International Journal of Frontiers in
Science and Technology Research
Journal homepage: https://frontiersrj.com/journals/ijfstr/
ISSN: 2783-0446 (Online)

(REVIEW ARTICLE)

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The small bang theory: A complementary alternative to the big bang cosmology with implications for physics, biology, and chemistry

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International Journal of Frontiers in Science and Technology Research, 2023, 04(01), 017–020

Publication history: Received on 01 January 2023; revised on 07 February 2023; accepted on 10 February 2023

Article DOI: https://doi.org/10.53294/ijfstr.2023.4.1.0052

Abstract

While perhaps more in the purview of physics, the hypothesis proposed here still has wide-ranging implications for biological living systems as well. Central to it are the fundamental particles known as electrons, which of course also play a central role in the electron transport chain and oxidation-reduction (redox) reactions found throughout not only inorganic, but organic and biochemistry, in addition to biology. The formerly mentioned electron transport chain involves the incremental extraction of energy from electrons in living biological systems, while the latter is characterized by loss of electrons by one chemical species – oxidation – and subsequent gain of those electrons – reduction – by an adjacent chemical species. Such is the basis for nearly every, if not all metabolic processes in living organisms.

Keywords: Big Bang; Cosmic Microwave Background; Electron-positron pair; Hadron; Photon

1. Introduction

Currently prevailing cosmological models for the origin of the universe posit that "the universe as we know it started with an infinitely hot and dense single point that inflated and stretched — first at unimaginable speeds, and then at a more measurable rate — over the next 13.7 billion years to the still-expanding cosmos that we know today," with a milieu of subatomic particles such as protons, neutrons, electrons, quarks photons, muons, gluons, etc. forming into both the animate and inanimate matter present around us in the interim, leaving behind in its wake the prevailing "afterglow" of the cosmic microwave background (CMB) radiation [1]. Indeed, it is this latter phenomenon of the CMB that is usually cited as the greatest evidence in support of the Big Bang theory in addition to the observed expansion of the universe [2].

Albert Einstein, however, once famously said that "everything should be made as simple as possible, but no simpler" [3], and so to that end, the hypothesis, with corroborating experimental evidence, is put forth here that the CMB has been present, albeit much, much smaller, since the inception of the universe, and that the universe as we now know it began as a Planck-volume polarized vacuum CMB of virtual photons which oscillated into real photon pairs, whose presence expanded the vacuum and whose collisions produced electron-positron pairs. These subsequently collided to form quarks, gluons, and the other composite hadrons like protons and neutrons, in turn manifesting the strong, weak, and gravitational forces from the already present electromagnetic force, by virtue of these particles' presence, further growing and expanding the polarized spacetime vacuum, forming the stars, galaxy clusters and superclusters that we now observe today.

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2. Methodology

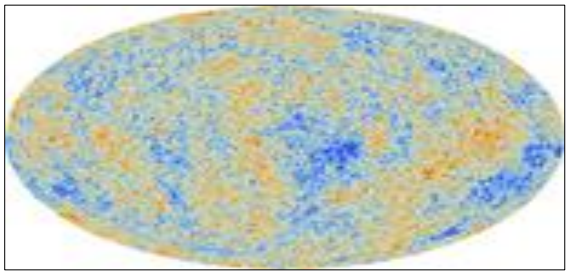
The initial tenet of this theory is that virtual photons in a Planck-volume polarized vacuum CMB oscillated into real photon pairs, a well-known phenomenon known as the Casimir effect [4], and thus the Small Bang. The Planck volume was chosen here since it is the smallest definable three-dimensional space in which a polarized vacuum may exist [5]. Virtual photons have recently been detected experimentally at microwave frequencies [6] and have been experimentally oscillated into real photons by changing the direction of a magnetic field "mirror" in a vacuum several billion times per second, oscillating the vacuum up to 25% the speed of light via microwave radiation [7]. This can be readily achieved given the frequency of the CMB, which ranges from 0.3 Gigahertz (GHz) to 630 GHz, with a peak of 160.4 GHz [2], corresponding to as many billions of oscillations per second, i.e., 0.3, 630, and 160.4, respectively [8]. As a matter of perspective, the peak of 160.4 GHz corresponds to roughly only six times the energy of 5G network equipment [9], compared to the nearly unimaginable energies required for the occurrence of the Big Bang [1]. Intriguingly, recent evidence also suggests that a polarized CMB may be linked to the phenomena of dark matter and dark energy [10], though it should be noted here that the only one of the four forces of nature present at this point and starting out was electromagnetism.

The next tenet of the Small Bang theory is that of expansion of the polarized vacuum to accommodate the presence of the real photons being generated. Corollary to this and increasing expansion even more would be the radiation pressure of the photons which, in addition to carrying energy, also transport momentum, capable of exerting mechanical force [11]. Such expansion would then be amplified by the pressure accompanying the formation of electron-positron pairs from resultant photon pair collisions, which has also been observed experimentally [12]. The first and arguably only fundamental particle here then would have been the electron and its accompanying antiparticle, the positron, with electromagnetism still the predominant force, but with gravitation beginning to manifest as a consequence of the electron's and positron's slight mass, as dictated by Einstein's general relativity theory [13]. Recent evidence, known collectively as Energy Wave Theory (EWT), also supports these conclusions [14].

