Beyond Relativity and Quantum Mechanics: Space Physics

Why We Have No Physical Cosmology, and How to Start Creating One

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Which Physics Do You Want?

A. A physics that only models and predicts the experiences of the observer—his sensations and measurements?

OR

B. A physics that models the Cosmos and creates and tests theories about the nature and causes of all phenomena?

Which Physics Do We Have?
We Have: 

A. Observer-Based Physics

**Axioms:**

- **Absolute c:** The *velocity* of light is a **law of nature**: light moves at *c relative* to every *observer* or coordinate system (CS).

- **The Special Principle of Relativity:** Relates all “laws of nature” to *observers* (CSs) moving uniformly relative to each other.

- **The General Principle of Relativity:** Relates all “laws of nature” to any *observers* (CSs), including accelerating and rotating observers.

- **Quantum Mechanics:** Relates all “laws of nature” to *observers’* perceptions; views the interactions of *observer* and *object* as the **ultimate reality**


The “laws of nature” are mathematical correlations of observers’ measurements!
What’s Missing in “Modern Physics”?

- **The Cosmos**—there are only *observers* and their *CSs* (frames), their experiences and measurements.

- **Objective-Cosmic frame(s):** e.g. in which light *physically* moves at *c*, etc.

- **Hypotheses** concerning the *nature* of space, matter or light

- **Theories** about the *causes* of any fundamental phenomena:
  - What *causes* light to always move at *c*, regardless of the velocity of its source?
  - What *resists* the acceleration of matter and *prevents* matter from moving at *c*?
  - What *causes* the transverse Doppler *redshift* of the spectra of atoms in motion or in gravitational fields? (a.k.a. “time dilation”)
  - Relative to what is *rotation absolute*? How?
  - What *causes* gravity?
  - What is *energy*? A substance? Motion?

The “laws of nature” have no explanation, everything is MAGIC!
We’ve been here before!

Observer-based Cosmology

Planetary Motion in the Earth-Observer’s Frame
The Cosmos revolves around us.

Ptolemaic Cosmology

Earth-observer model
The Math was Complex, but Worked!

Deferents, epicycles and equants described the observer’s experiences and measurements; but had no physical reality.
Philosophy: Beyond Consciousness to Cosmos

- Copernicus replaced the observer’s frame with a Cosmic frame.

- The Earth’s motion was not evident to the senses; it was evident to the mind—it was a theoretical construct necessary to explain our experiences.

- The Copernican Revolution was an act of philosophical cognition.

- Philosophy: We create theories that allow our minds to reach beyond our consciousness (experience) to an understanding of the Cosmos.

- Theoretical physics requires a similar philosophical revolution today.
Classical Physics was Ether Physics

- To explain motion, Newton posited **absolute space**—an single Cosmic Euclidean ether necessary to explain inertia, rotation.

- Newton believed that all matter had a **definite velocity** in this space, even if it could not be determined. *Principia, Definitions, Scholium, para. 9 (1686).*

- Maxwell modeled light as **waves** in the ether, created mechanical models of the ether.

- Lorentz believed that light moved at **c** in the ether, and produced his **transformations** based upon his theory of electrons in motion in the ether.

- Lorentz **explained** the null Michelson-Morley experiments as due to a physical length contraction in the direction of motion.

- What happened to this physics that sought the **causes** of phenomena?
Religion against Philosophy

- **Bishop Berkeley**: Copernicus’ and Newton’s ideas threatened to replace religion with natural philosophy - to replace God with Cosmic causation.

- **Subjective Idealism**: Since we know only our own conscious experiences and have no direct knowledge of any material Cosmos, we must not assume that it exists. 
  
  *Principles of Human Knowledge* (1710) body, para. 18

- **Berkeley**: Consciousness is a virtual reality simulation supplied to our spirits and coordinated by God. See the movie: “The Matrix” (1999)

- **Subjectivistic Science**: Merely describes and models our experiences.

- **Mathematical Science**: Seeks the quantitative “laws” that govern our experiences and measurements.

- **Everything is Magic**: God makes it all happen; no need for Cosmic causes.
David Hume
“Enlightenment” “Philosophy”

- **Denied** that we could know any Cosmic causes

- Our **belief** that an **effect** will follow from a **cause** is merely a “**custom**” we have acquired through repetitive **experience**.

- **Denied** that we could ever **know** the **cause** of such a “**custom**” as **gravity**.

  *An Enquiry Concerning Human Understanding (1748)*
Ernst Mach’s Positivism

- Admitted the influence of **Berkeley** and **Hume**

- **Subjectivist:** “The world consists only of our sensations”
  
  Ernst Mach, *Analysis of Sensations*, 12 (1897)

- **Redefined** physical theories as **quantitative instruments**—mathematical tools for reproducing and predicting **observations**.

