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The cosmic web and microwave background fossilize the first turbulent combustion

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ABSTRACT

The weblike structure of the cosmic microwave background CMB temperature fluctuations are interpreted as fossils of the first turbulent combustion that drives the big bang[1,2,3]. Modern turbulence theory[3] requires that inertial vortex forces cause turbulence to always cascade from small scales to large, contrary to the standard turbulence model where the cascade is reversed. Assuming that the universe begins at Planck length 10^{-35} m and temperature 10^{32} K, the mechanism of the big bang is a powerful turbulent combustion instability, where turbulence forms at the Kolmogorov scale and mass-energy is extracted by $< -10^{113}$ Pa negative stresses from big bang turbulence working against gravity. Prograde accretion of a Planck antiparticle on a spinning particle-antiparticle pair releases 42% of a particle rest mass from the Kerr metric, producing a spinning gas of turbulent Planck particles that cascades to larger scales at smaller temperatures (10^{-27} m, 10^{27} K) retaining the Planck density 10^{97} kg m^{-3}, where quarks form and gluon viscosity fossilizes the turbulence. Viscous stress powers inflation to ~ 10 m and $\sim 10^{100}$ kg. The CMB shows signatures of both plasma and big bang turbulence. Direct numerical simulations support the new turbulence theory[6].

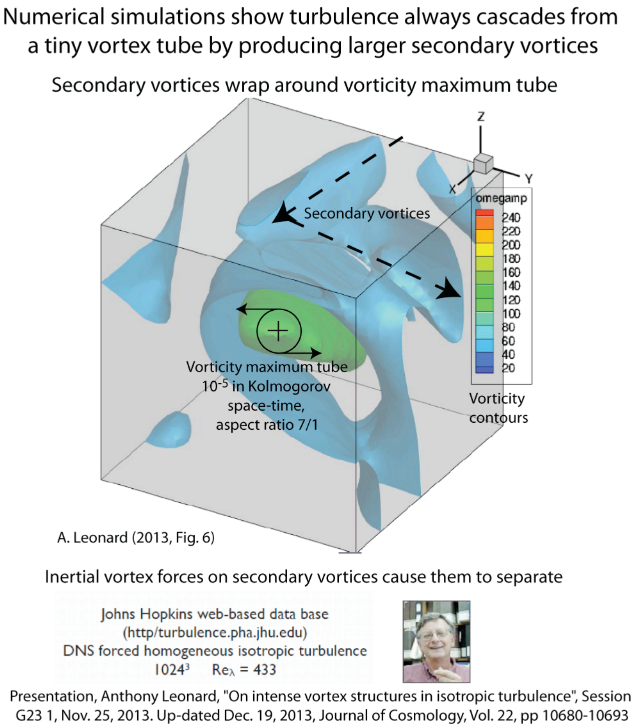
Keywords: Cosmology, star formation, planet formation, extraterrestrial life.

1. INTRODUCTION

Cosmology is in a state of rapid change since collisional fluid mechanics has been included. Instead of clumps of cold dark matter and antigravitational dark energy, the dark matter of galaxies is predicted and observed to be clumps of a trillion < Earth mass planets from fluid mechanics Gibson (1996)[3], as independently demonstrated by careful measurements over a 15 year period of a quasar gravitationally lensed by a galaxy, Schild (1996)[4]. From the flood of information from new and improved telescopes it is increasingly clear that standard models of cosmology and fluid mechanics are obsolete and must be revised. Most scientists explain the dark night sky and increasing redshift and galaxy density with increasing distance as conclusive evidence of a hot big bang origin. It seems obvious that the big bang should be turbulent, but if the universe starts as a space-time singularity at Planck conditions, where does the turbulent energy come from? No large scale turbulence or large scale anything else exists at the time of the big bang to supply energy. The answer is that the big bang turbulence generates its own energy: it is a form of turbulent combustion[1,2]. It is also clear that the standard models for the origins of life are incorrect, since they do not account for the existence of 10^{80} densely packed hot water ocean planets at 2 Myr sharing information on cosmic scales about organic chemistry and DNA as the planets make all the stars.

