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# Fluid mechanics leads to life in the universe

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## ABSTRACT

The standard (old) cosmological model ΛCDMHC is flawed by fluid mechanical simplifications of the Jeans 1902 theory of gravitational structure formation. Corrections result in HydroGravitational Dynamics (HGD, new) cosmology and early, cosmos-wide, life termed the biological big bang. Kinematic viscosity, turbulence and diffusivity as well as fossil turbulence and fossil turbulence waves of new cosmology require early and massive plasma-epoch fragmentation by voids. Old cosmology gives no stars or planets for 400 million years (the dark ages) and can only result in extremely rare, intermittent, and highly localized life, if any, with no cosmic distribution mechanism. At the plasma to gas transition time 300,000 years, new cosmology produces 30,000,000 planets per star in dense, Jeans-mass, proto-globular-star-cluster clumps (PGCs) that host the formation of stars by planet mergers. Supernovae seed the small hydrogen planets with oxides to form deep-water oceans, giving life at two million years and evolved complex life in freezing cold oceans by eight million years. Cosmic distribution of HGD life occurred promptly by jets from supernovae and jets from active galactic nuclei. Biology of PGC planets is an extension of extraterrestrial cosmic biology. Herschel-Planck-Spitzer-WMAP space telescope images show these PGCs by the infrared light of their planet mergers.

**Keywords:** Cosmology, star formation, planet formation, extraterrestrial life.

## 1. INTRODUCTION

Theory and observations of cosmology and biology are converging. None of these can function in isolation from the others. Cosmology finds that the earliest and brightest galaxies are colored various shades of red and powered by mergers of a vast population of life-infested planets in dense clumps. Biology is confronted by evidence of life forms that could not possibly have evolved on earth or even in the solar system or within our particular Earth-PGC dense dark matter planet clump within the billion such missing-mass clumps in our Galaxy. Fred Hoyle once remarked that it should have been obvious from the beginnings of microbiology that life must be cosmic. Biology is a small part of astrobiology. From new cosmology and new biology, we are all aliens to Earth, but with a common ancestry and history extending nearly to the beginning of time and space. Our secret origins cannot be revealed either by telescopes or microscopes alone, or these used in isolation from any theories in any scientific disciplines, but by a combination of all. The key to understanding cosmic life appears to be fluid mechanics.

The paper is organized into a discussions of the theory and observations of gravitational structure formation, focusing on the plasma and gas epochs when plasma proto-superclusters, proto-clusters, proto-galaxies and their proto-voids were formed by fragmentation of the plasma when permitted by large viscous stresses of the plasma in the rapidly expanding early universe. When the plasma turns to gas, a dramatic reduction in viscous stresses permits fragmentation at the smaller length scales and mass scales required to host life. All of the ordinary (baryonic) matter produced by nucleosynthesis fragments into a fog of hot gas planets termed Primordial-Fog-Particles (PFPs) in dense clumps termed Proto-Globular-star-Clusters (PGCs), Gibson (1996). Stars form and die and life begins in a biological big bang event from 2 Myr when the $10^{80}$ planet water oceans condense to 8 Myr when they freeze, Gibson-Wickramasinge-Schild (2011), Gibson-Schild-Wickramasinghe (2011), Gibson (2011).

The primordial hydrogen and helium-4 gas of the planets began freezing when the decreasing temperature of the expanding universe reached the hydrogen triple point temperature of 13.8 K at 24 Myr. At this time the PGC clumps, and clumps of PGC clumps, began to diffuse away from the proto-galaxy core to form the dark matter galaxy halo. Schild (1996) independently identified small planetary mass objects (termed rogue planets) as the missing mass of a galaxy from the rapid twinkling frequency of a distant quasar lensed by the galaxy and microlensed by the planets. Differences in brightness of the mirage quasar images observed by Schild confirm that the planets are in clumps.

