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MIDNIGHT RIDERS:
STRATEGIES FOR PERPETUATING LIFE IN THE UNIVERSE

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LONG AND SHORT-TERM THREATS TO LIFE

As far as we know 'for certain', we are the only sentient species in the universe, on the only living planet. As life-forms ourselves, we naturally have an interest in perpetuating life. We know that our own solar system has a finite life-span. Indeed, this is the fate of all suns. We are about half-way through the life-span of our sun, and at some point, commonly put at about 5 billion years hence, our sun will run out of nuclear fuel, and go through a process of expansion, destruction of most of its planets, and then collapse and explode.

Thus, for the life that has evolved in this solar system to continue to grow and evolve, some way must ultimately be found to migrate to other suitable star systems before that point. Mars and all other potential human habitations in our solar system will be destroyed.

There are other short-term threats to life on our planet. Astronomical impacts, or other local events such as wars, plagues, or other ecological catastrophes could destroy some or all of life as we know it before the technology of space travel is developed.

SEEDING LIFE INTO THE GALAXY-THE SHORT TERM INSURANCE POLICY

The short-term threats to life on our Earth are probably well-know to all. Since there is at this time no absolute guarantee that life exists elsewhere, some strategy should be pursued to seed life into the galaxy in the event of a catastrophe on Earth.

What is hereby proposed is to insert a wide variety of soil, rock, and waterborne microorganisms and spores into inexpensive canisters, and fire them directly out into space in all directions away from the sun, seeding the rest of the galaxy with life.

No attempt would need to be made to aim them at any particular target, other than to keep them in the plane of the Milky Way galaxy. They would be dispersed in high numbers with the hope that a small percentage would encounter a star system with earth-like planets, and that eventually some would be captured by such planets and crash on their surface. They would be constructed in such a way that they would open and release the microorganisms. The small percentage of these microorganisms and spores that would be capable of living in the new environment would then commence to colonize the planet and initiate whatever evolution the new mix would be capable of producing.

The rationale behind such a seemingly radical proposal is actually very practical. We will not be going to other star systems very soon, and we will not arrive there for a very long time. It would be a great advantage to us if evolution on otherwise lifeless planets had time to progress to the point of converting carbon dioxide and sulfur atmospheres to oxygen atmospheres by the time we get there.

There is another more important reason to seed life into the rest of the universe now. We are in a particular window of time in which such a technological feat is possible. There is no absolute guarantee that we will always be such a technologically sophisticated species. Ecological degradation, world wars, world-wide plagues, or astronomical impacts could degrade humans' ability to continue to take the slow road to the stars.

In such a case, and if in fact the rest of the universe were empty of life, and if we were to be the only planet capable of evolving the advanced civilization necessary to initiate space travel, then the universe would be forever barren. We owe it to the future of evolution in the cosmos to insure against this possibility at the earliest possible moment that we can do so.

The odds that the rest of the universe is barren of life are small. However, they are not zero. The odds that we will encounter some planetary catastrophe before we are technologically capable of initiating conventional space colonization is also quite small. However, once again, those odds are not zero.

The future is unpredictable. We do not know with certainty what may occur. There is however, one fact that we do know for certain. It is an absolute certainty, with odds of 100 per cent, that at some time in the future, our earth and our solar system will become completely uninhabitable. It is only reasonable to devote a small fraction of our precious resources to such an important undertaking.

Ethical Considerations

At first the presumption of this program to seed earth-based life indiscriminately among the stars may give some pause. However, the advantages outweigh the disadvantages.

In the case where a planet is barren of life, there should be no ethical problems. We will have seeded that planet with our DNA-based predecessors. This is what we would have done and will do anyway, as we will inevitably bring our plants and animals with us to any planet that we would contemplate visiting and colonizing, not to mention the myriad microorganisms inhabiting our bodies.

