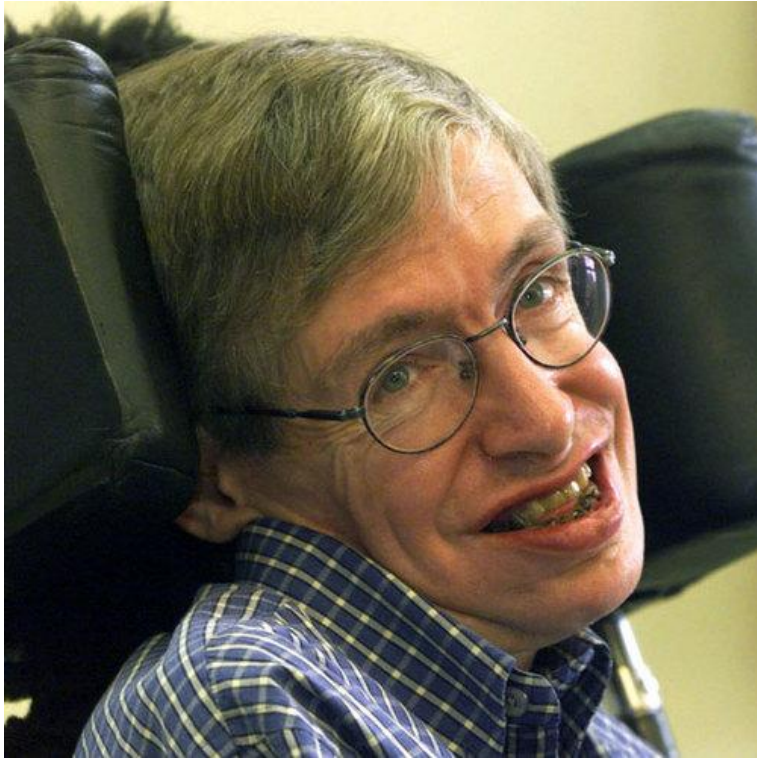


THE MYSTERY OF EXISTENCE: Why Is There Anything At All?

- (a.) SOME REACTIONS TO “WHY EXISTENCE?” (Stephen Hawking, John A. Wheeler, Steven Weinberg, Bertrand Russell, David Deutsch, Roger Penrose, Alex Vilenkin)
- (b.) A LIST OF VARIOUS POSSIBLE ANSWERS
- (c.) ETERNAL COSMOS (often seen as making God unnecessary)
- (d.) CREATION BY QUANTUM PHYSICS (Hartle-Hawking and Vilenkin models)
- (e.) MULTIPLE UNIVERSES, AND WAYS OF CREATING THEM (including Everett’s way)
- (f.) FINE-TUNING SUGGESTS MANY UNIVERSES and “ANTHROPIC” OBSERVATIONAL SELECTION (intelligent living beings must find themselves in fine-tuned universes)
- (g.) COULD FINE-TUNING BE A SIGN OF DIVINE SELECTION INSTEAD? (God creates only life-permitting universes)
- (h.) IF MULTIPLE UNIVERSES, NOT GOD, then MORE REASON TO FEAR A VACUUM INSTABILITY DISASTER ? (Martin Rees on risks of beating cosmic ray collision energies; Steven Weinberg on accelerators reaching “even the Planck energy”, far higher)
- (i.) MAY THE COSMOS EXIST FOR NO REASON AT ALL ?
- (j.) CAN MIND EXPLAIN THE COSMOS ? .. God’s Mind Creates Everything Else? .. God’s Mind *IS* the cosmos? (Spinoza) .. Mind is essential to physical reality? (Andrei Linde; John Wheeler and Paul Davies on delayed-choice double-slit experiments)
- (k.) A PLATONIC EXPLANATION FOR EVERYTHING, OR FOR GOD ? (Plato, Aristotle, Spinoza, Hegel; Paul Tillich, Hans Küng, A.C.Ewing, Keith Ward; John Polkinghorne, physicist-theologian; Nicholas Rescher, John Leslie, among philosophers of science)
- (l.) BRANDON CARTER’S “DOOMSDAY ARGUMENT”, applying his Anthropic Principle: We are prima facie unlikely to be, for example, among the earliest 0.01% of all humans.



“What is it that breathes fire into the equations and makes a universe for them to govern? Why does the universe bother to exist?”

-- in chapter 9 of *Black Holes and Baby Universes* (1993)

Stephen Hawking, British physicist, born 1942



Wheeler

John A. Wheeler, American physicist, 1911-2008

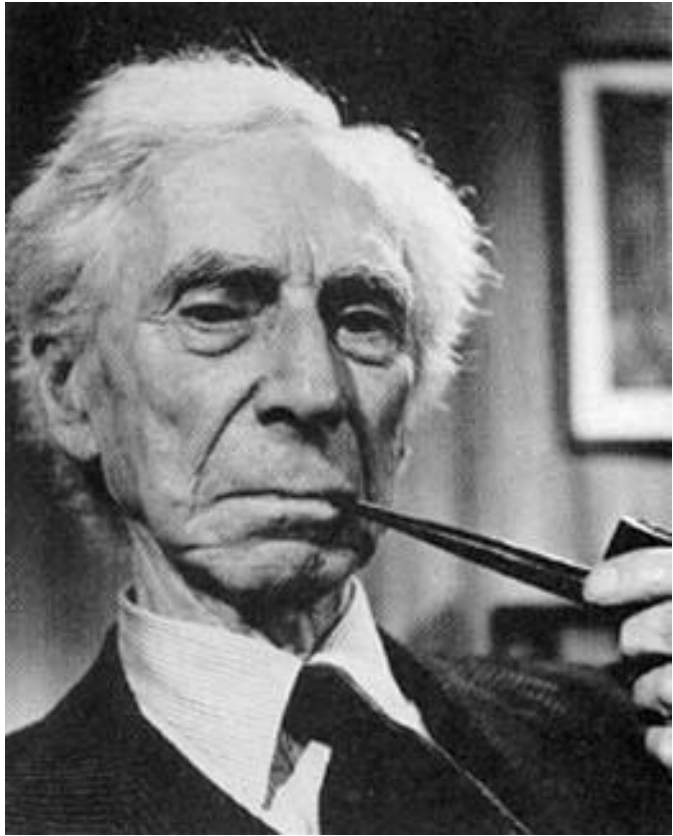
“I ask myself: How come the quantum? How come the universe? How come existence? They are questions that will fall within physics and will be answered as matters of science, not of philosophy or theology---or speculation.”