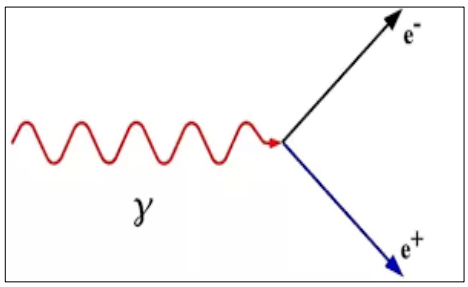
Next, expansion continued with the experimentally confirmed collision of electron-positron pairs and their annihilation into first, quark-antiquark pairs and gluons, and then hadrons, with recombination forming proton and neutron hadrons, all representing an increase in the numbers and types of subatomic particles, as well as an increase in the gravitational force and the beginning manifestations of the strong and weak nuclear forces, the latter coming from residual hadron decay [15]. The prevailing cooler temperature of the CMB at 2.73 K, as compared to the extremely high temperature called for with the Big Bang, not only allowed near-instantaneous formation of these subatomic particles and forces, but also greatly facilitated the recombination of electrons, protons, and neutrons into neutral molecular hydrogen and its isotopes, allowing for the seeds of star, and eventually galaxy cluster and supercluster formation to begin [1]. Indeed, expansion was no doubt greatly enhanced by the ignition of the first stars via nuclear fusion and has continued on to what is now observed today. Given the age of the universe, the resultant diameter due to expansion from the processes described here matches, to within a statistically significant 3% or 0.03, given a p value of 5% or 0.05, of the accepted diameter of the observable universe [16].

3. Results and Discussion

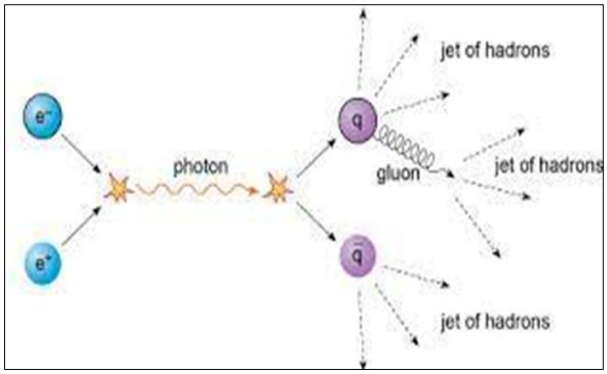
The entire process may be summarized in Figure 1 below. While the expansion of the universe and the presence of the CMB are cited as the biggest proofs for the Big Bang, they also prove the Small Bang theory as well, along with the cited experimental evidence, without the need for exorbitant conditions to exist or the spontaneous formation of matter and energy from nothing as called for in the former. All that is required for the latter is an omnipresent reduced-size CMB of virtual photons, providing a much simpler, more elegant resultant cosmology.



Frame A



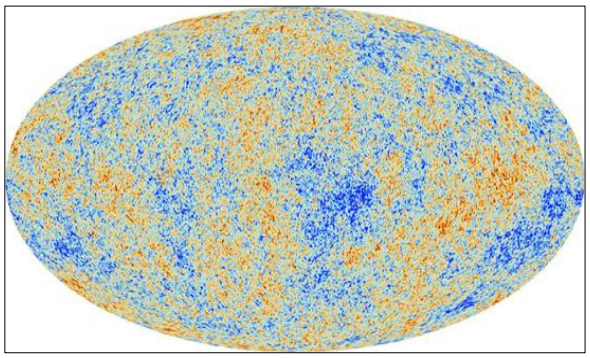
Frame B



Frame C

Frame D

Frame E



Frame F

Figure 1 Frame A: Planck-volume polarized vacuum Cosmic Microwave Background (CMB) of virtual photons. Frame B: The Small Bang – the CMB oscillates virtual photons into real photons (γ), whose pair collisions generate electron (e-) – positron (e+) pairs. Frame C: Collisions of these pairs generate photons whose subsequent collisions now generate quarks (q), antiquarks (q̄), gluons, and hadrons. Frame D: Recombination allows hadron particles such as protons and neutrons to form, permitting formation of hydrogen atom isotopes and molecular hydrogen, which then coalesces into clouds where star formation begins. Frame E: Clusters and superclusters of galaxies formed from stars. Frame F: Present-day CMB that permeates the known observable universe

Abbreviations

- CMB: Cosmic Microwave Background,
- EWT: Energy Wave Theory,
- GHz: Gigahertz,
- Redox: oxidation-reduction

4. Conclusion

While perhaps more in the purview of physics, the hypothesis proposed here still has wide-ranging implications for biological living systems as well. Central to it are the fundamental particles known as electrons, which of course also play a central role in the electron transport chain and oxidation-reduction (redox) reactions found throughout not only inorganic, but organic and biochemistry, in addition to biology. The former electron transport chain involves the incremental extraction of energy from electrons in living biological systems, while the latter is characterized by loss of electrons by one chemical species – oxidation – and subsequent gain of those electrons – reduction – by an adjacent chemical species. Such is the basis for nearly every, if not all metabolic processes in living organisms.

Compliance with ethical standards

Acknowledgments

I especially thank my fellow faculty and staff at Blue Ridge Community and Technical College (BRCTC). I also thank my student, Vincent Torres, whose valuable discussions helped to greatly influence the writing of this paper.

Disclosure of conflict of interest

The author declares no conflict of interest in the performance of this research or the writing of this paper.

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