In the case where there might already be life of some kind inhabiting these worlds, there are of course other considerations. If there is primitive life there, then there will be an interaction between the life forms originating from different planets. This normally will result in evolution having more variability to work with and thus greater biodiversity and adaptation in its resulting biota. Again, this will inevitably happen anyway if we arrive later.

It is only when we contemplate our capsule landing in another advanced civilization that an ethical problem arises. Normally a small amount of an unfamiliar organism will have little effect on a robust established population. However, it is possible to contemplate that our earth organisms could react unfavorably with advanced life similarly to the importing of unfamiliar diseases decimating the New World's populations on earth after its discovery.

From a long-term perspective, it may perhaps be preferable to have the interaction with our biota take place on their world. If there is another technological civilization out there, then at some point in the far future we will meet (if no catastrophes befall either of us). If either of us are carrying potentially incompatible diseases, then this meeting and the subsequent evolutionary adaptation to them would better proceed as soon as possible, and (from our point of view) on their planet, not ours.

Some have suggested encoding or restricting the capsule's decomposition so as to warn an advanced civilization of the contents. There will of course be much discussion on this important ethical issue.

In short, while there are some questions about the ethics of this proposal, the advantages of seeding life into a possibly barren universe outweigh the disadvantages. From a purely scientific perspective it probably would be interesting to observe and study life on some planets that have evolved purely on their own track with no outside DNA contamination. However if life is as ubiquitous as some think, there would be plenty of such worlds, as our capsules would only contact a tiny fraction of available star systems.

Technology

Because many thousands of capsules should be sent out, this would not be the type of expensive rocket launch program we are used to. All we need to do is to head straight out from earth with enough speed to escape earth's gravity and keep on going out of our solar system.

The payload could be made quite small, as large quantities of inoculum would not be required. The canisters could be as small as a few inches in diameter. The main requirement is that they be able to survive an atmospheric descent onto a planet's surface without burning up, that they be able to disintegrate, and that they have some form of cosmic ray shielding.

One design would have a mild steel inner casing in which the inoculum can be sealed, which would be capable of rusting through. Over this could be several inches of lead. The lead would be a cosmic ray shielding, and during atmospheric entry it would melt and slough off, taking accumulated heat with it.

Single stage military rockets should (hopefully) someday be able to be acquired from war-surplus scrap heaps for pennies on the dollar. These could be lifted to the edge of the atmosphere with balloons. Altimeters could trigger firing at this point, and the rockets would go straight out into space. No guidance system should be required other than to ensure stability.

The design of the rocket could be made simple, inexpensive, and mass produced. One could even involve amateur rocket societies around the world, as this is a widespread hobby, and would generate local interest in and support for the project. Local clubs and communities could finance launches and get to include inoculum samples from their local ecosystems. One could also envision this being done in a more sophisticated way, with guidance being provided to some targets with more well-researched possibilities of success. Many hundreds of capsules could be sent in each launch, and over the thousands of years of space flight would disperse quite widely.

One other possible and inexpensive way of launching canisters would be to insert them into unsuccessful oil well holes and shoot them out with high explosives. There have been many proposals to use various types of mass drivers to boost materials into low earth orbit, but currently they are seen as impractical for various reasons including trajectory control. In our case this would not be so much of a factor.

Bruce Mackenzie has proposed a very intriguing extension to this project. He has suggested that we insert the human genome into the genome of a spore-producing microorganism, and use the very long-lived capabilities of spores to carry our genome out and disperse it into the universe.

Chromosomes have only small parts of their DNA strings that actually carry active genes of the host organism. In between are long strings of random base-pairs that ordinarily do not code for anything. In this proposal, our human genome would be inserted into these unused spaces, probably with novel starting and ending sequences.

Any advanced civilization discovering these organisms would probably recognize that they were of off-world origin, and immediately sequence them. The specially marked sequences would then be recognized as belonging to another organism. These advanced civilizations would then hopefully be motivated to grow out and express this novel genome, with perhaps interesting results.

