# Big Bang's Quantum Problem

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The early twentieth century produced the beginnings of relativity, quantum mechanics, and the big bang, but then went off the rails like much of the world in the early 1930s. The rest of the world recovered but quantum mechanics did not recover. Physics was weighed down with a continuum geometry that did not allow quantum mechanics and relativity to be united. Then came 30 years of cold fusion experiments that could not be explained. To get things back on track we will dispense with the creation myth of this New Age physics that Edwin Hubble's work produced, the big bang. There is an intimate connection between cold fusion and the improbability of any great bang emanating from a point. The underlying problem was the suppression of the development of both quantum mechanics and relativity. *final published version 15 Sept. 2021*

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## I. THE REASON FOR CENSORSHIP

Censorship is widespread in physics as certain subjects have been labeled off limits. Censorship in physics became rampant after the 1960s in order to protect the people involved in contract physics: the funders being principally bureaucrats wrote the script – the science publishers with high margins enforced the script – the researchers who dutifully followed the script, the public was left out because they did not know there was a script. State sponsored research was a growth enterprise and a politically simple way to extract money for political control of their version of the sciences by ensuring minimal opposition. The word censorship to control what was published was never used rather it was replaced by "peer review".

There were three different ways the censorship operated: first is intellectually driven by favoring an approach such as the Copenhagen version of quantum mechanics and its derivatives that bars explicit connections to reality (Ferry, 2019), second is ideological, where at the end of WWII the Presidium thought by staffing party followers into physics programs at universities and major laboratories it would inform them of future weapon advances (Del Santo, 2020), and third was to empower the administrative state: academic/government/favored industries, funded through extravaganzas while suppressing any ideas that challenged their authority (Eisenhower, 1961). These manipulators as a palliative to support the myth of their mastery of the physical sciences supplied the public with the big bang as a quasi-religious creation myth to be worshiped preferable from a hot tub at Big Sur (Kaiser, 2011). This was all accomplished with some excellent salesmanship, stretching energy conservation beyond its limit, and with little checking.

A most public example of an affront to establishment science was *Cold Fusion* in 1989 which managed to challenge all three lobbies and was immediately labeled a pathological science (Fleischmann and Pons, 1989) (Mallove, 1991). The cold fusion smear was done so rapidly after the announcement it was obvious as a political rather than a deliberative decision.

Another area successfully suppressed and more general is the foundation problem of quantum mechanics that has been shunned for a century (Gamow, 1966) to protect a particular form of quantum mechanics that has as its basic tenant: a limit on the questions one can ask about physical features. Helping to confuse this problem with quantum mechanics and wanting to get in on the gravy train were mathematicians who thought they could adopt quantum mechanics and make it a branch of their discipline using rigor to replace non-conforming experiments. The net result of this political activity is an incoherent mess where the utility of quantum mechanics and physics as a whole has been diminished making it difficult to either check or challenge even a simple idea like the big bang.

## II. RELIGION IN SCIENCE

There was a recent accidental challenge to the standard picture of the big bang by data at high $z$, where $z$ supposedly represents the recessional velocity, from bodies very much further away than those used by Hubble showed an apparent anomalous increase in acceleration. This is not an easy thing to accomplish for something as large as the universe. It came to be called dark energy. Actually, it could be a measure of something very different that slowly builds by changing the properties of these photons created along time ago. Rather than force a major fix to the original story of the big bang these contracted saviors fixed a few not so free constants in general relativity to save their religion (Perlmutter and et. al., 1998) (Riess and et. al., 1998).

The quasi-religious veneer that spread over the physical sciences with the ascendancy of the big bang as a sort of New Age creation myth is now beginning to show its age. A recent creditable challenge to the big bang's standard candle calibration (Kang, 2020) joined an earlier challenge concerning the changing concept of inflation required to make the visible universe sufficiently large in its allotted 13 billion years existence (Ijjos *et al.*, 2014). Inflation had to be invented for the universe expanding from a point, an ideal start for some mathematicians, but the point turned out to be a slow grower. This is a major crack in the myth of the big bang. A second crack started with the detection of *pep* fusion of two protons with an electron to produce the deuterium nucleus that has recently been detected on the sun (Collaboration, 2018). There is no reason to limit deuterium production to only occur on the sun by the weak process. It should also be a viable process within the earth as we have both ample hydrogen along with large volumes of an FCC metal useful for supporting cold fusion in $\gamma$-Fe and its alloys (Wallace and Wallace, 2019). The third crack and the most important has to do with the foundation of quantum mechanics and how the photon deals with gravity over long periods of time. It is the last two of these troubles that will reduce the big bang to a footnote by questioning the origin of the measured red shift of far flung shining bodies.