The standard turbulence "poem" from G. I. Taylor and L. F. Richardson says "Big whorls have little whorls that feed on their velocity, and smaller whorls have smaller whorls, and so on to viscosity (in the molecular sense)". The problem is that the poem is wrong and the turbulence cascade direction is backwards. A better definition and cascade direction follows from "Little whorls on vortex sheets, form and pair with more of, whorls that grow by vortex forces, Slava! Kolmogorov!".

The mechanism is illustrated by Figure 1, from Leonard (2014). Professor Leonard used the large numerical simulation of turbulence in a library at Johns Hopkins University to explore the role of vorticity. He found a common morphology at small scales, where a tiny vortex tube was found to be radiating secondary vortices growing with distance and powered by inertial vortex forces according to the new definition of turbulence by Gibson (1996)[3] needed to explain the big bang and the evolution of the universe controlled by collisional fluid mechanics. Rather than the standard LCDMHC cosmology, which assumes the collisionless Boltzmann equation, HGD (Hydro-Gravitational-Dynamics) cosmology is assumed that includes the revised definition of turbulence.


Numerical simulations show turbulence always cascades from
a tiny vortex tube by producing larger secondary vortices

Secondary vortices wrap around vorticity maximum tube

A. Leonard (2013, Fig. 6)

Inertial vortex forces on secondary vortices cause them to separate

Johns Hopkins web-based data base
(http/turbulence.pha.jhu.edu)
DNS forced homogeneous isotropic turbulence
1024^3 $Re_\lambda = 433$

Presentation, Anthony Leonard, "On intense vortex structures in isotropic turbulence", Session G23 1, Nov. 25, 2013. Up-dated Dec. 19, 2013, Journal of Cosmology, Vol. 22, pp 10680-10693

Figure 1. Numerical simulations of turbulence, Anthony Leonard.

Observations of the cosmic microwave background have accumulated for nearly a decade with ever increasing precision. Figure 2 shows the power spectrum of the CMB produced by the Planck collaboration in the upper right hand panel. The maximum at multipole (wavenumber) 200 is incorrectly referred to as a "Sonic Peak", due to sonic baryon (plasma) oscillations in cold dark matter clumps (halos), but this is physically impossible and contrary to the CMB spectrum. Secondary turbulence vortices give equal amplitude secondary peaks, as observed. Sonic oscillations would monitonically decrease with decreasing ℓ.

The plasma epoch exists between 10^{11} s when mass exceeds energy to 10^{13} s when the plasma becomes gas. The plasma kinematic viscosity ν estimated by Gibson (1996)[3] is ~ 10^{26} m^2 s^{-1}. Aesthenosphere viscosity (the viscosity of the plastic rock layer below sliding continents) is computed from glacial rebound to be much less, at ~ 10^{21} m^2 s^{-1}. Such enormous viscosities prevent plasma turbulence until ~ 10^{12} s, and rule out any baryon sonic oscillations within CDM clumps, even if CDM exists (it does not) or if could clump (it could not).

