

Article

Aether: The God of Physicists (Part IV)

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ABSTRACT

In this four-part article, I argue, as many others do, that the aether is the physical but non-material substance from which the universe came to exist. To exist, things must be in spacetime, but the aether is not in spacetime, it is before spacetime. It is, but does not exist as matter. It is all permeating and non-dimensional; it is inside and between particles; it is everywhere. Everything is made from it, even the space that surrounds us. It is indivisible, or it would not be the aether as it was defined thousands of years ago. Wholeness in space and time is what allowed Nature to evolve. Holistic awareness, or self-reference, emerges from an inward necessity which is satisfied as information is chosen from the context in which a system evolves. Human consciousness evolved from the same holistic awareness property all matter has shown to possess. Human consciousness is spacetime dependent, just like matter. No brain equals to no human consciousness.

Part IV of this four-part article includes: Quotes and Excerpts; Book and Article Resources; and On-line Resources.

Keywords: Aether, immaterial substance, human consciousness, physics, God.

Quotes and Excerpts

"That gravity should be innate, inherent, and essential to matter, so that one body may act upon another at a distance through a vacuum, without the mediation of anything else, and by and through which their action and force may be conveyed from one to another, is to me so great an absurdity that I believe no man who has in philosophical matters a competent faculty of thinking can ever fall into it. Gravity must be caused by an agent acting constantly according to certain laws, but whether this agent be material or immaterial I have left to the consideration of my readers."

"I here use the word attraction for any endeavor whatever made by bodies to approach each other; whether that endeavor arise from the action of the bodies themselves as tending mutually to, or agitating each other by spirits emitted; or whether it arises from the action of the ether or of the air or of any medium whatever [...] upon as real, to enable acceleration or rotation to be looked upon as something real." --- Isaac Newton (1693)

"Absolute Space in its own nature, without relation to anything external remains always similar and immovable." --- Isaac Newton (1687)

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"I agree with you that the general relativity theory admits of an ether hypothesis as does the special relativity theory. But this new ether theory would not violate the principle of relativity. The reason is that the state [...metric tensor] = Aether is not that of a rigid body in an independent state of motion, but a state of motion which is a function of position determined through the metrical phenomena." --- Albert Einstein (1916)

"But on the other hand there is a weighty argument to be adduced in favour of the ether hypothesis. To deny the ether is ultimately to assume that empty space has no physical qualities whatever.

[...]

Recapitulating, we may say that according to the general theory of relativity space is endowed with physical qualities; in this sense, therefore, there exists an ether. According to the general theory of relativity space without ether is unthinkable; for in such space there not only would be no propagation of light, but also no possibility of existence for standards of space and time (measuring-rods and clocks), nor therefore any space-time intervals in the physical sense. But this ether may not be thought of as being endowed with the quality characteristic of ponderable media, as consisting of parts which may be tracked through time. The idea of motion may not be applied to it." --- Albert Einstein (*Ether and the Theory of Relativity*, 1920)

"The inseparability of time and space emerged in connection with electrodynamics, or the law of propagation of light. With the discovery of the relativity of simultaneity, space and time were merged in a single continuum in a way similar to that in which the three dimensions of space had previously merged into a single continuum. Physical space was thus extended to a four dimensional space which also included the dimension of time. The four dimensional space of the special theory of relativity is just as rigid and absolute as Newton's space." --- Albert Einstein (1954)

"When forced to summarize the general theory of relativity in one sentence: Time and space and gravitation have no separate existence from matter. ... Physical objects are not in space, but these objects are spatially extended. In this way the concept 'empty space' loses its meaning. ... The particle can only appear as a limited region in space in which the field strength or the energy density are particularly high..." --- Albert Einstein

"Nobody would believe that the chance disturbance--say by an impact--of one body in a system of uninfluenced bodies which are left to themselves and move uniformly in a straight line, where all the bodies combine to fix the system of coordinates, will immediately cause a disturbance of the others as a consequence.