- **Refused** to believe in **atoms** *(circa 1900)* because they were not **evident** to our senses.

- **Positivism** was the dominant ideology in **Science** at the start of 20th century.

- **Science** today remains **positivistic**, is **opposed to philosophy** (explanatory theory).
The Origins of Relativity

- **Bishop Berkeley**: We must treat motion not as absolute, Cosmic, or real but as merely relative to ourselves or to other objects in our consciousness, and treat time as the mere succession of events in our consciousness.  
  *Principles of Human Knowledge* para. 112., para. 98 (1710)

- **Ernst Mach**: Newton’s theory of absolute space and motion was “devoid of content”, since we only know “relative spaces and motions”. Mach called those who shared his view “relativists”.  
  *The Science of Mechanics*, 283, 293 (1883)
Albert Einstein

- **Philosophical:** had read Berkeley, admitted influence of Hume and Mach

- **Subjectivist:** “The only justification for our concepts...is that they serve to represent the complex of experiences; beyond this they have no legitimacy.”
  

- **Mathematical idealist:** “Nature is the realization of the simplest conceivable mathematical ideas.”
  

- Relativity rendered the historic struggle between the views of Ptolemy and Copernicus “quite meaningless” since “Either CS could be used with equal justification.”
  
  Einstein and Infeld, *The Evolution of Physics*, 224 (1938)

- **Theist:** God is “a superior mind that reveals itself in the world of experience.”
  
Einstein Created “Modern Physics”

- Einstein’s 1905 papers on Special Relativity and the lightquantum created a physics based upon idealism and limited to subjectivistic modeling.

- His “lightquantum” became the foundation of Quantum Mechanics.

- Like Mach: He denied the existence of ether and of light waves because they were not directly evident to the senses.

- He eliminated physical causality from physics, replacing causes with ideas that helped to model experience.

- He instituted the Berkeley-Mach program—replacing explanatory natural philosophy with descriptive Science.
Does Relativity Work?
No: Twin Paradox

Relativity means, literally, that all motion is merely relative to any arbitrary frame of reference.

But: “frames” in relative motion have identical trajectories in each other’s CSs!

A third frame is required to break the symmetry!

(The Cosmos, luminal ether, inertial space, etc.)

Relativists must introduce a third frame surreptitiously.

Subjectivistic models cannot be used to explain Cosmic reality!

Is this problem solved by General Relativity?
No. Relativity Was Not Generalized

- Realizing that SR required a **third frame**; Einstein tried to eliminate it by “relativizing” **acceleration**, **rotation** and **gravitation**! He tried to relate the “laws of nature” to accelerating and rotating observers!

- **The General Principle of Relativity**: “All bodies of reference K, K’, etc. are **equivalent** for the description of natural phenomena (formulation of the general laws of nature), **whatever** may be their state of motion.”

  Relativity, The Special and General Theory, 61 (1961)

- **But**: **Matter** causes **gravity**, the **distribution** of **matter** determines the inertial/rotational **frame**! **Motion** in this **Cosmos** is **never** merely **relative**. *(Remember Copernicus)*

- **Ad Hoc Fix**: Relativists relate GR’s ideas or equations only to **Cosmic CSs**: those of the **near** and/or **distant celestial bodies**.

- They apply **subjectivistic** Relativity in an **objectivistic** way.
Einstein realized that he had again failed to eliminate the ether:

"According to the general theory of relativity space is endowed with physical qualities; in this sense, therefore, there exists an ether...But this ether may not be thought of...as consisting of parts which may be tracked through time. The idea of motion may not be applied to it."

Einstein, “Ether and the Theory of Relativity” (1920)

Einstein should have abandoned the Relativity program.

No parts, no motion: he forbade scientists to theorize about ether-space!
Space-Time Misunderstood

“The space-time curvature around the Earth acts on fast or slow balls in exactly the same way. It tells these balls how to move.”

No. GR’s field equations describe how the observers’ measured space-time intervals are altered by the presence of a gravitational field. Space-time describes the effects of gravity.
Space-Time is Subjectivistic

\[ ds^2 = c^2 dt^2 - (dx^2 + dy^2 + dz^2) \]

- Composed of the **intervals** that observers measure between "events"; the **one thing** they can agree upon when \( c \) is **absolute** for each.

- **Not a Cosmic model:** Light travels at \( c \) in **every observer's frame**!

- A model of **consciousness**; of the rules of the **Berkeley's Matrix**

- **Epistemologically equivalent** to Ptolemy's **deferents, equants**, and **epicycles**.

- Einstein: "The chronotropic interval has no physical meaning or significance."

  quoted by T. Levi-Civita, Nuovo Cimento, 13, 45 (1936)
Relativity: Ideas Became Causes!