## III. MATHEMATICAL DILEMMA OF THE BIG BANG

The point that is the origin of the big bang, a common object in Euclid's geometry, yet as a physical object it has never been found. The point of the big bang is a concept that does not survive in quantum mechanics (Wallace and Wallace, 2020) as all matter and fields have a finite scale. One minor problem of being a point is you don't suffer from Lorentz contractions not even mentioning the infinite energy it would take to stuff the smallest amount of matter into a point. If points existed then you could cobble together a continuum representing any and all real numbers, but you lose out on dimensions since they simply become indexes that can be arranged in any way. Dimensions turn out to be very important building blocks in assembling matter, and making them irrelevant as the continuum does is not acceptable (Cantor, 1878) (Dauben, 1979). Recently, astronomers, mathematicians, and astrophysicists have found major problems with the big bang, however, a history covering some of the original objections and difficulties are found in Eric Lerner's book *The Big Bang Never Happened* (Lerner, 1991).

### A. The Building Blocks of Particles and Fields

Particles and fields are living organisms, they are not fixed objects, they continually recreate themselves in a dance from their own self-reference frame to be expressed in the laboratory frame (Wallace and Wallace, 2020). Their own frame of reference, self-reference frame that maybe three dimensional is a flat space where there is only one expressible spatial variable, the radial distance from its source of creation that forces a spherical symmetry on the base structure. Particles are generated from longitudinal fields in the self-reference frame where their inertia is produced along with charge. When these properties are expressed in the laboratory frame with spin a magnetic moment is generated and then the total accounting of the properties are expressed as mass.

Massless fields are generated by transverse fields and support neither inertia, a mass, nor a charge. These flat

self-reference frames for particles and fields are restricted to one free spatial variable with no direct mapping to the laboratory frame where measurements are made, because these spaces are statistically independent of each other and the laboratory frame. What is transferred between the self-reference frames and the laboratory frame are the properties of the particles and fields. Statistical-independence in exchange for the information from the self-reference frame forces a net loss of volume extracted from the laboratory frame that allows mass to generate a topological shrinkage defect of spherical symmetry in the laboratory frame. A set of self-consistent field equations for particles and fields in both frames can be easily derived from the conservation of energy and the requirement of statistical independence. One feature that is characterized in the laboratory frame is the property of superposition of fields that is not sourced by a mathematical postulate, but the result of statistical independence between all these fields. A fine example is the non-interacting behavior of the photon fields.

The real driving force that sets the geometry of physics is found in the relativistic conservation of energy for a massive particle and a massless field.

$$E^2 = p^2c^2 + (mc^2)^2$$
$$E = \hbar\omega_o \tag{1}$$

The quadratic relationship is made up of two terms: a kinetic energy term with momentum and a self-energy term that contains any potential contributions embedded in the mass term. Because this takes the form of a Pythagorean theorem for properties of a right triangle, it implies the spaces in which the kinetic energy is defined, called the laboratory frame, is orthogonal and independent from the particles self-reference frame where mass is generated. It is from the quadratic equation of energy conservation that produced the realization there was a second independent space where particle properties were created and partially generated. The expression requires a more general version of orthogonality than found in geometry. These hidden spaces are not precluded by tests of Bell's inequalities or his proof (Ferry, 2019).

The starting description of particle properties are defined by a set of differential equations in the self-reference frame, which generate the particle structure that are then completed in the laboratory frame resulting in charge (Wallace and Wallace, 2014), magnetic moment (Wallace and Wallace, 2020), and mass. The laboratory frame quantum description is also revised with the Schrödinger equation picking up two new terms to make it compatible with relativity (Wallace and Wallace, 2021). The most obvious change is the wave equation is now embedded in the revision.

$$\nabla^2\Phi - \frac{1}{v^2}\frac{\partial^2\Phi}{\partial t^2} = \frac{2m}{\hbar^2}\{-i\hbar\frac{\partial\Phi}{\partial t} + V(1 + \frac{V}{2m_oc^2})\Phi\}$$
$$field\ \ equation \quad \rightleftharpoons \quad medium \quad polarization \tag{2}$$

The second term that is added to the Schrödinger equation $V^2/2mc^2$ plays an even more important role. It supplies the mechanism by which fields can renew themselves forcing the statistical basis on to quantum mechanics (Wallace and Wallace, 2020). This occurs because there are two equally weighted solutions to the equation $V + V^2/2mc^2 = 0$. It is not just a simple non-linear term that is useful in describing high intensity interactions.