Time intervals and events for HGD cosmology are shown in Figure 1. The critical difference is that planets form at 0.3 Myr, immediately after the plasma to gas transition, not after a 300 Myr period called the dark ages before ΛCDMHC cosmology can make the first star, and eventually the first planet. By this time it is too late for complex life to form, or be widely distributed in the expanded universe even if it does.

| Event | Time (seconds) |
|---:|---:|
| Big Bang | $10^{-43}$ to $10^{-27}$ |
| Nucleosynthesis | $10^{2}$ |
| Matter exceeds Energy | $10^{11}$ |
| Plasma supercluster fragments | $10^{12}$ |
| Plasma galaxy fragments | $10^{13}$ |
| Gas galaxy fragments | $10^{13} + 10^{12}$ |
| First stars and supernovae | $10^{13} + 10^{12}$ |
| First water oceans and life | $10^{14}$ |

Figure 1. Time intervals for critical events according to HGD cosmology that claims the missing mass of galaxies is primordial earth-mass planets in clumps that form the first stars and host the first life. Frictional entropy is produced by the HGD turbulent instability causing the big bang and inflation. A finite time of expansion is expected, followed by a gravitational contraction (the big crunch). The baryonic density $\rho_0$ at the time of first fragmentation $10^{12}$ seconds matches that of old globular star clusters and giant molecular clouds.

The first event in Figure 1 is the big bang, which does not concern us in the present paper. A big bang origin at Planck scales is common to both new and old cosmologies. It was hot, turbulent and rotational, and is discussed in more detail in a second paper of the present conference 8521-20 about dark energy. Nucleosynthesis produced hydrogen and helium-4, with traces of deuterium, tritium and helium-3. Matter exceeded energy at 3,000 years, or $10^{11}$ seconds, marking the beginning of the plasma epoch. The last event at 3 Myr ($10^{14}$ s) is the likely peak of the biological big bang, where deep water oceans of warm water are most common, teeming with evolving organic chemistry and life, which is readily exchanged by merging planets and their jets within PGCs, and between galaxies by jets of active galactic nuclei.

The crucial difference between new and old cosmologies with respect to life formation occurs at $10^{12}$ seconds, or 30,000 years after the big bang. At this time, the length scale of causal connection ct, where c is the speed of light and t is the time, increases with t to match the more slowly increasing viscous-gravitational scale of HGD cosmology and the super-cluster length scale $L_{SC} \sim (M_{SC}/\rho_{SC})^{1/3}$, where $M_{SC}$ is the mass of a supercluster and $\rho_{SC}$ is the density of the plasma. Note that it is not cold dark matter CDM that causes the first structure by condensations of non-baryonic dark matter NBDM at the Jeans scale, where the speed of sound is reduced by assuming the unknown NBDM particles are cold. Even if the particles could be created cold, they would rapidly diffuse away from any condensation because they are nearly collisionless. Similarly, the seed CDM condensations will not cluster to make gravitational potential wells into which the baryons will fall. The standard ΛCDMHC model is rendered mostly obsolete by HGD cosmology.

## 2. THEORY

The ΛCDMHC cosmological model relies on the Jeans 1902 theory for structure formation in a gas nebula. Jeans assumed frictionless ideal flow of the gas and linear perturbation stability analysis without effects of diffusion. This reduces the governing equatons to those of acoustics, so the only length scale for structure formation is the Jeans scale $L_J = V_S/(\rho G)^{1/2}$, where $V_S$ is the speed of sound in the gas and $(\rho G)^{-1/2}$ is the gravitational free fall time in a gas of density $\rho$. The density must be set to zero to get a solution (the Jeans swindle).

No structures can form during the plasma epoch of Fig. 1 because the Jeans scale of the plasma is larger than the horizon scale $L_H$ of causal connection ct, sometimes called the Hubble scale. Information transfer cannot take place faster than the speed of light. Observations in Figure 2 show clear evidence of very early gravitational structure formation in the plasma epoch.

## 3. OBSERVATIONS

An example of recent evidence showing plasma epoch structure formation is provided by Figure 2, from Spitler et al. (2012) and the z-FOURGE collaboration.