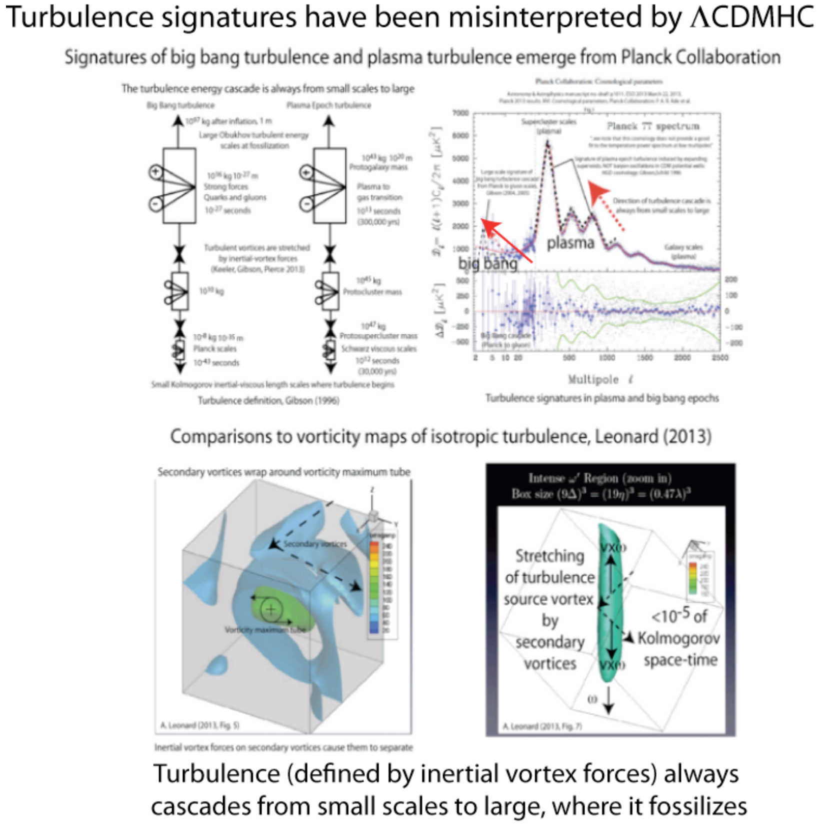


Figure 2. Plasma turbulence and Big Bang turbulence signatures in the CMB.

The mechanism of plasma epoch viscosity is simple. The plasma is very hot, very low density, and is mostly protons and electrons. It is very viscous. Photons collide elastically with electrons, so the mean free path for photon-electron collision can be estimated from the Thomson scattering cross section and electron density to be ~ 10^{18} m: less than the scale of causal connection ct for time values t > 10^{10} s. The viscosity ν is the mean free path times the speed of the particle carrying the momentum; that is, the light speed c = 3 10^8 m s^{-1}. Thus ν is ~ 3 10^{26} m^2 s^{-1}. This is larger by trillions than the viscosity by proton-electron collisions.

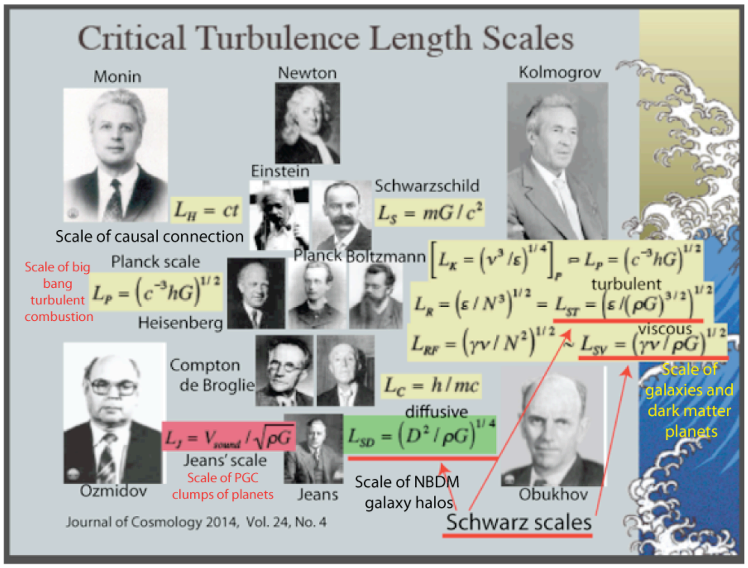
In Fig. 2, the CMB peak at $\ell = 200$ can have nothing to do with sound in such a super-viscous fluid as the cosmic plasma, but must represent the largest scale of a turbulence cascade. The angular scale is near 1 °, so the physical scale at present would be ~ 3 10^{22} m. The fragmentation scale of plasma protogalaxies is ~ 10^{20} m (the Nomura scale), so the observations of the CMB suggest a turbulent plasma cascade from a Kolmogorov scale ~ 10^{20} m of plasma protogalaxies to an Obukhov (energy) protogalaxycluster scale 300 times longer than a protogalaxy. If the CMB peaks were sonic, the third peak would be lower than the second. It is equal, proving the peaks are not sonic but a fossil plasma turbulence signature.

