On the Validation of Physics Theories – Several Examples

by

Roger Ellman

Abstract

A description of a physical behavior that successfully describes and predicts all of that behavior's actions is not necessarily a valid description of that actual physical process. For example, the Ptolemaic Earth-centered description of the behavior of the then known planets and moon was highly successful in its descriptions and predictions for 1500 years yet it was definitely not a valid description of the system.

For a description and explanation of a physical effect to be valid it must meet the following four requirements:

- It must accurately describe and explain the effect's observed behavior,
- It must include and account for the mechanism and causes of the effect,
- It cannot rely on any unjustified assumptions,
- It must validly relate to all other established descriptions and explanations of physical effects.

Unfortunately, modern physics suffers from a number of proffered theories that fail these fundamental requirements as the presented examples demonstrate.

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A description of a physical behavior that successfully describes and predicts all of that behavior's actions is not necessarily a valid description of that actual physical process. For example, the Ptolemaic Earth centered description of the behavior of the then known planets and moon was highly successful for 1500 years yet it was definitely not a valid actual description of the system.

For a description and explanation of a physical effect to be valid it must meet the following four requirements:

- Of course, it must accurately describe and explain the effect's observed behavior and its data,
- It must include and account for the mechanism and causes of the effect,
- It cannot rely on any unjustified assumptions,
- It must validly relate to all other established descriptions and explanations of physical effects.

Physics, and most other sciences, are an amalgamation of data collection, by means of both formal experiments and passive observation, and theories constructed to account for the resulting data. But theories proffered must, of course, not only be consistent with the data on which they are directly based, but must be consistent with all available data and with other theories that have advanced to being accepted "laws" by virtue of their success in relating to their subject or their status as being effectively axioms.

Physics study and research have to be conducted, of necessity, in relatively narrow selected aspects of the overall subject of physics. But, the actual physics of the natural world is one continuous seamless body of behavior. Therefore, the description of behavior in each "relatively narrow selected aspect" must integrate seamlessly with that of all the others else it is incorrect

Inherent in this concept of theories is that validly proffered theories must be either based on data which means that they must be experimentally testable or based on logical derivation from prior validated theories or laws of nature. No matter how interesting or profound a proffered theory may be if it is inherently untestable and cannot be logically derived from prior validated theories or laws of nature it is of no value [and is probably invalid].

Unfortunately, modern physics suffers from a number of proffered theories that fail these fundamental requirements as the following examples demonstrate.

1. THE PROBLEM OF BIG BANG MATTER VS. ANTIMATTER SYMMETRY

It is generally agreed that before the universe there was nothing, absolute nothing. That is the starting point because it is the only starting point that requires no cause, no explanation nor justification of its existence. It is further generally agreed that the change from nothing to something must be of such a nature that it does not violate conservation.

From that it is generally deemed, and reasonably so, that the Big Bang had to be largely symmetrical and exhibit a smooth spherical uniformity in the pattern of particles, energy, and radiation emitted outward in all directions from the singularity source. That would also apply to

the emitted particles versus their antiparticles and would imply that the Big Bang should have resulted in equal amounts of matter and antimatter, for which the general expectation would be their complete and almost instantaneous total mutual annihilation.

On the other hand, because a total mutual annihilation did not take place, as evidenced by our and our universe's existence, the general cosmological position currently favored holds that the original symmetry must have been modified by a slight skewing in favor of matter, that the universe is now all matter, all original antimatter having been annihilated with an equal amount of original matter.

That "slight skewing" directly contradicts the requirement that matter and antimatter came into existence at the beginning in exactly equal amounts so that they symmetrically balanced each other maintaining conservation.

Therefore, the problem is not that of identifying a "slight skewing" but rather is the problem of an alternative to the presumed total mutual annihilation. Yet contemporary cosmology steadfastly sticks to its search for "a slight skewing" in spite of that's contradicting the necessity for "Big Bang" symmetry and conservation.

In brief, the solution is that the specific requirements for a mutual annihilation to take place and the special circumstances of the "Big Bang" militate against the occurrence of the presumed comprehensive mutual annihilations. Those reasons that the total mutual annihilation did not occur and the resulting implications are presented in detail in the paper, *The Problem of Big Bang Matter vs. AntiMatter Symmetry* [1], listed in the References, and are logically derived from prior validated theories and axioms.

2. THE PROBLEM OF THE UNIVERSE ORIGINATING FROM NOTHING, *Ex Nihilo*

It is generally agreed that before the universe there was nothing, absolute nothing. That is the starting point because it is the only starting point that requires no cause, no explanation nor justification of its existence. But, the universe coming into existence from absolute nothing would appear to be impossible, to be "getting something from nothing".