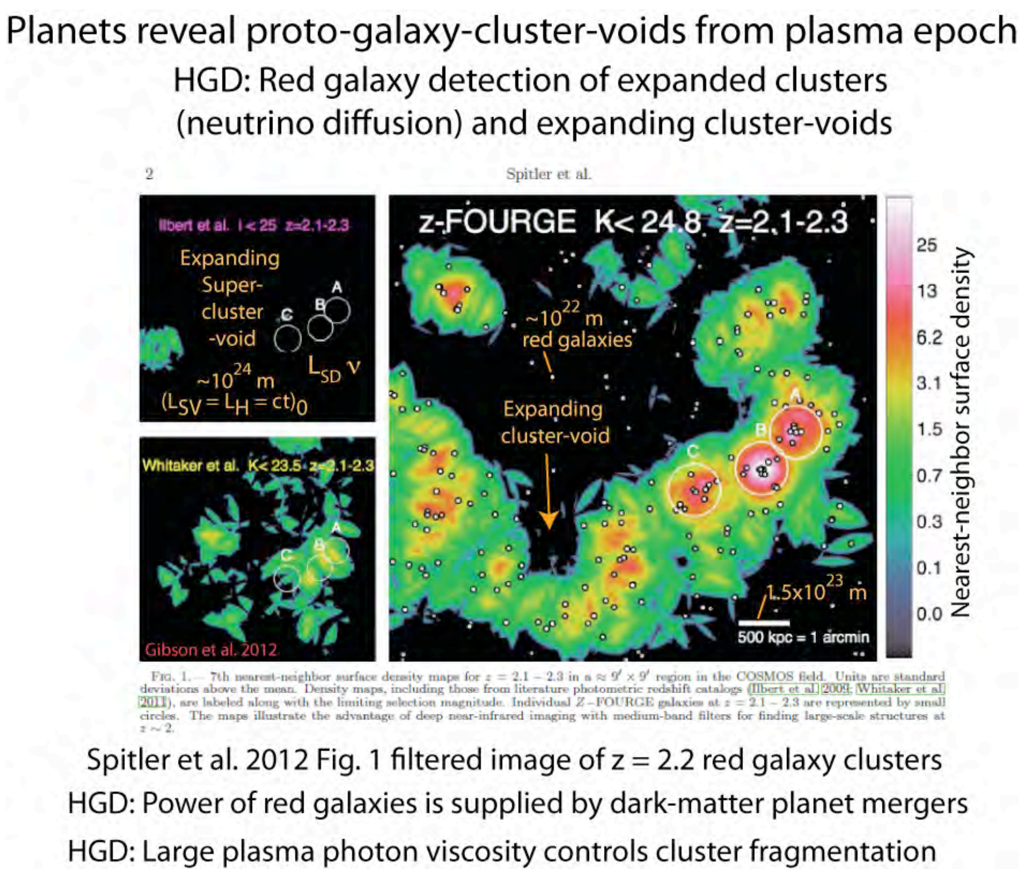


Figure 2. Filtered infrared images of red galaxies from the 4000 angstrom Balmer line (z-FOURGE collaboration) permit their precise locations at redshift z ~ 2.2 (Spitler et al. 2012, their Fig. 1) and the location of expanding clustervoids and superclustervoids predicted by HGD cosmology, but indetectable otherwise.

Furthermore, radio telescope evidence exists from Rudnick et al. 2008 arXiv:0704.0908v2 of a 300 Mpc ($10^{25}$ m) supercustervoid region completely devoid of matter, confirming the predictions of HGD cosmology and falsifying CDMHC cosmology.

Figure 3 shows infrared and optical images of the Antennae galaxy merger, to contrast the predictions of HGD and ΛCDMHC cosmologies, and to show manifestations of extraterrestrial life in the cosmos. Two galaxies, termed A and B in Fig. 3, are merging as shown by the two star trails that appear as antennae. What causes the star trails?