The term “Midnight Riders” derives from the timing of the firing near midnight necessary to ensure that the trajectory would be away from the sun and outward into space. The “Riders” would be in for a very long “Midnight” journey through the blackness of interstellar space, on their way to an uncertain but perhaps important future.

LONG-TERM SPACE COLONIZATION STRATEGIES

Most space enthusiasts consider that our ultimate salvation will be achieved by developing some form of space colonies or spaceships that will be sent off to search for and colonize potential earth-like planets. This is problematic as an ultimate strategy for several reasons.

The most obvious problem with the spaceship strategy is that even under the most ambitious scenario, only a very small percentage of Earth's population could ever be accommodated on such a spaceship fleet. This problem is compounded when one thinks of the vast number of plants and animals that would need to be included in each spaceship to successfully populate a viable, diverse ecosystem on a potentially habitable planet. We are not just talking about a Noah’s ark-like sampling of a few individuals. We know that to maintain a viable population of any small or endangered species, large numbers must be maintained in a breeding population to avoid genetic inbreeding problems. This would also apply to our human population.

Another and even larger problem with this approach is the combination of the distance and time required to investigate numbers of potential new solar systems. We currently can detect planets through two means. The first is by observing a star for wobble, and calculating the size and orbit of potential planets that would be required to produce that wobble. This method is currently only capable of detecting gas-giant planets, and these only relatively close to their parent star with orbital periods of a reasonably short period of observation. This method is probably inherently incapable of detecting earthlike planets in the habitation zone of a star.

The second method currently used is the transit method, which observes a periodic dimming of the light from a star, and calculates what planet would be required to pass between the star and Earth to cause such a periodic dimming. This can currently be used to detect planets down to several times Earth mass. However, it is not capable of any analyses of the conditions necessary for life, such as water, an oxygen atmosphere, or a protective magnetic field. Of course, another limitation of this method is that it is only capable of detecting planets that orbit their star in a plane that is perfectly aligned with the Earth.

It is possible that at some point in the future we could develop the technology to detect Earth-like planets directly, and even analyze them for some of the characteristics required for sustaining life in large numbers. Indeed, plans are underway to construct such a technology consisting of a large linked array of telescopes in space.

However, even with such technology, there would be many unanswered and unanswerable questions remaining, one of which would be the presence of a planetary magnetic field capable of shielding against damaging high-energy particles, a necessity for the development of life as we know it.

Thus, even with the help of the advanced technology of the future, there would be no real guarantee that any star system we headed for would ultimately be capable of being colonized. We would therefore need to plan for our large colonization spaceship to be capable of very long multigenerational flights through interstellar distances, searching for and investigating perhaps many dozens of potential planets before perhaps finding one that could support life.
This scenario thus raises the question of the availability of power sources to propel, heat and maintain populations through potentially many centuries of travel through regions where no significant sunlight is available.

We need to start to think of scenarios in which large sections of the earth's biota can be transported to distant star systems. One could conceive of small moons being colonized, and then somehow used as enormous spaceships for a long interstellar cruse. Theoretically the earth itself could be moved out of orbit, and transported to a distant star system and re-inserted into the orbit of a younger star, although what energy source could accomplish this is unknown at present. We would not have to actually find a replacement planet, but simply insert the Earth into a similar orbit around the new star, and get another multi-billion year lease on life.

While these are indeed radical proposals, at some point in our future we will be facing extinction of life as we know it in this solar system, with the possible exception of a few lucky individuals sent out on starships. At that point, all of the remaining beings on this planet will really not have much to lose by trying radical proposals. By staying in our Sun's orbit, our chances of survival will be zero. At least by attempting to journey to another nearby sun with large bodies as transport, we will have some chance of success.

This chance, however small, should, will, and must be taken, for the fate of life continuing to grow and evolve in the universe might just depend on it.