Physics theorists have been aware of that problem and bothered by it for some time. Solutions have been proposed, for example deeming the absolute nothing as a "quantum foam" a non-nothing something due to quantum effects of quantum particles "springing into and out of existence".

Solutions like that quibble with the issue: they postulate something without providing an origin or cause for it whereas the entire point of a beginning *ex nihilo* is that that beginning requires no origin or cause for its "being" not even an unaccounted for "quantum foam".

But that leaves the problem of "something from nothing".

In brief, the solution is that the only possible way for the origin to arise is for it to have been the coming into existence of "something" and, simultaneously and co-located with that "something", its exact opposite so that conservation to the prior nothing is maintained. That is the only way a universe can be obtained *ex nihilo*.

How that happened, and how it avoided an immediate total cancelation, and how it leads directly to the universe and its matter, energy, and physical laws that we know today is fully presented in the References listed paper *How and Why the Universe Began* [2] and in the book *The Origin and Its Meaning* [4]. It includes a validating derivation, in the Euclidean Geometry sense, of the fundamental laws of physics: Newton's, Coulomb's, Ampere's, etc. Laws from that beginning.

3. THE PROBLEM OF THE UNIVERSE ORIGINATING FROM A SINGULARITY

The reason for the requirement that the universe originated from a singularity is to prevent there having been an infinite rate of change from just before the universe began to its first moment. If the universe sprang into existence as a non-zero volume the rate of change in the first instant would have been infinite, which is impossible.

On the other hand, how can anything material, let alone an entire universe, originate from the completely zero volume of an initial volumeless singularity ?

It would appear that we are caught in an impossible contradiction: the universe had to originate from a dimensionless, volumeless singularity and the universe had to originate from something of sufficient content to be the source of the entire universe. Since the universe clearly made it past that obstructing contradiction and now exists there is a solution to the contradiction.

In brief, the solution is that the universe began as, that is the "Big Bang" was, the beginning of a pair of spherical oscillations of a $\pm[1 - cosine]$ form . Each oscillation of the pair provides a smooth transition from zero to its finite maximum without any infinite rate of change because its convergent series expansion has an infinite set of finite derivatives therefore no infinite rate of change. Thus a zero volume singularity is not needed.

The oscillations were of the content of a non-zero volume. The pair were so unstable that they promptly exploded into the mass of particles of our universe the non-zero volume supplying the content of the universe. Thus both aspects of the contradiction are resolved. The solution is presented in detail in the References paper *How and Why the Universe Began* [2]. Its validity stems from that there is no alternative solution to the singularity problem.

Furthermore, the "Big Bang" having begun in a non-zero finite volume removes the need for the hypothesis of initial rapid inflation at a rate exceeding the speed of light, which is impossible. The initial universe began already "inflated".

4. THE PROBLEM OF GRAVITATION

The accepted doctrine of gravitation is that gravitating mass curves space, but that doctrine is without an explanation of what that "curvable" space is and how, by what mechanics, gravitating mass curves it. Furthermore, the gravitational effect travels at the speed of light meaning that it is communicated by a flow from the attracting mass to the attracted mass. That is, that the analogous structure of gravitomagnetic field to electromagnetic field neglects that the static electric field is communicated by a flow [currently attributed to photons]. Those two conditions are mutually inconsistent, space statically deformed to produce the gravitational field effect versus a dynamic flow outward from the gravitating mass, and that inconsistency demonstrates that the General Relativity description of gravitation, while mathematically able to predict gravitational behavior, is not a valid description of gravitation in nature.

The solution to the problem of gravitation lies in the origin of the universe from which gravitation arose. In brief, the fundamental particles of matter, protons and electrons, resulting from the "Big Bang" explosion of the original oscillations [above part 3] were resulting oscillations of the same form propagating outward flows in that form.

Their initial outward flow was into the surrounding primal empty space [the "nothing"]. Of course, that could not contain the conditions, ε_0 and μ_0, needed to set the speed of propagation, therefore the ε_0 and μ_0 were, by default, inherent in the flow itself. That means that such flows encountering each other mutually slow each other. That effect, when an "attracting" particle's flow encounters the flow source of an "attracted" particle, produces gravitational attraction.

The gravitational effect and action are presented in greater detail in the References paper *The Problem of Understanding Gravitation* [3] and comprehensively in "Section 19, Gravitation" of the book *The Origin and Its Meaning* [4]. This treatment of gravitation is further validated by its mathematical proof that inertial mass and gravitational mass are equal and identical.