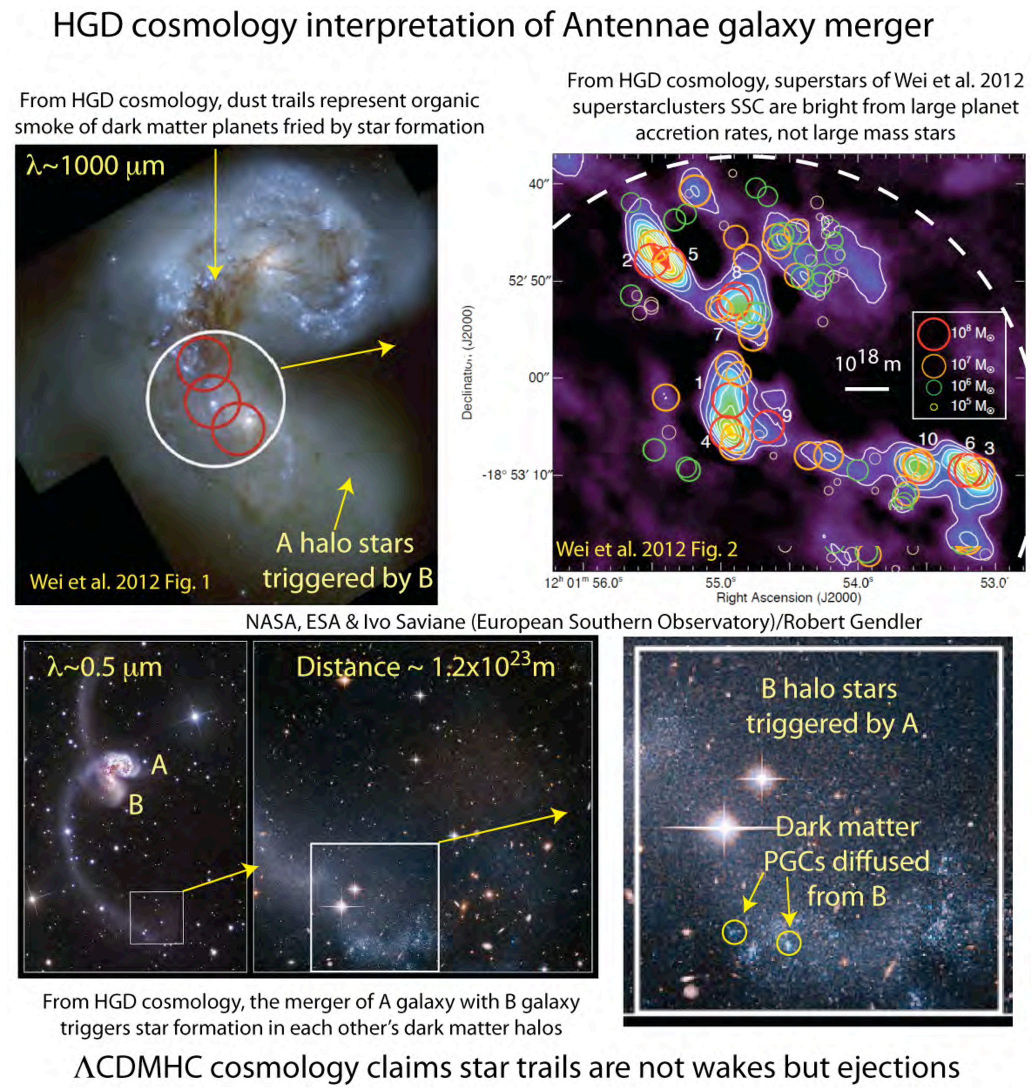


Figure 3. Observations of the Antennae galaxy by Wei et al. 2012 at 1 mm wavelength (top left and right) reveals A galaxy dark matter PGCs and PGC clusters of various masses and sizes diffused outward from the A protogalaxy to form its halo when the planets froze solid at 24 Myr, with stars triggered into formation by the passage of the B galaxy. B halo dark matter halo stars in PGCs were similarly triggered in place by the passage of the A galaxy in the bottom optical images. HGD cosmology explains the Antennae as star wakes, not ejections as tidal tails according to ΛCDMHC cosmology. Hot star formation near the galaxies leaves opaque PAH (polycyclic-aromatic-hydrocarbon) dust trails as the life forms of surrounding planets are evaporated (upper left), see images of Helix PNe in Gibson-Schild-Wickramasinghe (2011).

The conventional interpretation of the Antennae is that these are “tidal tail” ejections of stars between A and B neglecting fluid mechanical forces that might resist the tides. Frictional stresses between planets resist disruption of the proto-galaxies until the planets have become mostly frozen at about 24 Myr.

The mm band images of Wei et al. 2012 at the top of Fig. 3 show massive Super-Star-Clusters SSC with sizes ranging from PGC scales to thousands of times larger. These large objects are much too massive to have been extracted from their mother galaxies by tidal forces as part of tidal tails, and there is no evidence of the reverse tidal effect on the opposite sides of the galaxies. From the excellent resolution of both the mm (1000 μm) band and optical (0.5 μm) band images a much more plausible (HGD) interpretation is that the star trails are wakes induced as A and B move through each other's baryonic dark matter halos of PGC clumps of planets, as well as clumps of PGC clumps that are observed in the panel of Fig. 3 in the upper right.