Correcting the Schrödinger equation naturally unites electromagnetic theory with quantum mechanics and allows the prompt polarization interaction between a field and matter to be computed. The polarization effect is essential to understand for two reasons, first energy is reversibly transferred between the field and matter and affects the a detected photon's velocity and secondly this transfer is the precursor to drive any possible transition. The question is what is the magnitude of the effect for a photon traveling long distances through space. Fortunately, the answer is rather simple, the expanding wave front of the photon taken over a wavelength depth on the wave front that is expanding with a volume $4\pi\lambda r^2$ where the electric field intensity for the expanding shell is expressed from the self-reference frame solution of the photon field (Wallace and Wallace, 2020):

$$|\mathbf{E}(r)| = u^*(r)u(r) \sim \frac{1}{r^2} \tag{3}$$

The product of the electric field that will polarize the medium in the ever expanding shell volume produces a constant $1/r^2 \times 4\pi\lambda r^2 = constant$ that will remain small and possibly not even be detectable because of the thinness of the dielectric medium. So the principal classical optical effect for a photon traveling over a long distance through space will not be a dielectric attenuation, but will be absorption by gases and dust. The problem with tying absorption to distance is that photon fluxes from earlier eras would have seen a different distribution of matter in regions of star formation from which distances were estimated by supernovae events (Kang, 2020).

## IV. GRAVITATIONAL RED SHIFT

Interpreting the red shift of light sources from tens to millions of light years distance is not a trivial matter because there is no way to do a laboratory experiment to confirm the assumptions used in setting the distance scale. Those few photons that have survived a trip of a billion or more light years carry with them a measure of the matter they have encompassed. The commonly held interpretation is that the Doppler effect determines the bulk of the red shift and that requires the universe to be expanding, a very energy intensive process on a very large scale. The original relationship of this expansion in the past has been constrained to a linear Hubble law relating expansion velocity to distance. This is a model from classical physics applied in the third decade of the 20th century and does not take into account either the quantum or relativistic properties of the photon on a large scale.

Gravity is totally unlike the other forces: electromagnetic, weak, and strong all of which are derived from particle and field structures that overlap generating a contact interaction. Gravity is a second order interaction where the shape of the laboratory frame is altered due to a concentration of mass. Mass affects the motion of a photon or a neutrino locally by curving its path in the laboratory frame. However, that is not the only way a massless field will be affected by gravity. The second process was realized by Einstein that even a massless field has to do work to escape the pull of gravity so a photon could not be used as a perpetual motion machine freely avoiding paying the energy necessary to over come the gravitational potential (Misner *et al.*, 1972). Gravity being a second order effect enters the quantum mechanical energy conservation equation in a simple way for massless fields.

Gravitational potential, $V_g(r)$ needs to be included in the energy conservation relation for massless particles by adding a term to Planck's radiation expression where $\hbar\omega_o$ is the energy of the photon at creation.

$$E = \hbar\omega_o \longrightarrow \hbar\omega(r) - V_g(r) \quad \& \quad \omega_o > \omega \tag{4}$$

What gives the photon the ability to use both slits in Young's diffraction experiment is its structure defined in its own self-reference frame solution that limits the description of its motion to only one free spatial variable $r$. This is not a one dimensional solution as we simply have no access to the angular variables in the field's own frame of reference so that the three dimensional solution is a spherical propagating shell for a wave front. The solution, $u(r,\tau)$, for the photon in the self-reference frame is an expanding wave front shell from which its electric field can be set, equation 3.

$$u(r,\tau) = \frac{e^{i\{\kappa r - \omega\tau\}}}{r} \tag{5}$$

This solution has its origin at the location of the photon's field creation and produces an expanding spherical shell. This ever expanding shell if not absorbed by dust will encompass an increasing amount of matter. Even though the average gravitational potential at any point in space maybe near zero, the photon with its ever expanding spherical shell is continually working against an increasing amount of matter contained within this boundary. This growing mass generates the gravitational potential that is continually reducing the frequency of the photon. The frequency reduction only becomes evident over very large scales. If we assume the density of matter over these large scales takes on an average value of $\rho$, we can estimate the frequency dependence of the photon that is dependent on the mass contained within its spherical wave front.