5. THE PROBLEM OF QUANTUM ENTANGLEMENT

Bell's Theorem demonstrates that quantum theory and the equations of quantum mechanics require entanglement. But it does not prove that nature behaves that way; it only proves that physicists' equations behave that way. Entanglement conflicts with our sense as to how the world should work. Einstein declared it "spooky actions at a distance".

In brief, as in the case of General Relativity's gravitation, Quantum Mechanics, while mathematically able to predict behavior, is not a valid description of nature.

The relationship between the universe resulting from the "Big Bang" and the principles of Quantum Mechanics is fully set out in "Appendix B, Quantum Mechanics" to the book *The Origin and Its Meaning* [5] and is logically derived from prior validated theories and axioms.

A major fault of Quantum Mechanics is that it is unable to identify any cause or mechanism for its contended behaviors which include instantaneous communication over significant distances which is impossible.

6. THE PROBLEM OF RELATIVITY VS. AN ABSOLUTE FRAME OF REFERENCE

Lorentz [of the Lorentz transforms and Lorentz contractions fame] contended against Einstein that there had to be a medium in which electro-magnetic waves exist and propagate, and that that would of necessity be an absolute frame of reference for the universe. Einstein won that dispute contending that electro-magnetic waves needed no medium and that there was no absolute frame of reference.

But, that victory was in a conflict of Lorentz's opinion opposed to Einstein's opinion combined with Einstein's substantial other successes and reputation. It was not a victory of solid reasoning nor demonstrated factual evidence.

Now solid reasoning and new data not available to Einstein and Lorentz show that Lorentz was correct and that Einstein's Theory of Relativity should correctly be termed Einstein's Principle of Invariance. The universe has an *absolute* universal frame of reference which is the frame of the "Big Bang".

As with quantum entanglement, Einstein's comprehensive relativity and denial of an absolute frame of reference for the universe conflicts with our sense as to how the world should work. A universe that began with a "Big Bang" should have the location of that origin somewhere "in its middle" and the frame of reference of that event should be a general overall frame for the universe.

In brief, the solution is that "our sense" is correct and that Einstein's Theory of Relativity should be Einstein's Principle of Invariance, that the physical laws and fundamental constants are the same throughout the universe, which naturally follows from the universal unity in its overall frame - a replacing of "relativity" with "absolutivity". Of course relative motion exists; it is relative to the absolute frame. Of course the relativistic contractions and transforms still apply – they fundamentally stem from that the speed of light is a universal constant.

Furthermore and importantly, absolute motion, that is motion relative to the absolute frame is significant when considering electron motion in atomic orbits and behavior currently attributed to "spin".

The issue is fully developed and set out in the papers *The Einstein - Lorentz Dispute Revisited* [6] and *That, Contrary to Einstein, There is an Absolute Frame of Reference* [7], listed in the References, and is based on new 20th Century data and logically derived from prior validated theories and axioms.

7. THE PROBLEM OF THE AGE OF THE UNIVERSE AND THE EARLIEST GALAXIES

A number of years ago the estimates of astronomers and astrophysicists were that the earliest galaxies took about 2½ - 3 billion years to form, that is, that they did not appear until *2.5-3.0 billion years* after the "Big Bang". Those estimates were based on analysis of the processes involved in star formation and in the aggregation and "clumping" of matter in the early universe.

Since then improved equipment and techniques [e.g. Keck and Hubble telescopes and gravitational lensing] have resulted in reports of observation of early galaxies having stars that formed as early as *300 million years* after the Big Bang based on the observed redshifts and the Hubble Law. Such new data has led to the abandonment of the several billion years estimates of the time required for star and galaxy formation.

These distance determinations are based on observation off redshifts applied to the Hubble Law. The value of the Hubble Constant is generally taken as in the range of *60 to 75*, but a precise value remains to be determined. The current generally accepted age of the universe is *13.7 billion years*, which corresponds to a Hubble Constant of *67*. The most recent [2012] determination of a value for the Hubble Constant is *74.3 ± 2.1*.

For high z cosmic objects the Hubble Law results in recession velocities approaching the speed of light. That those velocities are attributed to expansion of space, not to actual velocity of the objects, does not really relieve the problem. According to the Hubble Law the distance between we the observers and those far distant cosmic objects is nevertheless increasing at a rate almost the speed of light which is unreasonable for such immense masses.