We should [...] have to picture to ourselves some other medium, filling, say, all space, with respect to the constitution of which and its kinetic relations to the bodies placed in it we have at

present no adequate knowledge. In itself such a state of things would not belong to the impossibilities. [...] we might still hope to learn more in the future concerning this hypothetical medium; and from the point of view of science it would be in every respect a more valuable acquisition than the forlorn idea of absolute space." --- Ernst Mach (1893)

"Having recognized that the individual points in Newton's absolute space have no physical reality, we must now inquire what remains of this concept at all." --- Max Born

"I cannot but regard the ether, which can be the seat of an electromagnetic field with its energy and its vibrations, as endowed with a certain degree of substantiality, however different it may be from all ordinary matter." --- Hendrik Lorentz (1906)

"Natural science (physics) contains in itself synthetical judgments a priori, as principles. ... Space then is a necessary representation a priori, which serves for the foundation of all external intuitions." --- Immanuel Kant (1781)

"I cannot conceive curved lines of force without the conditions of a physical existence in that intermediate space." --- Faraday (1830)

"...quantum field theory says that associated with any mass m there is a length called its Compton wavelength, l_c , such that determining the position of a particle of mass m to within one Compton wavelength requires enough energy to create another particle of that mass. Particle creation is a quintessentially quantum-field-theoretic phenomenon. Thus, we may say that the Compton wavelength sets the distance scale at which quantum field theory becomes crucial for understanding the behaviour of a particle of a given mass. On the other hand, general relativity says that associated to any mass m there is a length called the Schwarzschild radius, l_s , such that compressing an object of mass m to a size smaller than this results in the formation of a black hole. The Schwarzschild radius is roughly the distance scale at which general relativity becomes crucial for understanding the behaviour of a given mass. Now, ignoring some numerical factors, we have:

$$l_c = \hbar/mc$$

and

$$l_s = Gm/c^2$$

These two lengths become equal when m is the Planck mass. And when this happens, they both equal the Planck length!"

[...]

"...in topological quantum field theory we cannot measure time in seconds, because there is no background metric available to let us count the passage of time! We can only keep track of topological change."

"The topology of spacetime is arbitrary and there is no background metric."

"Quantum topology is very technical, as anything involving mathematical physicists inevitably becomes. But if we stand back a moment, it should be perfectly obvious that differential topology and quantum theory must merge if we are to understand background-free quantum field theories. In physics that ignores general relativity, we treat space as a background on which the process of change occurs. But these are idealizations which we must overcome in a background-free theory. In fact, the concepts of 'space' and 'state' are two aspects of a unified whole, and likewise for the concepts of 'spacetime' and 'process'. It is a challenge, not just for mathematical physicists, but also for philosophers, to understand this more deeply." --- John C. Baez (from *Higher-dimensional algebra and Planck scale physics*, as it appeared on the book *Physics Meets Philosophy at the Planck Scale* by Craig Callender and Nick Hugget)

"Quantum phenomena are caused by fractal topological defects embedded in and forming a growing three-dimensional fractal process-space, which is essentially a quantum foam." --- Reginald T. Cahill

About Process Physics:

...The guiding idea of its approach is that natural existence consists in and is best understood in terms of processes rather than things--of modes of change rather than fixed stabilities. For processists, change of every sort--physical, organic, psychological--is the pervasive and predominant feature of the real.

Process philosophy diametrically opposes the view--as old as Parmenides and Zeno and the Atomists of Pre-Socratic Greece--that denies processes or downgrades them in the order of being or of understanding by subordinating them to substantial things. By contrast, process philosophy pivots on the thesis that the processual nature of existence is a fundamental fact with which any adequate metaphysics must come to terms.

Process philosophy puts processes at the forefront of philosophical and specifically of ontological concern. Process should here be construed in pretty much the usual way--as a sequentially structured sequence of successive stages or phases...

<http://plato.stanford.edu/entries/process-philosophy/>

[...]

Process philosophy is a longstanding philosophical tradition that emphasizes becoming and changing over static being...

...the world, at its most fundamental level, is made up of momentary events of experience rather than enduring material substances. Process philosophy speculates that these momentary events, called "actual occasions" or "actual entities," are essentially self-determining, experiential, and internally related to each other.