The gravitation potential is computed using the photon's mass equivalence $\hbar\omega = mc^2$.

$$V_g(r) = -\frac{4\pi G\rho\hbar\omega(r)r^2}{3c^2} \tag{6}$$

To get the total frequency shift the following expression reduces to a first order differential equation that can be solved where $\alpha = 4\pi G\rho/3c^2$.

$$d\omega(r) = \frac{d\omega}{dr}dr = dV_g(r) = -\alpha\{2r\omega + r^2\frac{d\omega}{dr}\}dr \tag{7}$$

$$\frac{d\omega}{dr} + \frac{2\alpha r}{1-\alpha r^2}\omega = 0 \tag{8}$$

$$\omega(r) = \omega_o\{1 - \alpha r^2\} \tag{9}$$

This can be solved for the red shift parameter $z(r) = (\omega_o/\omega(r)) - 1$.

$$z(r) = \frac{\alpha r^2}{1-\alpha r^2} \tag{10}$$

The mass density dependent for gravitational red shift found in relation for z(r) can be compared to the standard argument for the mass dependence to $z_h(r)$ from Hubble's law based on a mass receding.

$$
\begin{aligned}
v &= H_o r \\
\gamma &= \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \\
z_h(r) &= \gamma - 1
\end{aligned}
\tag{11}
$$

The important term is the mean density $\rho$ and at what distance does this gravitational red shift become sufficiently large to be measured. What is nice about this relation for $z(r)$ if there is no ever expanding universe it gives a measure of the mean density of matter averaged over a very large volume that can be used to determine the mean density in a few principal directions. The initial quadratic relationship of the gravitational red shift implies the distance scales may have been over estimated when made to conform to a linear fit. In the range of high *z(r)* a wall is run into as energy is drained out of the long lived photons.

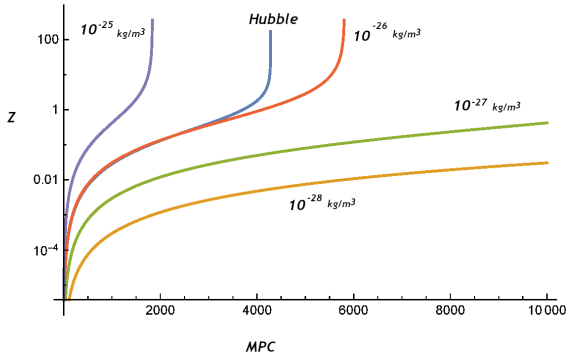


Figure 1 **The trace labeled Hubble was computed using equation 11 with $H_o = 70\ km/secMPC$ where 1 MPC $= 3.262 \times 10^6$ light years $= 3.086 \times 10^{22}$ meters for an expanding universe. Below 3000 MPC Hubble calculated response varies little when $H_o$ goes from 6.8-7.2. The other curves were computed from equation 10 for photon propagation. What is interesting is the Hubble result almost matches the gravitational red shift over lower z values where the mean density of the universe is $10^{-26}\ kg/m^3$. This value of $10^{-26}\ kg/m^3$ is half the value derived for gravitational collapse (Weinberg, 1972). The step increase at high z values caused by the gravitational red shift eliminates the need to postulate a dark energy causing any expansion.**

Linear curve fitting over narrow ranges can often be misleading and has been confirmed in the variations of the Hubble constant from different data sets. Two very different approaches at least for small $z(r)$ yield similar results because they are both quadratic expressions. As the value of $z \to 1$ then the difference between accelerating massive particle and a propagating massless field begins to show.

## V. COSMIC MICROWAVE BACKGROUND

Another victim of the big bang model was the cosmic microwave background that was supposed to be the electromagnetic relic of the big bang. This brings into question the real origin of cosmic microwave background? First question to ask is whether this microwave energy reservoir is only the lower limit of the gravitational red shifted radiation. The limiting action occurs when the highly red shifted ancient photons interact with molecular matter and their rotational states in the region $\sim 200Ghz$ halting their progress by sharply reducing the mean free path between scattering events. It is an interesting black body spectrum that is pumped by ancient photons that have been gravitational red shifted. Olber's paradox of the night sky not being bright is just that astronomers picked the wrong frequency band because the sky is bright at the $2.75^o$ K black body of the CMB.