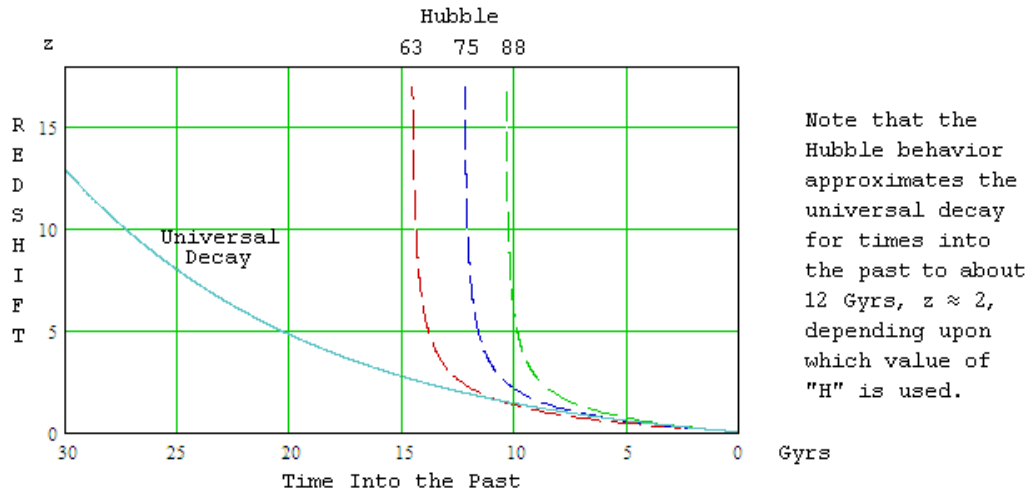
The problem of sufficient time after the Big Bang for stars to form, the unreasonable recession velocities implied by the Hubble Law, and even that the Hubble "constant", on which those all depend, is so poorly determined and appears to not be subject to better determination, would all evidence that the Hubble theory is defective and should be replaced.

In brief, analysis of the Hubble Law shows that it is asymptotic to an age of the universe that depends on the [poorly determined] value of the Hubble Constant. The Hubble Law embodies an interpretation of redshifts and a system of distance measurement to cosmic objects. An alternative to it that nevertheless fulfills those functions is based on the universe's gradual overall exponential decay with time constant, $\tau = 11.3373$ *Gyrs*, which is well validated by a number of phenomena,[8] validation better than that for the Hubble theory.

The Hubble theory, while useful during its early years, has become a problem and a handicap and is interfering with the progress of cosmology, astrophysics and astronomy. As with another theory that was useful in its early days even though profoundly in error, namely Ptolemy's Earth-centric universe system, the Hubble theory should be dropped and its place taken by the Universal Exponential Decay.

The issue is fully developed and set out in the paper *The Problem of the Age of the Universe and the Earliest Galaxies* [9], listed in the References, and is logically derived from prior validated theories and axioms.

From that analysis the age of the universe appears to be over *30 billion years*, not the current deemed *13.7* and a redshift of $z = 11.9$, about the earliest reported, corresponds to about *28 billion years* ago which has enough time for the earliest objects to have formed.



Comparison of the Universal Exponential Decay vs. the Hubble Theory

8. THE PROBLEM OF THE NEUTRON DECAY AND THE QUARK HYPOTHESIS

As part of the general hypothesis of "quarks" the proton is hypothesized to be the combination of two "up" quarks and one "down" quark and the neutron to be the combination of one "up" quark and two "down" quarks. The charges attributed to those quarks are as follows.

Quark	Charge
Up	+ $^2/_3$ that of electron, q
Down	- $^1/_3$ that of electron, q

Table 1

It is well known and well established by scientific observation that a free neutron radioactively decays into a proton plus an electron plus an anti-neutrino with a mean life time before decay of about *881* seconds as follows.

(1) $^0n_1 \Rightarrow {}^1p_1 + {}^{-1}e_0 + \bar{\nu}$

Of those decay products achieving the proton component requires [per Table 1] that one of the neutron's "down" quarks spontaneously change into an "up" quark. That raises the following immediate issues.

- Which one of the two "down" quarks so changes ?
- Why not the other one ?
- By what mechanism does the change take place ?

That spontaneous change would seem quite unlikely.

In brief the entire quark hypothesis is untenable and unnecessary. Free quarks have never been observed, never will be, and are at best mere fragments of fundamental particles, fragments created in artificially generated extremely high energy collisions.

See the detailed paper: *The Neutron Decay Into a Proton and an Electron Faults the General Quark Hypothesis*[10] with regard to quarks, and the book *The Origin and Its Meaning*[11] for the nature and construct of protons and neutrons.

References

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