

Panspermia Asks New Questions

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ABSTRACT

There is a widespread sentiment that panspermia is uninteresting is because it does not answer fundamental questions about the origin of life. The strongest version of panspermia asks entirely new questions. While barriers to the acceptance of panspermia are falling and evidence supporting it is accumulating, the mere possibility of panspermia unhinges the Darwinian account of evolutionary progress. The new theory removes an issue dividing science and religion, but it requires an amendment to the big bang theory.

1. PANSPERMIA FACES SCEPTICISM

Twenty-five years ago, panspermia was considered a farfetched notion for a number of reasons:

Microbes in space would be killed by radiation.
Cells can not remain viable for the millions of years interstellar trips would take.
The heat of atmospheric entry or impact with Earth would sterilize anything.
There is insufficient evidence for complex organic compounds in space.
There is precious little water on other moons or planets.

Today all of those objections have been reversed, and hard evidence for panspermia has been reported. In August 1996, a NASA team reported evidence for fossilized bacteria in a meteorite from Mars ¹. Later, the same group found fossils that were undisputably biological in other Mars meteorites ². And in October 2000, fossilized microbes reported in Lunar soil collected by the Soviet Union's unmanned *Luna* program were publicized ³.

But in a study announced at the Lunar and Planetary Science Conference in Houston in March 2000, nine meteorites were examined for contamination with terrestrial bacteria and amino acids — and all nine were contaminated ⁴. The possibility of contamination immediately cast a shadow of doubt on all fossilized germs in meteorites, even fossils that came from the moon in sealed containers. And such scepticism is entirely proper in science. Without principled scepticism there could be no science.

2. MODERN PANSPERMIA

It is often said that panspermia isn't very interesting, because it simply removes the problem of the origin of life from our planet to some other place. This is wrong. If science found proof that life on Earth had arrived here from somewhere else, the headlines would be large. On the other hand, there are several kinds of panspermia, and some are more interesting than others.

Pseudo-panspermia is the delivery of complex organic compounds from space, to give the prebiotic soup some starter ingredients. This notion has already become widely accepted.

Basic panspermia is the presence in space, or on bodies like comets or asteroids, of microbial life that can be safely delivered to planets and start life there. If the cells escape from a living planet on fragments after a meteor impact, the phenomenon is called litho-, ballistic-, impact- or meteoritic panspermia. Such trips are usually thought to be interplanetary only. Svante Arrhenius proposed that naked cells might travel interstellar distances propelled by light pressure, a theory now called radio-panspermia. Whereas a light coating of carbon could protect single cells from UV radiation, a couple of meters of water or rock are needed for protection from cosmic rays. Consequently, radio-panspermia is currently in disfavor. The danger of radiation damage influenced Francis Crick and Leslie Orgel, in 1973, to propose that life came to Earth by directed panspermia, the theory that intelligent life from elsewhere sent germs here in a spaceship.

Modern panspermia proposes comets as the delivery vehicles. Comets can protect cells from UV and cosmic radiation damage; and comets can drop cells high in the atmosphere to float gently down. If bacterial spores can be immortal, as it appears, comets could spread life throughout a galaxy.

3. STRONG PANSPERMIA

So far we have been talking about only the origin of life on Earth or on any given planet. Strong panspermia is the extension of modern panspermia to deal with evolution as well. In strong panspermia, the genes for evolutionary advances are not written by copying mistakes and reshuffling within an original set of bacterial genes. Instead they are installed by gene transfer. If these genes are spread by infectious agents such as viruses, they can transform whole populations in a single generation.

The importance of gene transfer in evolution has gradually become recognized within mainstream biology. For example, a study that appeared in *Nature* in May⁵ reported:

"It is difficult to account for the ability of bacteria to exploit new environments by the accumulation of point mutations alone. In fact, none of the phenotypic traits that are typically used to distinguish the enteric bacteria *Escherichia coli* from its pathogenic sister species *Salmonella enterica* can be attributed to the point mutational evolution of genes common to both. Instead, there is growing evidence that lateral gene transfer has played an integral role in the evolution of bacterial genomes, and in the diversification and speciation of the enterics and other bacteria."

Horizontal gene transfer also works in eukaryotes, where we used to hear that the germ line was protected from invasion. The very opposite may be the case. In February, Kidwell and Lisch⁶ announced that some transposable elements preferentially target the germline cells and avoid somatic cells when they invade.

In the strong version of panspermia, Darwinian evolution can produce variation that results from one or two point mutations, and can, by natural selection, lead to adaptation, or microevolution. But this is not the same as macroevolutionary progress requiring whole new genes that differ from known predecessors by dozens to hundreds of essential nucleotides. In strong panspermia, those new genes must be supplied from elsewhere.