Such galaxy clusters have been observed in the Hubble ultra-deep-field, but have always been misidentified as chain galaxies rather than chain ***clusters*** of galaxies. The Hickson compact group galaxies such as the Stephan quintet are examples of such chain clusters of galaxies, stretched by turbulence inertial vortex forces and the expansion of the universe into a thin pencil (with the Nomura morphology, where turbulent spheres making lasagna-like pancakes and then spin up into spaghetti-like vortex tubes). The galaxies look close together because they are viewed end on. Red arrows show the turbulent cascade direction from small scales to large of the plasma turbulence from galaxy to galaxy cluster scales (10^{20} m to 3 10^{22} m), and big bang turbulent combustion from Planck scales (10^{-35} m) to quark-gluon viscous scales (10^{-27} m), now inflated by the factor 10^{52} expansion of the universe to the present ~10^{25} m size of these fossils of big bang turbulence.

2. THEORY

Figure 3 compares stratified turbulence theory with self-gravitational stratified turbulence theory, using the new inertial vortex force definition of turbulence[3]. Oceanographic specialists Monin and Ozmidov pioneered the applications of Kolmogorov-Obukhov universal similarity to the ocean and atmosphere. Jeans independently attempted to describe self-gravitational flows assuming the Euler (inviscid) equations and linear perturbation stability analysis (no turbulence), but failed. The Jeans length scale only applies to the plasma to gas transition, giving the mass of protoglobularstarclusters PGC of dark matter gas planets at L_{SV}, but fails to describe fragmentation of the plasma to form protogalaxies that also occurs at this viscous Schwarz scale.

When turbulence is defined by inertial vortex forces, the universal similarity laws of Kolmogorov and Obukhov apply to self gravitational cosmological fluids.



Critical Schwarz scales for big bang turbulent combustion depend only on light speed c, Planck constant h, Newton's constant G, with Boltzmann's constant k needed for thermodynamics and temperature.

Figure 3. Turbulence scaling for stratified and self-gravitational flows.

The big bang occurs when the quantum mechanics Compton scale L_C = h/mc matches the general relativity Schwarzschild scale $L_S = mC/c^2$ at the Planck mass $m_P = (hc/G)^{1/2} \sim 10^{-8}$ kg. Both turbulence and gravity are highly nonlinear, so normal mathematical methods fail at big bang conditions. Fig. 3 summarizes the application of turbulence methods to the big bang. Several length scales emerge, termed Schwarz scales, based on the physical model for the big bang turbulence, shown in Fig. 2.

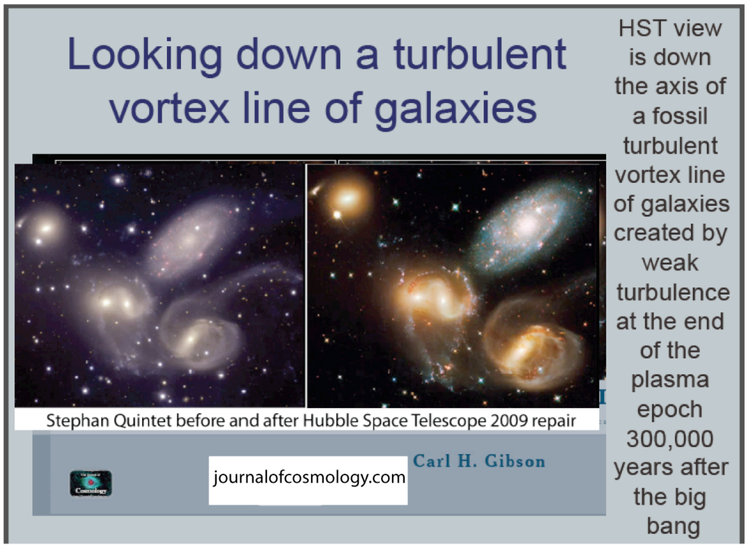
Since the new definition of turbulence and the resulting new big bang turbulence theory are strongly supported by CMB observations, this means that the amazingly complex and brilliant mathematical models of Hawking, Thorne, Susskind, Berkenstein, etc. are reduced to simply further unsuccessful attempts to solve the turbulence problem, adding their names to a long distinguished list of scientists that have failed in their mathematical approach to what is considered the single most difficult outstanding problem of classical physics. The problem was solved[1,2] by realizing it cannot be solved by mathematics. Mathematics cannot solve nonlinear problems. Cosmology is doubly nonlinear because it involves both turbulence and gravity.

