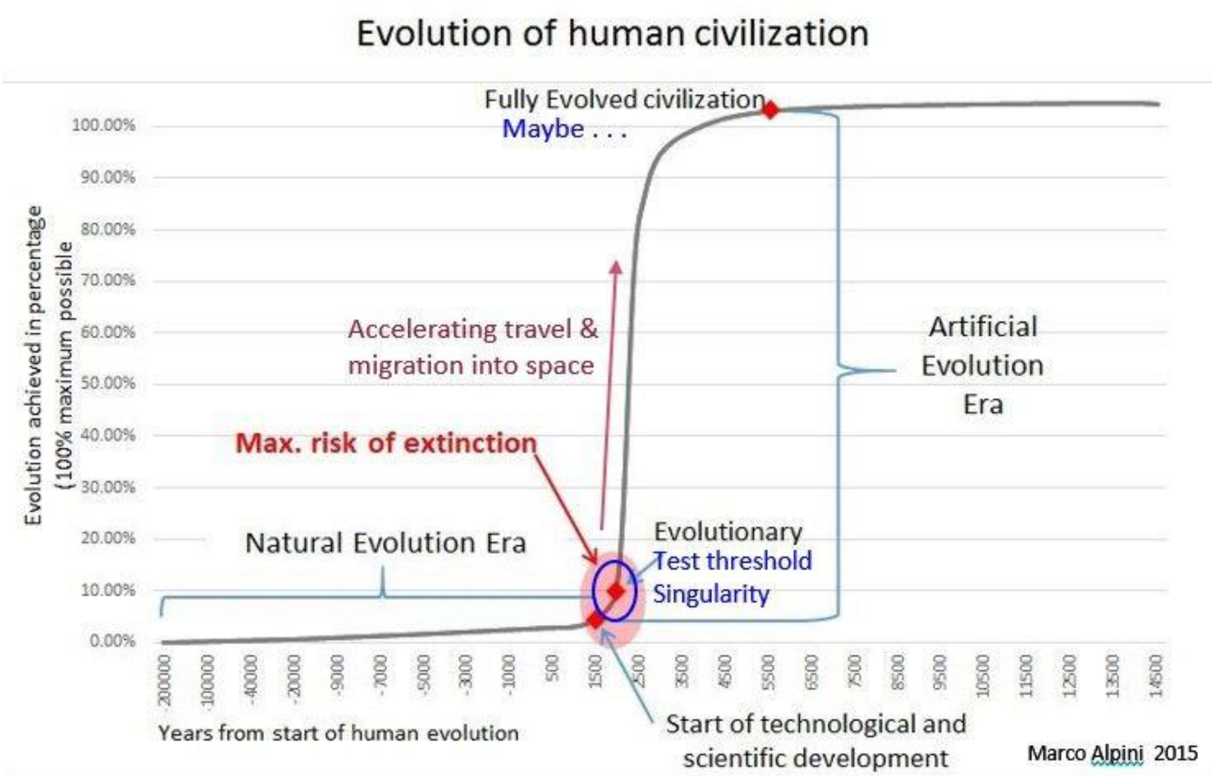

Fig 4   Adapted from diagram originally produced by Marco Alpini, and slightly modified to suit this narrative, there is an emergent evolutionary "test point" that the human civilization will encounter as an artifact of the approaching 1st stage singularity transition. It is at this moment of intersection, compressed into a few decades, that potential for migration into space becomes possible, if not necessary, or fails.

Of course, this rather extreme potential outcome is not a certainty, but awareness of this potential extends beyond the margins of speculative controversy and thematic content for science fiction media, there is enough partial reality inherent with this speculation to give this some serious consideration.

In the midst of this looming potential outcomes from this current moment, which comes as a series of increments within this 1st stage singularity transition, is a window of opportunity [fig 3].

It is within the timescale of this evolutionary window of opportunity, that emergence into space travel development and migration becomes a relevant, if not crucial component of this transition process. This can also be viewed as an evolutionary transition test, compressed into a few decades, that will likely be determined within the aforementioned window of opportunity, that we have already entered [fig 4].

Current motivations and support for traveling and delivering payloads into space has been shifting evermore into the private sector, as a business opportunity, at least in the western world. Much of the current communication and media networks of the planet are almost exclusively dependent on satellites, along with planetary resource management, research projects, and of course, defense applications.

A resurgence of interest in revisiting the moon, and Mars in the near term represents a combination of scientific, strategic and commercial interests, not the least of which could include the mining of He3 (an isotope of Helium) from the moon, which has profound implications as a potential fuel source for fusion reactors. Even though fusion reactor implementation is still in various stages of development, it has progressed radically from its earlier theoretical research days of the mid 20th century. Advanced prototypes are being constructed and tested worldwide (China has just claimed the first 100 sec duration controlled fusion reaction).