Figure 4 shows a Herschel image of the nearby star Fomalhaut, from Acke et al. (2012). The HGD interpretation of the bright comet accretion disk is that life-infested comets are continually impinging on the star, its planets and their moons from the Oort cavity boundary of Earth's PGC. The PGC shares the spin of the remnant vortex line from the cosmic big bang, along with the Galaxy. Acke et al. (2012) suggest comets have been captured and are breaking up in a resonant accretion disk of the planet Fomalhaut b. Another possibility is a primordial planet, possibly Jupiter mass or larger, is the cometary source of all the Fomalhaut objects. Centrifugal forces of the PGC put the comet into an orbit about the star. We may see in Fig. 4 a means of producing rocky metallic planets like the Earth and Mars as remnant Jupiter planet cores. Mergers of planet cores and fragmentation and evaporation of cometary objects take place within the accretion disk with the solid planet and cometary debris in resonance. With time the disk will decrease in diameter and eccentricity as comets fall into the star and hydrogen and helium gas of the evaporated comets are ejected by radiation pressure.

Matese and Whitmire (2011) identify a planet Tyche with mass about three Jupiters precisely at the boundary of the Oort cavity $3x10^{15}$ m from the Sun (20,000 AU) where HGD cosmology would predict it to be from the expression $L_{Oort\ Cavity} = (M_{SUN}/\rho_0)^{1/3}$, where $\rho_0$ is the density of first plasma epoch fragmentation $4x10^{-17}$ kg/m$^3$. Such massive planets form from primordial planets of the Earth-PGC by planet mergers and are the source of the life infested planets of cometary panspermia. Tyche represents one of the thousand Jupiters needed to produce the sun, with rocky and metallic central core produced by the mergers to explain such planets as Earth.

Evidence of extraterrestrial life and life before the existence of Earth is found in a variety of meteorites, especially carbonaceous chondrites, Pflug and Heinz (1997), Engel and Nagy (1982), Wickramasinghe, Hoyle and Wallis (1997), Engel and Macko (2001) and Hoover (2011). The odds that life originated abiotically on Earth from HGD is immeasurably small; that is, a probability of perhaps one chance per primordial planet produced by the cosmological big bang, or $10^{-80}$. Hoyle and Wickramasinghe give smaller odds, $< 10^{-100}$.

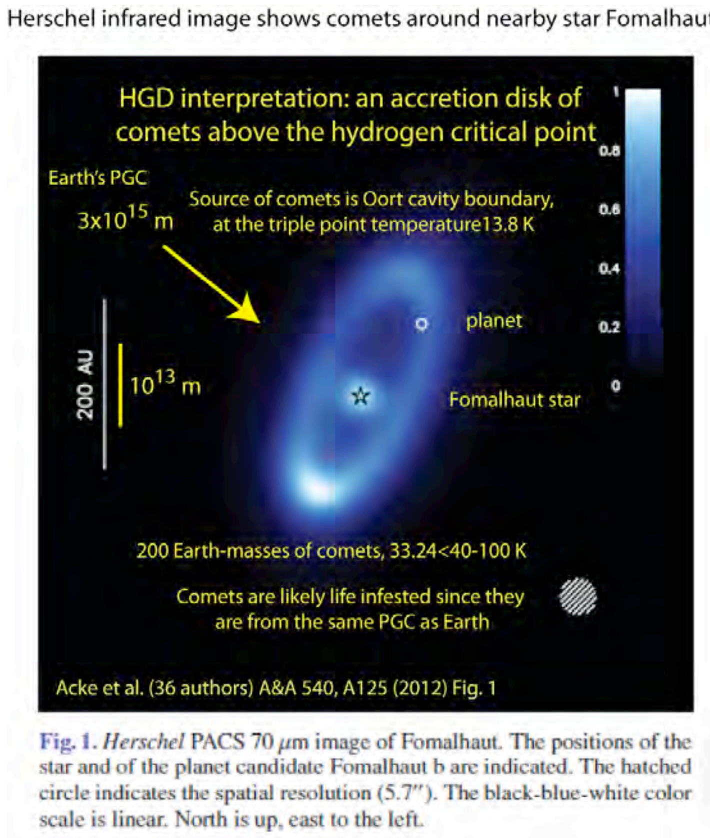


Figure 4. Herschel infrared image of nearby star Fomalhaut, at a distance of 7 pc or $2x10^{17}$ m., Acke et al. 2012, Fig. 1. The authors estimate 200 Earth masses of broken up comets are available in this resonant planet accretion disk to transmit life by Wickramasinghe-Hoyle cometary panspermia to whatever other planets inhabit the Fomalhaut system.