Actual occasions correspond to electrons and sub-atomic particles, but also to human persons. The human person is a society of billions of these occasions (that is, the body), which is organized and coordinated by a single dominant occasion (that is, the mind). Thus, process philosophy avoids a strict mind-body dualism....

http://en.wikipedia.org/wiki/Process_philosophy

<http://plato.stanford.edu/entries/spacetime-become/>

"When theorizing about an all-inclusive reality, the first and most important principle is containment, which simply tells us what we should and should not be considering. Containment principles, already well known in cosmology, generally take the form of tautologies; e.g., "The physical universe contains all and only that which is physical." The predicate "physical", like all predicates, here corresponds to a structured set, "the physical universe" (because the universe has structure and contains objects, it is a structured set). But this usage of tautology is somewhat loose, for it technically amounts to a predicate-logical equivalent of propositional tautology called autology, meaning self-description. Specifically, the predicate physical is being defined on topological containment in the physical universe, which is tacitly defined on and descriptively contained in the predicate physical, so that the self-definition of "physical" is a two-step operation involving both topological and descriptive containment. While this principle, which we might regard as a statement of "physicalism", is often confused with materialism on the grounds that "physical" equals "material", the material may in fact be only a part of what makes up the physical. Similarly, the physical may only be a part of what makes up the real. Because the content of reality is a matter of science as opposed to mere semantics, this issue can be resolved only by rational or empirical evidence, not by assumption alone." --- Christopher Michael Langan

<http://www.ctmu.org/Articles/IntroCTMU.htm>

"As everyone knows, the aether played a great part in the physics of the nineteenth century; but in the first decade of the twentieth, chiefly as result of the failure of attempts to observe the earth's motion relative to the aether, and the acceptance of the principle that such attempts must always fail, the word "aether" fell out of favour, and it became customary to refer to the interplanetary spaces as "vacuous"; the vacuum being conceived as mere emptiness, having no properties except that of propagating electromagnetic waves. But with the development of quantum electrodynamics, the vacuum has come to be regarded as the seat of the "zero-point" oscillations of the electromagnetic field, of the "zero-point" fluctuations of electric charge and current, and of a "polarization" corresponding to a dielectric constant different from unity. It seems absurd to retain the name "vacuum" for an entity so rich in physical properties, and the historical word "aether" may fitly be retained." --- Sir Edmund T. Whittaker (in the preface to his scholarly and scientific *A History of the Theories of Aether and Electricity*, 1951)

"The aetherless basis of physical theory may have reached the end of its capabilities and we see in the aether a new hope for the future." --- Paul A.M. Dirac (Physics Nobel Prize winner, 1954)

[...]

"Physical knowledge has advanced much since 1905, notably by the arrival of quantum mechanics, and the situation [about the scientific plausibility of aether] has again changed. If one examines the question in the light of present-day knowledge, one finds that the aether is no longer ruled out by relativity, and good reasons can now be advanced for postulating an aether... We can now see that we may very well have an aether, subject to quantum mechanics and conformable to relativity, provided we are willing to consider a perfect vacuum as an idealized state, not attainable in practice. From the experimental point of view there does not seem to be any objection to this. We must make some profound alterations to the theoretical idea of the vacuum... Thus, with the new theory of electrodynamics we are rather forced to have an aether." --- Paul A.M. Dirac (*Is There an Aether?*, Nature 168 (1951): 906-7)

In an article on *Ether* for the Encyclopedia Britannica Maxwell wrote:

"Ether or Aether ('aiqhr', probably from 'aiqw' - I burn) a material substance of a more subtle kind than visible bodies, supposed to exist in those parts of space which are apparently empty... Whatever difficulties we may have in forming a consistent idea of the constitution of the aether, there can be no doubt that the interplanetary and interstellar spaces are not empty, but are occupied by a material substance or body, which is certainly the largest, and probably the most uniform body of which we have any knowledge. Whether this vast homogeneous expanse of isotropic matter is fitted not only to be a medium of physical interaction between distant bodies, and to fulfill other physical functions of which, perhaps, we have as yet no conception, but also

... to constitute the material organism of beings exercising functions of life and mind as high or higher than ours are at present - is a question far transcending the limits of physical speculation."

[...]

Maxwell's words at the conclusion of his 1873 work on electricity and magnetism:

"All these theories lead to the conception of a medium..., and if we admit this medium as a hypothesis, I think it ought to occupy a prominent place in our investigations, and that we ought to endeavor to construct a mental representation of all the details of its actions, and this has been my constant aim in this treatise."

<http://www.mathpages.com/home/kmath322/kmath322.htm>

"Well, perhaps we should finish with this business about empty space.