3. OBSERVATIONS

Figure 4 shows one of the first images from the heroic 2009 repair of the Hubble Space Telescope (the odds of astronaut survival were slightly better than surviving Russian roulette with a six shooter). To protect the telescope from a meteor shower, it was pointed for several days in a direction that happened to include the Stephan Quintet of galaxies, permitting the right image taking full advantage of the highest resolution image ever of this interesting object, discovered by the astronomer Edouard Stephan in 1877. It is the most compact group of galaxies ever discovered, but is consistently misinterpreted as a collision of galaxies based on ΛCDMHC cosmology. It is the opposite.

From the repaired HST, the image of galaxy NGC 7320 on the upper right could be colored blue because it is much closer than the others, whose light is red shifted because they are farther away. The galaxies are arranged on a thousand to one aspect ratio pencil, stretched by the expansion of the universe to ~ 10^{25} m from 10^{22} m and kept compact by viscous interactions of the galaxies.

The repaired HST image of a galaxy in the Stephan Quintet
appears blue because it is much nearer to the Earth than the others



Looking down a turbulent vortex line of galaxies

HST view is down the axis of a fossil turbulent vortex line of galaxies created by weak turbulence at the end of the plasma epoch 300,000 years after the big bang

Stephan Quintet before and after Hubble Space Telescope 2009 repair

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Plasma protogalaxies fragment along weakly turbulent vortex lines
at the end of the plasma epoch to form chain galaxy clusters such
as the Stephan Quintet and the Quasar Quartet (JoC, Vol. 25, No. 46).
The vortex tube pencils are a thousand times longer than they are wide.

Figure 4. Stephan Quintet imaged by the repaired Hubble Space Telescope.

As shown in Fig. 4 and in the Quasar Quartet[5], galaxies form by fragmentation along the weak turbulence vortex lines of the plasma epoch at protogalaxy Nomura-Kolmogorov viscous scales of 10^{20} m. Each of the galaxies of Fig. 4, and all other galaxies, have a nucleus that fossilizes the Nomura scale, freezing this fossil of the plasma turbulence into the > 10^{53} galaxies produced by the big bang. The probability is ~ 10^{-7} for four quasars to randomly have the small angular separation observed, supporting the HGD cosmology hypothesis that the quasars fragmented as plasma proto-galaxies along a turbulent vortex line.

4. CONCLUSIONS

All evidence supports the conclusion that the standard models of turbulence and cosmology must be replaced. Turbulence must be redefined[3] to include only flows dominated by inertial vortex forces, and cosmology must be revised[1,2] to include this revised turbulence definition that requires turbulent kinetic energy to always cascade from small scales to large.

Numerical simulations[6] in Fig. 1 and Fig. 2 show that turbulence begins at small scales from a 7/1 vortex nucleus that occupies only a 10^{-5} fraction of Kolmogorov space time. CMB spectra in Fig. 2 confirm that the plasma viscosity have damped any baryon oscillations in cold dark matter halos, leaving the correct interpretation of the "sonic peak" as that of plasma epoch turbulence.

Fig. 3 and Fig. 4 show the theory of structure formation in the plasma and gas epochs, giving the vortex tubes of the cosmic web, and the large numbers of dark matter planets in PGC clumps that host the formation of life.

5. REFERENCES

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