Creating viable fusion reactors, integrated into the next generation of energy resources of the planet, opens a Pandora's box of potential opportunities, and a departure from the limitations and negative consequences of current centralized, fossil fuel energy systems on a mass scale. It also represents a potential next generation energy resource for eventual advanced space applications.

Beyond this model, however, is the vast implication of harvesting metals and various minerals from the asteroids orbiting between Mars and Jupiter. If the current planetary civilization, from whatever consortia of private sector and collaborating governments manages to get this far, within the aforementioned window of opportunity, without succumbing to planetary scale catastrophic conflicts, or severe self imposed impact on the life support and resource management capacity of the planet, the human species will begin to spread outward beyond the confines of the home planet.

It is at this juncture, that the first increment of "intelligent panspermia", from here, becomes possible, if not inevitable. It is further suggested that this series of development stages leading up to this incremental singularity transition stage is not unique to Earth, but rather a relatively common model among myriad other solar systems with "intelligent" life bearing planets. In this context, intelligent panspermia can be roughly divided into two specific categories: unintentional, and intentional.

4 The evolutionary aspects of evolution

Evolution tends to be a trauma induced process. Given that the amplitude and periodicity of the encountered trauma cycles do not exceed the system capacity to respond, the system will either evolve to a more functional form that it has adapted to, or perish in the process. It can also be further reasoned that this evolutionary process model operates as a type of fractal, whether it be in specific species of organisms, entire ecosystems, or different levels of complexity within that evolutionary spectrum.

The same general mechanism can also apply to societal systems, ranging from local communities and cultural domains, to entire civilizations, or different levels of complexity within that evolutionary spectrum. This evolutionary metric can also be applied economic and financial systems, business models and markets (Bionomics: Economy as an Ecosystem, Michael Rothschild as an example).