If you follow through the mathematics of the present Quantum Theory, it treats the particle as what is called the quantized state of the field, that is, as a field spread over space but in some mysterious way with a quantum of energy. Now each wave in the field has a certain quantum of energy proportional to its frequency. And if you take the electromagnetic field, for example, in empty space, every wave has what is called a zero point energy below which it cannot go, even when there is no energy available. If you were to add up all the waves in any region of empty space you would find that they have an infinite amount of energy because an infinite number of waves are possible. Now, however, you may have reason to suppose that the energy may not be infinite, that maybe you cannot keep on adding waves that are shorter and shorter, each contributing to the energy. There may be some shortest possible wave, and then the total number of waves would be finite and the energy would also be finite. Now, you have to ask what would be the shortest length and there seems to be reason to suspect that the gravitational theory may provide us with some shortest length, for according to general relativity, the gravitational field also determines what is meant by "length" and metric. If you said the gravitational field was made up of waves which were quantized in this way, you would find that there was a certain length below which the gravitational field would become undefinable because of this zero point movement and you wouldn't be able to define length. Therefore, you could say the property of measurement, length, fades out at very short distance and you'd find the place at which it fades out would be about 10^{-33} cm. That is a very short distance because the shortest distances that physicists have ever probed so far might be 10^{-16} cm. or so, and that's a long way to go. If you then compute the amount of energy that would be in space, with that shortest possible wave length, then it turns out that the energy in one cubic centimeter would be immensely beyond the total energy of all the known matter in the universe.

Present theory says that the vacuum contains all this energy which is then ignored because it cannot be measured by an instrument. The philosophy being that only what could be measured by an instrument could be considered to be real, because the only point about the reality of

physics is the result of instruments, except that it is also said that there are particles there that cannot be seen in instruments at all. What you can say is that the present state of theoretical physics implies that empty space has all this energy, and matter is a slight increase of the energy, and therefore matter is like a small ripple on this tremendous ocean of energy, having some relative stability, and being manifest. Now, therefore, my suggestion is that this implicate order implies a reality immensely beyond what we call matter. Matter itself is merely a ripple in this background.

If you take a crystal which is at absolute zero it does not scatter electrons. They go through it as if it were empty. And as soon as you raise the temperature and (produce) inhomogeneities, they scatter. Now, if you used those electrons to observe the crystal (e.g., by focusing them with an electron lens to make an image), all you would see would be these little inhomogeneities and you would say they are what exists and the crystal is what does not exist. Right? I think this is a familiar idea, namely to say that what we see immediately is really a very superficial affair. However, the positivist used to say that what we see immediately is all there is or all that counts, and that our ideas must simply correlate what we see immediately.

So now, with this vast reserve of energy and empty space, saying that matter itself is that small wave on empty space, then we could better say that the space as a whole (and we start from the general space) is the ground of existence, and we are in it. So the space doesn't separate us, it unites us. Therefore it's like saying that there are two separate points and a certain dotted line connects them, which shows how we think they are related, or to say there is a real line and that the points are abstractions from that.

The line is the reality and the points are abstractions. In that sense we say that there are no separate people, you see, but that 'that' is an abstraction which comes by taking certain features as abstracted and self-existent." --- David Bohm (*Wholeness and the Implicate Order*)

"The fundamental element of the cosmos is Space. Space is the all-embracing principle of higher unity. Nothing can exist without Space. .. According to ancient Indian tradition the Universe reveals itself in two fundamental properties: as Motion and as that in which motion takes place, namely Space. This Space is called Akasa .. derived from the root kas, 'to radiate, to shine', and has therefore the meaning of ether which is conceived as the medium of movement. The principle of movement, however, is Prana, the breath of life, the all-powerful, all-pervading rhythm of the universe. Space is the precondition of all that exists, be it material or immaterial form, because we can neither imagine an object nor a being without space. Space, therefore, is not only a *conditio sine qua non* of all existence, but a fundamental property of our consciousness. Our consciousness determines the kind of space in which we live. The infinity of space and the infinity of consciousness are identical. In the moment in which a being becomes conscious of his consciousness, he becomes conscious of space. In the moment in which he becomes conscious of the infinity of space, he realises the infinity of consciousness." --- Lama Anagarika Govinda (1969)

"There is a thing, formless yet complete. Before heaven and earth it existed. Without sound, without substance, it stands alone and unchanging. It is all-pervading and unfailing. One may think of it as the mother of all beneath Heaven. We do not know its name, but we call it Tao. Deep and still, it seems to have existed forever." --- Lao Tzu