4. THE DARWINIAN ACCOUNT OF EVOLUTIONARY PROGRESS

Is there any reason to consider this alternative to Darwinism? Yes. Firstly, the Darwinian account of evolutionary progress has no model in an analogous medium such as computers. True, computer models can be randomly changed, and they can evolve to solve pre-set problems. But no computer program has demonstrated the ability to compose new programs that add sophisticated new features to itself, as in the history of life on Earth. If a computer model ever did, it would establish in principle that evolutionary progress by the Darwinian method is possible.

The best way to establish that evolutionary progress by the Darwinian method is possible would be by closed-system biology experiments. Since 1990, closed experiments with bacteria have been under way⁷. Pedigreed strains of bacteria have been cloned and placed into varying environments to observe how they respond. At regular intervals, samples are pulled and genes from the samples are sequenced. Genetic mutation and recombination, and phenotypic variation are observed to occur. When the diet is changed from glucose to maltose, for example, the bacteria adapt to the new diet. But to metabolize a new sugar, the bacteria adapt by calling up genes that they already possess. There is no evidence, even after 25,000 generations, that a gene with a wholly new function has been composed in this experiment. To check this understanding, in August 2000, I contacted one of the principal investigators, Richard Lenski. Nothing he told me changes this opinion.

Finally, the Darwinian account of evolutionary progress has failed to obtain full support from the educated public. Even after 140 years of active advocacy, the theory elicits misgivings among a large share of intelligent adults. Organized opponents of the theory, "creationists," are able to influence public educational policy against it in many instances. No other modern theory of similar significance has experienced a similar fate. The reason for this anomaly could be that the theory is actually flawed.

In summary, there is no model for the Darwinian account of evolutionary progress in an analogous medium like computers, the process has not been demonstrated in close-system biological experiments, and it is considered implausible by many, perhaps even most, educated adults.

5. OPEN SYSTEM UNHINGES DARWINISM

Until the emergence of panspermia, science believed that our whole planet was a biologically closed system. If so, the closed-system experiment is already well under way with proven, planet-wide results in favor of Darwinism.

But the mere possibility of panspermia changes the situation entirely. One can no longer safely claim that the planet is a biologically closed system. Therefore, any instance of biological progress on Earth may result from the expression of genes acquired from elsewhere. In other words, the whole planet is subject to genetic contamination from space. If science ought to be sceptical of claims that have weak support, it should now be sceptical of the Darwinian account of evolutionary progress.

Other widely accepted theories have been overthrown after careful scrutiny. An example is the “luminiferous aether,” believed to be the medium in which light waves propagate. Following the Michelson-Morely experiment it was abandoned, and the theory of relativity emerged.

With Darwinism, the problem up to now has been that there was no scientific alternative. Both Darwinians and creationists said that there were only two choices — and only one of them is scientific. But now we know that biological input into our planet’s biosphere from elsewhere is possible. This possibility makes strong panspermia a scientific alternative to Darwinism.

6. THE BIG BANG

We must admit at least the possibility that life on Earth came from elsewhere, and that the genetic programs for intelligent life also came from elsewhere. But mustn’t life have originated from nonliving chemicals at some point? And mustn’t prokaryotes have advanced to become intelligent life *de novo* at some time in the past?

The scientific underpinning for this position is the standard big bang. If the whole universe is a biologically closed experiment that began without life, these assumptions would be valid. But the big bang is too remote as evidence and too fluid as a theory to serve as the foundation for biology. If life can originate from chemicals and make *de novo* evolutionary progress after that, there should be more tangible evidence than the big bang.

7. COSMIC ANCESTRY

In its strongest version, panspermia holds that intelligent life can only descend from prior intelligent life. Logically, therefore, intelligent life must have always existed, and what we have called “evolutionary progress” would actually be the *development* of pre-existing intelligent life.

This theory is fully scientific; there is nothing supernatural about it. I am attempting to name it Cosmic Ancestry. It responds to the informed criticism that Darwinism does not account for evolutionary progress. Furthermore, Cosmic Ancestry does not extend science beyond its proper realm. Science can never answer some questions, like “Why is there anything at all?” According to Cosmic Ancestry, “Why is there intelligent life?” is another question that science cannot answer. Intelligent life appears to have always existed. Until evolutionary progress in a closed system is demonstrated, that’s as far as science can pursue the matter. Meanwhile, creationists are free to call intelligent life a miracle. Bypassing the disagreement between science and religion, we are free to pursue new questions. For example,

“Under what circumstances, if any, is evolutionary progress in a closed system possible?”

“How could the big bang theory accommodate life from the eternal past?”

“How does intelligent life arrive and develop?”

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