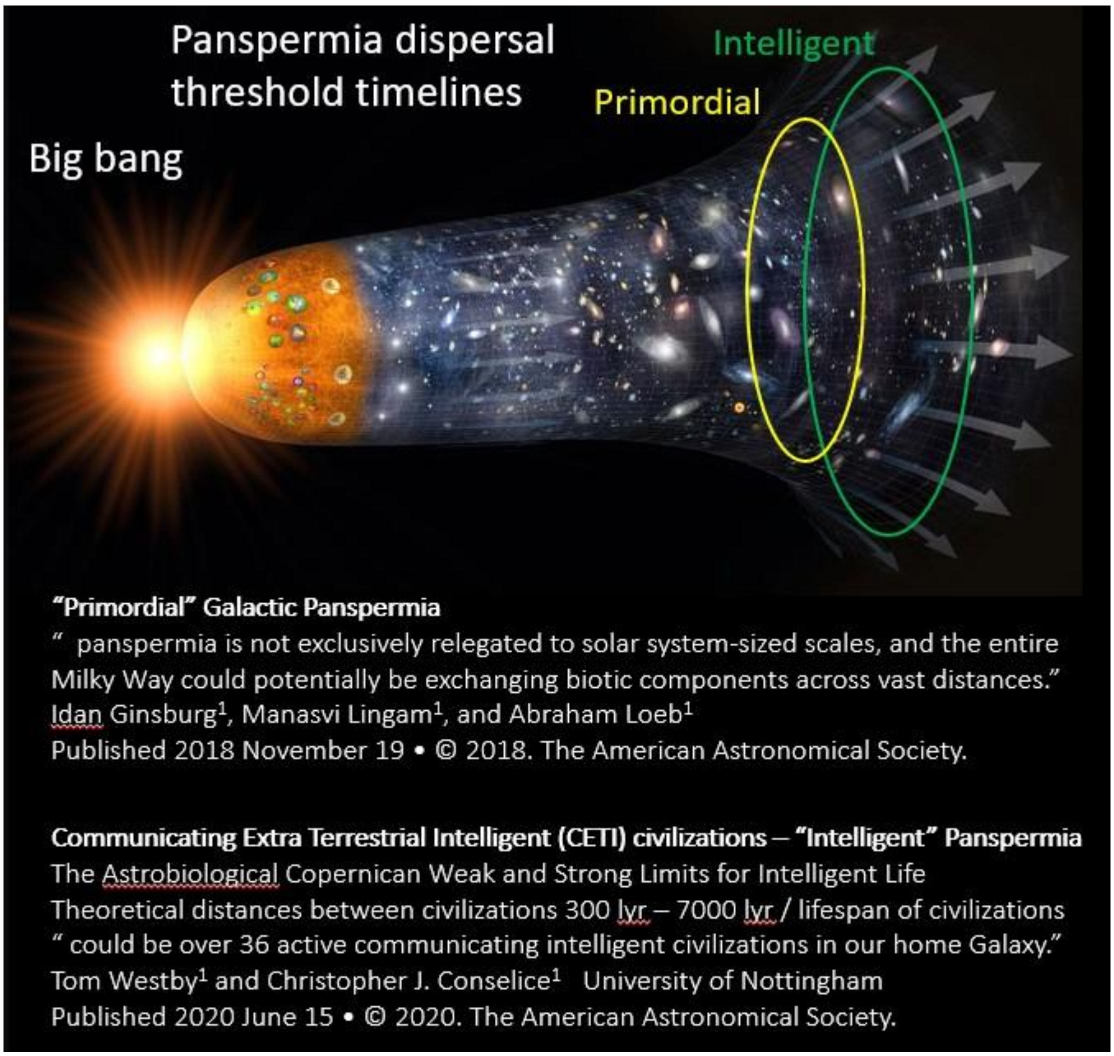

Fig 5 Relative timelines for primordial and intelligent panspermia dispersal thresholds

For the intelligent panspermia models (unintentional and intentional) to actually become possible from a specific planetary system, and replicate to other solar systems, throughout the habitable regions of this galaxy, a process repeated in myriad other galaxies, the planetary civilizations in question have to successfully navigate past the evolutionary test points encountered before and during the singularity transition iterations they will most likely be confronted with.

Aside from any previous catastrophic setback or even extinction event (planetary scale wars, biological or other unrecoverable "natural" disasters, severe environmental damage to the planetary resource base, etc.) for the planetary civilization up to this emergent singularity transition threshold, it would be a reasonable speculation that some form of space travel, even if only satellites and probes up that point, had already been accomplished by that civilization.

As nearby planets are probed and eventually visited by live astronauts or other types of lifeforms from the parent planet, some form of intelligent panspermia will likely occur, be it unintentional or intentional, or a combination of both.

In its simplest inception, some form of biological "pollution" or residue will eventually be deposited by visiting platforms, especially if this becomes a frequent process with populated bases and installations on the planet being visited. Here on Earth, examples of this unintentional panspermia potential has already been demonstrated, as rogue bacteria was discovered on the ISS (four interrelated species of Methylobacteriaceae), and even an ISS experiment which exposed Deinococcus directly to space, to test its ability to survive in that severe environment (which it did for three years).

The suggestion here is that no matter how carefully future spacecraft may be sterilized before visiting Mars, for example, it is highly likely that there will eventually be some form of biological residue or live organisms left there on the surface. If there are actual colonies or populated installations there, being visited at various intervals, this becomes even more of a probability. It could be extrapolated from this vantage point, that the unintentional panspermia phenomena could eventually extend beyond Mars.

Beyond this point, however, is the advent of intentional panspermia, the result of some form of terraforming being implemented on the targeted planet. This does not necessarily imply this would have to be a planetary scale operation, depending on the native conditions already there on that planet.

A further extrapolation of this concept would be a planetary civilization, determined to replicate biological panspermia as an intentional design strategy, would be focused on perpetuating this process on whatever planets or planetary systems might be within their reach.

Given this potential model for intentional intelligent panspermia, it could be reasoned that the earliest attempts at this strategy could have emerged within the last billion years (or less) in the known observable universe, given the rate and timelines of evolutionary development in various galaxies for emergent planetary civilizations that survived past their pre-singularity evolutionary test points, survived and flourished through their first stage singularity and successive stages of singularity increments, and went on to migrate to other worlds.

Back annotating from the "big bang" which most agree is around 13.8 billion years ago, a rough estimate might be possible to cite a universal age threshold when life began to appear and eventually flourish in various galaxies, planetary systems and worlds. Current evidence indicates this particular solar system dates back to 4.571 billion years, and the most commonly agreed to age for life to have first appeared here on Earth dates back to 3.77 billion years. The first evidence of organized civilizations here currently known dates back at least 6,000 years, but the level of societal, industrial and technical thresholds needed to facilitate any form of space travel only dates back to the mid 20th century, an infinitesimally small veneer of relative time.

Of course, not all life bearing solar systems started forming at the same time, nor did life begin, or relative evolutionary increments synchronize in the same timescales, but the question could be asked, how wide is this window of time as it extends throughout the universe. I suggested the perhaps overly ambitious guess of maybe a billion years, but even if this was pared back to a much narrower window of time, perhaps a "mere" 100 million years, this still allows for an extraordinary diversity of developing civilizations, at different stages of development.

Even just considering what might become possible here on Earth, within the next century, is highly speculative, but within that context, it is quite possible that advanced space technology would become available and utilized in a broad spectrum of applications, including energy systems, and resource harvesting, as suggested earlier. If anything, this expanding extension into space becomes an integral component of, rather than exotic appendage to the collective evolution of the planetary civilization.