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On-line Resources

1. Ether and the Theory of Relativity - Albert Einstein: An Address delivered on May 5th, 1920, in the University of Leyden
http://en.wikisource.org/wiki/Ether_and_the_Theory_of_Relativity
2. Einstein's Ether: Why did Einstein Come Back to the Ether? by Galina Granek
Department of Philosophy, Haifa University Mount Carmel, Haifa 31905, Israel
<http://redshift.vif.com/JournalFiles/V08NO3PDF/V08N3GRF.PDF>
3. AETHER, or Ether (Gr. *aither*, probably from *aitho*, I burn, though Plato in his *Cratylus* (410 B) derives the name from its perpetual motion-6n del *aei* thei *peri ton aera reon*, *aeitheer* dikaios an kaloito), a material substance of a more subtle kind than visible bodies, supposed to exist in those parts of space which are apparently empty.
<http://www.1902encyclopedia.com/E/ETH/ether.html>
4. Aether, Ether (Greek) (from *aitho* shining, fire): The upper or purer air as opposed to aer, the lower air; the clear sky; the abode of the gods. In Classical antiquity it denoted primordial substance, Proteus or protyle, the unitary source both of all substances and energies, the mask of all kosmic phenomena.
<http://nicedefinition.com/Definition/Word/Aether/Aether.aspx>
5. Theosophy, Vol. 50, No. 3, January, 1962 (Pages 129-134; Size: 17K): PROTEUS(1) THE ancients called primordial Substance "Chaos." Plato and Pythagoras named it the Soul of the World. "The Mundane God, eternal, boundless, young and old, of winding form," says the Chaldean oracles. All the ancient nations deified Cther in its imponderable aspect and potency.
<http://www.wisdomworld.org/additional/ListOfCollatedArticles/Proteus.html>
6. The California Institute for Physics and Astrophysics (CIPA) is dedicated to exploring fundamental problems in physics (e.g. gravitation, inertia, the nature of mass) as well as very-long range technological possibilities that may emerge from the properties of the quantum vacuum.
<http://www.calphysics.org/index.html>
7. The Center for Consciousness Studies at the University of Arizona promotes open, rigorous discussion of all phenomena related to conscious experience. The Center organizes conferences, on-campus lectures, web courses, and hosts visiting researchers.
<http://www.consciousness.arizona.edu/>
8. Crisis in Life Sciences. The Wave Genetics Response. Traditionally, genetics talks about DNA, RNA and proteins' speech and texts only. The standard linguistic structures of genome are realized at the material level in the form of sequences of "chemical letters" in a DNA chain consisting of the 2% coding DNA. In Wave Genetics the texts are realized at the material level in the form of sophisticated dynamic holograms (gene-holograms) in liquid crystals of the chromosome continuum.
<http://www.emergentmind.org/gariaev06.htm>
9. SHUFFLEBRAIN - The Quest of Hologramic Mind
<http://www.instinct.org/texts/shufflebrain/shufflebrain-book00.html>
10. PSYCHE (ISSN: 1039-723X) is a refereed electronic journal dedicated to supporting the interdisciplinary exploration of the nature of consciousness and its relation to the brain.
<http://www.theassc.org/>

11. If people frequently asked any questions about the CMB, then these might be among them!
http://www.astro.ubc.ca/people/scott/faq_basic.html

12. What Is the Cosmic Microwave Background Radiation?
http://www.nap.edu/openbook.php?record_id=9293&page=12#p2000334dppp12

13. Papers on Consciousness (David Chalmers).
<http://consc.net/consc-papers.html>

14. This site has been set up as an open venture between scientists, scholars, meditators and all those who believe that we are approaching a conceptual threshold in our understanding of how physics, physiology and consciousness interact.
<http://www.emergentmind.org/>

15. Sorry Einstein, the universe needs quantum uncertainty
<http://www.newscientist.com/article/mg21428702.100-sorry-einstein-the-universe-needs-quantum-uncertainty.html>

16. Henry Stapp papers on consciousness
<http://www-physics.lbl.gov/~stapp/stappfiles.html>

17. Creation Ex Nihilo... or from Wheeler's "Pregeometry"?
<http://www.quanta-gaia.org/dobson/wheelerPregeometry.html>

18. Modern Scientific Theories of the ancient Aether
<http://www.mountainman.com.au/aetherqr.htm>

19. Studies on Consciousness, Mind and Life
<http://www.thymos.com/>

20. Paul J. Steinhardt - Department of Physics, Princeton University, Princeton, NJ
<http://feynman.princeton.edu/~steinh/>