- Relativity begins with subjectivistic measurement concepts:
  - **Space** is the number of the observers’ measuring rods
  - **Time** is a number of ticks of the observers’ clocks
  - **Mass-energy** is a just a measurement

- Lacking any objective frames or Cosmic causes, these observers’ measurement-concepts became causes!
  - **Space-Time** became the “fabric of the Cosmos” and cause of motion.
  - **Time** became a mysterious thing that stops, runs slower, backwards.
  - **Mass-Energy** became a mysterious force or power.

Everything is MAGIC!
Platonic idealism; not Cosmic theory!
The Contradiction and Confusion

- **Inconsistency**: Einstein admitted that in the field of **epistemology** he had been an "unscrupulous opportunist", resorting to **realism**, **idealism**, **positivism**, and **Platonism** as the situation seemed to require. *Albert Einstein: Philosopher-Scientist*, p. 684

- Often spoke of “physical reality”, “causes”, etc. when he meant “ideass” that help to organize our **perceptions**.

- Subsequent physicists were **not** philosophers, they have not been able to **understand** or **replace** Relativity and QM.

- Physicians remain caught between their own **natural objectivism** and the **subjective idealism** of Relativity and QM.

- They try to use **Relativity** and **QM** to **model** and **explain** the **Cosmos**, not realizing that these models were **not** created for that **purpose**!
A New Metaphysics for a New Physics

Instead of idealism:

**Cosmism:** The Cosmos exists. We humans and our language-enhanced consciousness are products of its evolution. Our experiences result from the interaction of our sense organs and instruments with the rest of the Cosmos.

Cosmism is a philosophical theory—the best explanation of our existence and experiences.
Cosmism implies objectivism:

- **objectivism**: Knowledge consists of our *descriptions* and *models* of the *Cosmos*.

- **objectivistic modeling**: We relate regularities in our experiences and measurements to *Cosmic entities* and *CS(s)*. The result is a *model* of the *Cosmos*.

Only **objectivistic** models can form the basis of *causal-Cosmic theories*!
Replace SR with a Modified Newton-Lorentz Ether Theory

- Relativity doesn’t work, doesn’t “cause” anything and isn’t “proven” — what works are the Lorentz Transformations—when applied in the correct Cosmic frame!

- Newton-Lorentz ether theory contains the physical space that causes the Newtonian-inertial and Lorentzian-electromagnetic (“relativistic”) effects.

- Cosmic-objectivistic model: No more MAGIC!
  - Light moves at \( c \) in space
  - Atomic spectra are redshifted by velocity in space (not “time dilation”)
  - Space resists the acceleration of matter
  - Space prevents matter from moving at \( c \), etc.

How is this space related to matter? What happens to it in gravity?
Einstein realized that being accelerated by a rocket in deep space was similar to sitting on a planet’s surface (Principle of Equivalence).

Implication: Both forms of acceleration have the same cause: acceleration with respect to space.

Implication: Newton’s inertial ether-space must itself be accelerating radially Earthward \( (a=GM/r^2) \)

If space is a substance that is accelerating Earthward, it must also have a velocity!
Gravitational Velocity

- The velocity will be the sum of the total acceleration from rest at infinity to that radial distance $r$:

$$v = \sqrt{\frac{2GM}{r}}$$

- This is identical to the Newtonian escape velocity.

- At the Earth’s surface, space is flowing at 11.2 km/s.

- This velocity directly and simply produces the gravitational redshift and the Schwarzschild radius of black holes (velocity of space = $c$)!

$$\frac{\Delta f}{f} = 1 - \sqrt{1 - \frac{2GM}{rc^2}} \quad R_s = \frac{GM}{c^2}$$

- Unifies inertial and gravitational transverse Doppler redshift (“time dilation”): always caused by velocity in space.
Figure 1. Two-dimensional representation of the gravitational flow of inertial-electromagnetic space towards the center of a celestial body. The radial acceleration of the flow at any height outside the body, is $a = \frac{GM}{r^2}$ and the velocity is $v = \sqrt{2GM/r}$. This flow correctly models both the ballistic and electromagnetic effects of gravity.
Flowing Space Reproduces all GR’s Successes—More Simply


The river model of black holes

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This paper presents a new way to conceptualize stationary black holes, which we call the river model. The river model is mathematically sound, yet simple enough that the basic picture can be understood by non-experts. In the river model, space itself flows like a river through a flat background, while objects move through the river according to the rules of special relativity. In a spherical black hole, the river of space falls into the black hole at the Newtonian escape velocity, hitting the speed of light at the horizon. Inside the horizon, the river flows inward faster than light, carrying everything with it. We show that the river model works also for rotating (Kerr-Newman)

The author acknowledges that it works for weak-gravity situations also, but finds it “discomfortingly concrete”.