Figure 5 shows the HGD interpretation of Kwock and Zhang (2011), which claims an abiotic source of kerogen from star Nova events. Complex kerogen molecules from UIE (Unidentified Infrared Events) are assumed to somehow condense 0.5 to 1.5 years after the event when the signals are detected. The mechanism is not specified and seems highly implausible from the complexity of kerogen molecules. Kerogen is a waxy fossilized material in shale and other sedimentary rock that yields oil upon heating, and is insoluable in organic solvents. The time delay for UIE events nicely matches the time for light to travel from the star to the inner boundary of Oort cavity left in the PGC clump of planets when a star is formed. If the planets at the Oort cavity boundary are life infested, their evaporation by the Nova event radiation should produce the detected kerogen. The radius of an Oort cavity is given by the expression $(M_{STAR}/\rho_0)^{1/3}$, where $\rho_0$ is the density of the universe at the time of first fragmentation. From HGD, strong radiation from the central star stops the accretion of planets at the mass of the sun, and $\rho_0$ is the density of globular star clusters, giving a constant Oort cavity radius of $3x10^{15}$ meters.

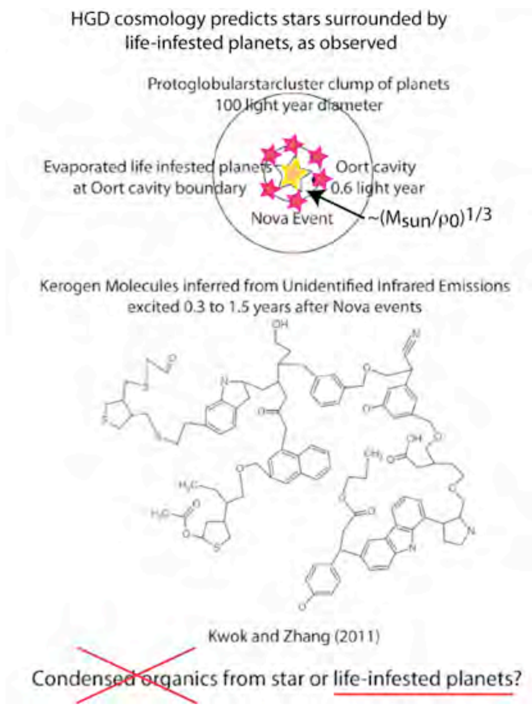


Figure 5. Evidence of evaporated life infested planets from infrared spectra of Kwok and Zhang (2011), based on HGD cosmology. From HGD, complex kerogen molecules by condensation on shock waves is a less plausible mechanism for their presence than evaporation of planets containing life surrounding such stars experiencing Nova events.

We see from Fig. 2 that HGD cosmology structure formation mechanisms have been in progress during the plasma epoch to produce the protogalaxies that fragment to dark matter planets in clumps that appear in the galaxy halos of Fig. 3. These are the descendants of the hot gas planets of the first deep water oceans that hosted the first life.

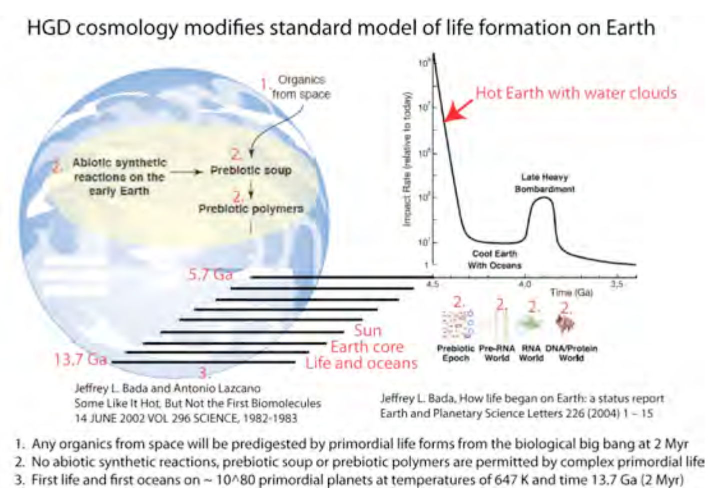


Figure 6. HGD cosmology modifies the standard models of how life developed on Earth, Bada and Lazcano (2002) and Bada (2004). Organic molecules from space are likely to be biotic, originating from the life infested PGC containing Earth.