21. Quintessence - Cosmologists have proposed that a mysterious substance called quintessence can explain why our universe is accelerating. But what is it made of?
<http://physicsworld.com/cws/article/print/2000/nov/01/quintessence>

22. Most approaches to the problem of consciousness see the brain as a computer, with neurons and synapses acting as switches or "bits". In this view consciousness is thought to "emerge" as a novel property of complex computation.
<http://www.consciousness.arizona.edu/hameroff/>

23. This is an online introduction to superstring theory, which is the leading candidate for the theory of all fundamental interactions in the universe.
<http://www.sukidog.com/jpierre/strings/>

24. David Bohm and Birkbeck College
<http://www.bbk.ac.uk/lib/about/bohm>

25. http://mist.npl.washington.edu/npl/int_rep/tiqm/TI_toc.html
26. Relativity, Quantum Gravity and Space-time Structures: Basil Hiley's Recent Publications
<http://www.bbk.ac.uk/tpru/RecentPublications.html>
27. Toward a Science of Consciousness
<http://www.imprint.co.uk/Tucson2000/jcsmainframe.html>
28. This introductory orientation is designed to provide you some general context regarding how autopoietic theory originated, how it developed, and where it stands now. Autopoietic theory is the term I use to denote the work of Chilean biologists Humberto R. Maturana and Francisco J. Varela (originally labeled the biology of cognition).
<http://www.enolagaia.com/Tutorial1.html>
29. Consciousness and Neuroscience - Francis Crick & Christof Koch
<http://www.slideshare.net/njqtpie86/consciousness-neuroscience-francis-crick-christof-koch>
30. Why Classical Mechanics Cannot Naturally Accommodate Consciousness but Quantum Mechanics Can
<http://arxiv.org/abs/quant-ph/9502012>
31. A Conversation with Physicist Brian Greene - John Fudjack
<http://www.tap3x.net/EMBTI/j6greene.html>
32. Quantum Teleportation
http://www.almaden.ibm.com/st/past_projects/quantum_information/
33. Holism and Nonseparability in Physics
<http://plato.stanford.edu/entries/physics-holism/>
34. Quantum Mechanics: 1-Dimensional Particle States Applet: This java applet is a quantum mechanics simulation that shows the behavior of a single particle in bound states in one dimension. It solves the Schrödinger equation and allows you to visualize the solutions.
<http://www.falstad.com/qm1d/>
35. Experiencing Soun-gui - Jean-Luc Nancy
<http://www.usc.edu/dept/comp-lit/tympanum/3/nancy.html>
36. On Exploring New Approaches Within Physics - John K. N. Murphy
<http://www.hotquanta.com/>
37. Quantum Nonlocality and the Possibility of Superluminal Effects - John G. Cramer
http://www.npl.washington.edu/npl/int_rep/qm_nl.html
38. Self-Organizing Systems (SOS) FAQ
<http://www.calresco.org/sos/sosfaq.htm>
39. Autopoietic Theory: Deeper Discussion
<http://www.enolagaia.com/ATDefs.html>

40. David Bohm and the Implicate Order - by David Pratt
<http://www.theosophy-nw.org/theosnw/science/prat-boh.htm>

41. It's confirmed: Matter is merely vacuum fluctuations: Matter is built on flaky foundations. Physicists have now confirmed that the apparently substantial stuff is actually no more than fluctuations in the quantum vacuum.

<http://www.newscientist.com/article/dn16095�rti=its-confirmed-matter-is-merely-vacuum-fluctuations.html>

42. Comparison between Karl Pribram's "Holographic Brain Theory" and more conventional models of neuronal computation

<http://www.acsa2000.net/bcngroup/jponkp/>

43. Alan Guth: A Golden Age of Cosmology: Even though cosmology does not have that much to do with information It certainly does have to do with revolution and phase transitions, in fact phase transitions in both the literal and the figurative sense of the word.

<http://edge.org/video/a-golden-age-of-cosmology>

44. Our world may be a giant hologram "If the GEO600 result is what I suspect it is, then we are all living in a giant cosmic hologram." --- Craig Hogan, director of Fermilab's Center for Particle Astrophysics.