Personal correspondence with A. Hamilton
Quantum Mechanics

- **Copenhagen Interpretation = Machian Subjectivism**

- Lacking any *Cosmic-physical* causes, the observer’s act of making a *measurement* becomes the *cause*!

- The *mathematical tools* of QM are so just many *deferents, equants* and *epicycles: ad hoc inventions* to model the observer’s experiences and yield the correct *predictions*.
  - Photons
  - Probability amplitudes
  - Hilbert spaces
  - Hermitian Operators
  - Fourier frequencies
  - Symmetry operations
  - Virtual particles, etc.

- As with the Ptolemaic and Relativistic systems, QM’s concepts and tools *may or may not* correspond in some way to the *underlying physical reality*.

- **Subjectivistic model:** Cannot form the basis of any causal-Cosmic theory!
But Physicists Want Physical Theories!

- Physicists are not subjective idealists. They want to explain the Cosmos as a physical system, a purpose for which Relativity and QM were not designed!

- They must choose between two approaches to physical theory:
  - **atomism**: Space is nothing, a void. All Cosmic phenomena are produced by self-existent particles interacting in a void.
  - **etherism**: Space is a substance with physical qualities; as such it is the substrate of all Cosmic phenomena. Energy and particles are just different kinds of motions and/or distortions within space.

Since etherism was banned, they had to resort to atomism.
Standard Model

Elementary Particles

Quarks
- u
- c
- t
- d
- s
- b

Leptons
- $\nu_e$
- $\nu_\mu$
- $\nu_\tau$
- e
- $\mu$
- $\tau$

Force Carriers
- $\gamma$
- $g$
- $Z$
- $W$

Three Generations of Matter

Fermilab 95-759
Atomism: Standard Model

- **12 Particles** and **4 forces** (and “virtual” “force-carrying” particles) are self-existent and move in a **void**.

- **No plausible physical mechanisms**—“particle exchange” causes attraction, repulsion, inertia, gravity, etc?

- Requires **hypothetical** particles that have **never** been **observed** and make **no physical sense**—photon, gluon, graviton, Higgs boson, virtual particles, etc.

- **Contradictory**: Quantum Electrodynamics (QED) requires **wave-modeling** to predict where the **flying photon** goes! (“Wave-particle duality”)

- **Particles-in-a-void** doesn’t work, if space were a **void**:
  - Light particles could travel at **any velocity**
  - Matter’s acceleration would **not** be resisted
  - Matter could travel at **superluminal** even infinite velocities
  - **No waves** would exist, no **fields**, etc.
  - **Motion** would have **no physical** or real effect of any kind!
Atomism Needs Ether Surrogates!

- Objective Frames (inertial, Earth, Sun-Star, etc.)
- Fields—electromagnetic, gravitational
- Space (without “-time”), “curved” space-time
- Higgs Field—to give particles “mass”
- Vacuum energy
- “Negative” energy
- Strings
- Extra dimensions, “curled up” dimensions
- Membranes, “Branes”
- Quantum “foam”
- Dark Matter
- Dark Energy
Atomistic Physics is like Creationist Biology

- **Zoo** of self-existent particles.
- No **causal explanation** of the **origins** or **interactions** of particles.
- Stands in the way of all further progress in physics.
Atomists Are Capitulating

- **Quantum Chromodynamics**, like QED, uses **wave-modeling** to predict where a particle will be **observed**.

- **Frank Wilczek** (MIT, Nobel) realizes that the facts require **space** to be a **substance**:

  "The entity we perceive as **space** is a multilayered, multicolored **superconductor** (It is) The **primary ingredient of physical reality**, from which all else is formed"


- **PROBLEM**: The models he is using, **SR, GR, and QM**, were designed to **evoke** the **physicality** of **space** and **prevent** us from **theorizing** about the **causes** of things!

- A theory of physical space must be based on **objectivistic models** and **physical hypotheses**.
Real Physics = Space Physics

The **Cosmos** is **space** and **motions** and **distortions** in and of **space**.

- **Replace Subjective-Idealistic** Concepts with **Cosmic-Physical** Concepts:
  - **Time** is just **Cosmic evolution**, the sequence of cause and effect.
  - **Energy** is **motion** in/of **space**; it is **not** a substance.
  - **Particles** are organized, persistent **patterns** of **motion** in and of space.

- **Theorize** about the **Nature** and **Mechanisms** of **Space**:
  - **A unique, complex substance**: Beware of analogies with known substances.
  - **Quantized**: consists of the ultimate quanta (Planck scale=$10^{-33}$ cm?)
  - Ascribe to it **whatever qualities** are needed **to explain** the phenomena.
  - **Paradoxes (contradictions) not allowed**—must produce a better theory!