Extrapolating further, maybe several centuries (if we get that far in this context), we may have gone well into the territory of colonization of other worlds, up to and including various implementations of terraforming and so on. It could be that we would become the purveyors of intentional, intelligent panspermia. But even given that theoretical model, occurring here, that is still an extremely narrow timeline compared to the age range of other potential civilizations, that have already progressed into vastly more developed, advanced arenas societal of propagation, science and technology, for which intentional panspermia and terraforming is a "normal" occurrence and a societal agenda in their relatively local domain of neighboring solar systems within reasonable reach.

5 Intelligent panspermia distribution metrics

To theorize any sort of such speculation, this would have to start with some form of a general formula for determining the average number of solar systems with life bearing planets, and subsets of those with civilizations at different stages of development, as distributed through the observable universe within the time window in which these successive events would likely have been (and are) occurring.

This concept was initiated by Frank Drake in 1961 with the publication of his well known formula, the Drake equation. Though considered then (and still is) controversial, it was at least a framework to start estimating what those numbers of developing ET civilizations might be with certain conditions being numerically defined.

The key components of this equation are:

- N is the number of civilizations with which we could communicate
- R* is the average rate of star formation in our galaxy
- fp is the fraction of those stars which have planets
- ne is the number of planets that can support life
- fl is the number of planets that will develop life
- fi is the number of planets that will develop intelligent life
- fc is the number of civilizations that would develop transmission technologies
- L is the length of time that these civilizations would have to transmit their signals to space

Various modifications to this initial equation have been submitted since then, but perhaps the most interesting series of updates to this concept was provided by Tom Westby and Christopher J. Conselice from the University of Nottingham (2018 – 2020), based on the perspective cited in the Astrobiological Copernican Principle, the premise being that the emergence of an "intelligent" or advanced civilization is not necessarily confined to humans, or similar lifeform types, but could extend across a much wider range of lifeform types.

Their revised version of the Drake equation is expressed here as:

$$N = N_* * F_L * F_{HZ} * F_M * (L/T')$$

- N is the number of civilizations we can communicate with
- N* is the total number of stars within the galaxy
- fL is the percentage of those stars that are at least 5 billion years old
- fHZ is the percentage of those stars which host a suitable planet for supporting life
- fM is the percentage of those stars with sufficient metallicity, allowing for advanced biology and an advanced civilization
- L is the average lifetime of an advanced civilization
- t' is the average amount of time available for life to develop

Given the available astrophysical data as extrapolated through this equation, it was determined that an average approximation of at least 36 distinct ET "active communicating civilizations" would be likely in a given galaxy similar to our own.

Between t' and L are the threshold domains of planetary abiogenesis and primordial panspermia, followed much later with intelligent panspermia (unintentional and intentional) emanating from some percentage of the more developed, post 1st stage singularity evolutionary transition era civilizations.

It's the personal opinion of this author that this number of 36 ET civilizations, as suggested with the revised Drake equation cited here, may be rather conservative (understandably so), that this could be a considerably larger number dependent on additional factors, such as the relative evenness (or lack thereof) of distribution of these civilizations and developing proto-civilizations within the generally accepted habitable regions of said galaxy. Observable evidence suggests that areas densely populated with organic molecules within these habitable regions tend to be coagulated into pockets where the likelihood of life proliferating in fairly high quantities would be considerably greater than in other adjacent areas.

If this distribution pattern were proved to be true, there could be a viable argument that suggests advanced ET civilizations would tend to be clustered into these areas, that communication and intersection among them would be more likely (depending on their state of development), and variations of intelligent panspermia (unintentional and intentional) would be more likely to be prominent in these areas.

Summary

The premise here is that life is common, perhaps ubiquitous across the universe within the post big bang time window that this process became chemically possible, and within those habitable regions of galaxies where such is (currently) deemed to be most likely to foster such. The proliferation of life from these primordial beginnings can be considered to be an artifact of both (rather than mutually exclusive) processes of abiogenesis and panspermia.

In this context, this first chronological layer of panspermia is termed here as “primordial panspermia”. A second layer of “intelligent panspermia” occurs much later, as developing planetary civilizations evolve to the extent that they begin to extend their presence beyond their home planet, to other worlds within their solar system, and eventually, from the relatively small subset of those civilizations, to other systems beyond their own.

This is what is termed here as intelligent panspermia, that is divided into two broad categories, unintentional and intentional. This is the concept of life being dispensed to other worlds, either by accident, or in the more advanced stages of development, as an intentional implementation of life beyond the home planet.

It is considered to be a crucial factor in this latter evolutionary developmental chain of events, that the planetary civilization in question has successfully navigated through a series of evolutionary tests, up to and beyond its intersection with their first “singularity” transition window of opportunity. It is from this threshold that migration into space becomes more prolific, as an integral (and necessary) element within their continued evolution into secondary and tertiary singularity transitions, ascending to more advanced stages of development.