<http://www.newscientist.com/article/mg20126911.300-our-world-may-be-a-giant-hologram.html>

45. Einstein and the Ether - by Ludwik Kostro (Apeiron, Montreal, 2000)

Whether gravitational, electrical, and nuclear interactions can be encompassed within a unified theoretical structure, and whether such a structure will be conceived as a plenary space with physical properties, remains to be seen. But if the history of the successive dynasties of aether is any guide, we can eventually proclaim: The luminiferous aether is dead! Long live the aether!" (Owen Gingerich)

<http://itis.volta.alessandria.it/episteme/ep3-24.htm>

46. Eye and Thou (Dissolving Descartes)

Capstone Address to the IEEE Visualization '97 Conference 24 October 1997

<http://www.hyperreal.org/~mpesce/viz97.html>

47. Gravitation as a pressure force: a scalar ether theory

http://geo.hmg.inpg.fr/arminjon/PIR96_1B.pdf

48. Problems of the Inhomogeneous Physical Vacuum

<http://www.sinor.ru/~che/Vdyatlov1.htm>

49. General Relativity and Spatial Flows: I. Absolute Relativistic Dynamics

<http://xxx.lanl.gov/abs/gr-qc/0006029>

50. Simple, common-sense physics The mechanical comprehension of the nature of the cosmos of the all-pervading aether

<http://www.aethro-kinematics.com/>

51. Astronomy 123: Galaxies and the Expanding Universe

<http://abyss.uoregon.edu/~js/ast123/>

52. Quantum Consciousness - by Piero Scaruffi

<http://www.scaruffi.com/science/qc.html#!>

53. Flowing Space - by Henry H. Lindner
<http://home.epix.net/~hhlindner/Writings/Implicate/Implications.html>

54. From the Heisenberg Picture to Bohm: a New Perspective on Active Information and its relation to Shannon Information.
<http://www.bbk.ac.uk/tpru/BasilHiley/Vexjo2001W.pdf>

55. Non-commutative Geometry, the Bohm Interpretation and the Mind-Matter Relationship - B. J. Hiley
<http://www.bbk.ac.uk/tpru/BasilHiley/noncommgeobohm.pdf>

56. Foundation Reasoning of Electrogravitational Theory and Tests
<http://www.electrogravity.com/index7.html>

57. Models of Self-Organization Using Genetic Cell Automata
<https://elibrary.asabe.org/abstract.asp?aid=13738&t=2&redir=&redirType=>

58. Despite several thousand years of failure to correctly understand physical reality (hence the current postmodern view that this is impossible) it is actually very simple to work out how matter exists and moves about in Space.
<http://www.spaceandmotion.com/Physics-Space-Aether-Ether.htm>

59. I said, at the Aether scale there are no distances to cover, it is everywhere. And, as Eugene V. Stefanovich contends: interactions, not forces, are instantaneously registered throughout space. Finally, someone offering a good explanation for instantaneous state transfers.
<http://arxiv.org/abs/physics/0612019> / <http://www.physicsforums.com/showthread.php?t=175965>

60. A Universe From Nothing' by Lawrence Krauss, Richard Dawkins, AAI 2009
<http://www.youtube.com/watch?v=EjaGktVQdNg>

61. The Mystery of Empty Space, University of California Television (UCTV)
http://www.youtube.com/watch?v=Y-vKh_jKX7Q

62. Why we don't 'need' an aether to explain Relativity" When dimensions are understood as mere components of the grid system, rather than physical attributes of space, it is easier to understand the alternate dimensional views as being simply the result of coordinate transformations."
<http://en.wikipedia.org/wiki/Spacetime>

63. Gravity Being Described as Space Flow Excerpt from Brian Cox's "Wonders of the Universe"
<https://drive.google.com/file/d/0ByfoRemtwEkpQUE5MF9xWkR6UWc/edit?usp=sharing>

64. Holographic principle http://en.wikipedia.org/wiki/Holographic_principle

65. The Quantum Fabric of Space-Time
<https://www.quantamagazine.org/20150424-wormholes-entanglement-firewalls-er-epr/>

66. The Good Vibrations of Quantum Field Theories By Don Lincoln
<http://www.pbs.org/wgbh/nova/blogs/physics/2013/08/the-good-vibrations-of-quantum-field-theories/>

67. Relativity Experimentally Confirmed

<https://drive.google.com/file/d/0ByfoRemtwEkpRUV6Qm44d3gzV1k/view?usp=sharing>

68. How Quantum Pairs Stitch Space-Time

New tools may reveal how quantum information builds the structure of space.

<https://www.quantamagazine.org/20150428-how-quantum-pairs-stitch-space-time/>

(The End)