The standard model of how life began on Earth is shown in Figure 6, Bada and Lazcano (2002) and Bada (2004). Bada, Miller and Urey pioneered the abiotic production of amino acids simulating conditions of the early Earth. Bada and

Lazcano may be right about the importance of low temperatures to the evolution of the first biomolecules, but the time and place of the evolution should be earlier and elsewhere.

Several modifications in the biological standard model are required according to HGD cosmology. Three points of difference are listed in Fig. 6: 1. The Organics from space on the Bada and Lazcano (2002) fig. 6 (left) is assumed to be abiotic, which is highly improbable from HGD cosmology, especially when comets originate in the Earth PGC since Earth is known to be life infested. 2. No abiotic synthetic reactions, prebiotic soup or prebiotic polymers should exist on Earth (left figure) and no prebiotic epoch, pre-RNA world, RNA world, or DNA/Protein world (right figure) should exist separate from the life transported to this planet by comets and meteorites. 3. First life and first oceans on the planets that merged to form the Earth have a history of 13.7 Gyr (left fig. 6) that predate the formation of the Earth core and the Sun. Most rocky planets like Earth during their formative stages should have water from their rocks, but mostly from their comets and meteorites according to HGD cosmology (right fig. 6).

## 4. DISCUSSION AND CONCLUSIONS

Fluid mechanical modifications to CDMHC standard cosmology permit an explanation for the early formation of life in the universe. The primary modification is the introduction of viscous stresses ignored by Jeans 1902. During the plasma epoch it is assumed that the primary momentum transport mechanism is elastic scattering of photons by electrons using the classic Thomson scattering cross-section and the densities and temperatures predicted by physical cosmology textbooks (e. g. Peebles, Peacock, Weinberg). The protons and alpha particles of nucleosynthesis are tightly bound to the electrons, so the momentum transport to electrons is passed on to the ions. The resulting photon viscosity coefficient is $4x10^{26}$ $m^2$ $s^{-1}$. Such a large kinematic viscosity cannot be ignored, and results (Figure 1) in fragmentation of the plasma at supercluster mass scales at time $10^{12}$ seconds (30,000 years), supported by clustervoids observations from precise mid-infrared filters in Figure 2. Larger cluster-voids such as that observed by Rudnick et al. (2008), discussed by Gibson and Schild (2010), completely falsifies CDMHC cosmology where voids and superclusters appear last rather than first, so voids predicted are much smaller than those of HGD cosmology. Figure 3 shows the infrared interaction of two merging galaxies and their halos in the Antennae galaxy, revealing dark matter halos of both galaxies to be PGC clumps of primordial planets that make stars and globular star clusters when agitated, as predicted by HGD cosmology, Gibson (1996) and Schild (1996).

HydroGravitational Dynamics HGD theory and recent observations, particularly in infrared bands, vindicate the Wickramasinghe-Hoyle hypothesis of cometary panspermia as the source of cosmic life on most planets, and provide the primordial planet mechanism and a 2 Myr time of life beginning in the first water oceans. Figure 4 shows an infrared image interpreted from HGD as a comet forming a Kuiper belt around Fomalhaut star at the height of its dynamical activity, then breaking up into smaller cometoids to deliver whatever life forms were present on the mother comet from the Oort cavity boundary of the Earth-PGC to Fomalhaut planets. According to HGD, planets are millions of times more common than expected from the standard cold dark matter CDM cosmology, and were created a thousand times earlier and a thousand times hotter, permitting a biological big bang at only 2 Myr after the cosmic big bang event. The concept that observed complex organic chemicals like kergogens form by condensation after Nova events, Figure 5, is unnecessary if life infested planets at the Oort cavity boundary have been evaporated. The standard biological model, Figure 6, where all life is created on Earth from abiotic materials of outer space, is therefore implausible according to HGD cosmology. The arrival of living, motile, red rain and diatom organisms in the Polonnaruwa carbonaceous chondrite, Wickramasinghe-Samaranayake et al. (2013ab) certainly vindicates the Hoyle-Wickramasinghe cometary panspermia hypothesis, and casts doubt on the standard biological model of Fig. 6., where life originates on Earth from abiotic materials, Bada and Lazcano (2002) and Bada (2004).

## 5. DEDICATION

This paper is dedicated to the memory of Minoru Freund, whose pioneering work in infrared cosmology and interdisciplinary science laid its groundwork, and whose courage inspires the next steps. See http://mino.seti.org/.

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