## VI. DEUTERIUM PRODUCTION

The other main pillar supporting the big bang and the expanding universe depended on the lack of a nuclear pathway to produce deuterium except by condensing it from the high energy soup that followed the big bang. There actually is at least one active pathway known as the *pep* weak fusion process where an electron and proton convert to a neutron and then combine with a second proton to form deuterium with a neutrino emitted. It is a reaction that runs on the sun and it has been detected at the Borexino facility (Collaboration, 2018). On the sun the deuterium that is produced is also consumed in fusion. The facility to produce deuterium is also available on the earth where the deuterium would not be immediately consumed in a second fusion process. The weak process is much less probable by a factor $\sim 10^{-8}$ that it is why it is not a major contributor to the sun's solar output. However, on the earth over geological time if deuterium is produced it would be expected to collect and build its concentration because there are few places other than volcanoes or rifts where it would be consumed in a D-D fusion process producing $He^4$ (Wallace *et al.*, 2012).

Lattice driven cold fusion has some very simple requirements and the principal one is a very symmetric structural cavity that can support two closely held ions to be fused. In the metal crystal systems such a cavity is found in the octahedral interstitial site of the FCC lattice with the proper lattice parameter to accept the ions (Wallace and Wallace, 2019). Pure iron at normal pressure converts to $\gamma$Fe when heated to above $912^oC$. The second requirement would be a supply of hydrogen,

and the third requirement would be an actively damaged structure, which undergoes spontaneous metallurgical recovery. All this is necessary to get a pair of hydrogen ions onto the same interstitial site with an acceptable lattice parameter for a short period of time. This form of cold fusion is much less probable than cold fusion with deuterium in a nickel or palladium lattice, however, there are vast quantities of hot iron within the earth to serve as a substrate. In fact, the rocky planets with their iron cores turn out to be rich in deuterium as a fraction of their hydrogen content as compared to the gas giant planets.

The rocky planets with their iron-nickel cores are enriched in deuterium. The earth has the minimum deuterium fraction, but it also has active plate motion, rifting, and volcanoes operating unlike Mars and Venus. It is our speculation that the earth's vulcanism is supported by a two stage breeder reactor which generates deuterium at the mantle-asthenosphere boundary and that deuterium is transported and feeds cold fusion reaction to maintain the hot column flow of magma to the earth's surface. There are other chemical markers in volcanic areas that indicate there are active low energy nuclear processes (Wallace *et al.*, 2012). More importantly, in normal processes that are on going with plate motion, fracturing of rock, drive more cold transmutation processes (Carpinteri *et al.*, 2015). None of which required the quenching of matter from the proposed big bang. There are also complex transmutation processes that are on going in plasma and liquid flows that will also contribute to altering the isotope distributions previously modeled from only high energy processes.

Table I **Values taken from the planetary and deuterium web wikis.**

| **Location** | **D/H ratio** $\times 10^6$ | **comments** |
|---|---|---|
| Venus | 20,000 | iron-nickel core |
| Earth | 156 | active volcanoes |
| Mars | 900 | iron-nickel core |
| Comets | 200-450 | |
| Jupiter | 14 | low density core |
| Saturn | 55 | low density core |
| Neptune | 114 | densest gas planet |
| Uranus | 55 | low density core |
| Space | 15 to 23 | quiescent gases |

## VII. CENSORED

The censoring process that has been applied by the physics establishment to publications unfortunately covered over a poor understand of relativity by limiting research into the foundation of quantum mechanics. What they missed was that quantum mechanics when done properly not only explained dynamics it also generated all the particles and fields with their attendant properties. This only gets rectified when relativity is properly included into quantum mechanics.

In additions to failing to properly treat the photon's interactions with mass a variety of experimental nuclear processes were ignored because they inconveniently exposed an incompetence in nuclear theory. The more troubling aspect of this look at physics shows the establishment version of physics is not a self-correcting organism, as there are too many selfish lobbies that control published information to allow such a correction process to occur. This ensures that teachers will be a century behind of what is actually known except in a few pockets of free inquiry. The relativity arguments we made could have been made in the 1920s so our acknowledgement are to those working on cold fusion and A. Einstein who made writing this note so easy.

"Everything that is really great and inspiring is created by the individuals who can labor in freedom" A. Einstein

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