-- in chapter 12 of *Geons, Black Holes and Quantum Foam* (1998)



Steven Weinberg,
American
physicist, born
1933

“Whatever our final theory of physics, we will be left facing an irreducible mystery. For perhaps there could have been nothing at all. Not even empty space, but just absolutely nothing.” -- in Episode 305, “Why is there Something Rather than Nothing?”, of Robert Lawrence Kuhn’s public television series *Closer to Truth: Cosmos, Consciousness and God* (2008)



“I should say that the universe is just there, and that is all.” -- in the Russell-Copleston debate on BBC Radio (1948)

Bertrand Russell, British philosopher, 1872-1970

Why Is There Anything At All? has usually been left to the believers in God. Philosophers of recent times often call it a meaningless question (for example, **Ludwig Wittgenstein: “It is nonsense to wonder at the existence of the world”**).

Physicists and cosmologists have now started to discuss the question. Even the philosophers have therefore paid more attention to it.

The Problem of Existence, editor T.Goldschmidt, **published in May 2013**, contains sixteen new articles by philosophers. One is **Gonzalo Rodriguez-Pereyra**, Oxford’s Professor of Metaphysics, who argues that Nothingness was certainly *logically possible*----it would not have been self-contradictory, like a round square.

However, *The Grand Design (2010)* by **Stephen Hawking and Leonard Mlodinow**, can seem to suggest that physical equations “breathed fire” creatively, and that they were creatively powerful through Logical Necessity.

In *A Universe From Nothing (2012)*, **Lawrence M. Krauss** also seems to say that physical laws could create a cosmos. [**“ ‘Something’ may always come from nothing. It may be required. The metaphysical ‘rule’ that *out of nothing, nothing comes*, has no foundation in science.”**]

Why Does The World Exist? (2012) by Jim Holt includes four chapters interviewing physicists/ cosmologists: David Deutsch, Alex Vilenkin, Steven Weinberg, Roger Penrose.

-- DEUTSCH: “I can’t rule out the possibility that there is a foundation for reality. But if there is, then the problem of *why* that’s the foundation would still be insoluble.”

-- WEINBERG: “The laws of nature might dictate that there *has* to be something. For example, those laws might not allow for empty space as a stable state. But you’d still have to ask, ‘Why are the laws *that way*, rather than some *other way*?’”

-- When asked whether “bits of mathematics” are “so powerful that they can generate a physical world all by themselves”, PENROSE replies: “**Something like that, yes. The Platonic world [of mathematics] ‘controls’ the physical world**”. But he adds that how it controls it “**is perhaps the greatest mystery of all**”.

-- VILENKIN suggests that the universe could have “tunnelled” out of Nothing in a way obeying quantum laws ---- yet, Jim Holt asks, “where exactly are the laws written down?” “**If you like,**” Vilenkin answers, “**you can say they’re in the mind of God.**”

The Mystery of Existence, edited by **John Leslie and Robert Lawrence Kuhn**, published in **April 2013**, is the first-ever major edited volume (fifty authors reprinted, going back to Plato) about ALL the main ways --- philosophical, religious, scientific --- of reacting to “Why is there a universe, instead of emptiness?”.

It reprints physicists/ cosmologists including **William Bonnor, Paul Davies, Alan Guth, Stephen Hawking, Fred Hoyle, Andrei Linde, John Polkinghorne, Martin Rees, Leonard Susskind, Max Tegmark, Alex Vilenkin, Steven Weinberg**.

Robert Lawrence Kuhn’s gigantic *Closer to Truth* television series includes interviews in which he discusses the question with philosophers, with theologians, and with such scientists as **Paul Davies, Owen Gingerich, Alan Guth, Michio Kaku, Lawrence Krauss, Andrei Linde, Seth Lloyd, John Polkinghorne, Lee Smolin, Leonard Susskind, Max Tegmark, Alex Vilenkin, Steven Weinberg, and Frank Wilczek**. For the interviews, go to www.closetotruth.com

SOME MAIN POSSIBLE ANSWERS TO “WHY EXISTENCE?”

-- GOD:

1. Infinite person (simple because of being infinite?)
2. **Aquinas**: God is Pure Being, Infinite Existence
3. **Spinoza**: God is an infinite mind, containing all things
4. **Plato**'s Creative Force, “The Good”, sometimes called “God”

-- COSMOS ALWAYS HAS EXISTED (**Epicurus**; **David Hume**, as one of his suggestions; cosmologists such as **George Gamow**, **William Bonnor**, **Fred Hoyle**, and others more recently such as **Andrei Linde**)

-- A BLANK IS COMPLETELY IMPOSSIBLE (**Francis Herbert Bradley**; **Henri Bergson**, **Bede Rundle**; theists such as **St. Anselm**, **Alvin Plantinga**; perhaps **Hawking-and-Mlodinow**)

-- ALL LOGICALLY/ MATHEMATICALLY POSSIBLE THINGS EXIST (**David Lewis**, **Peter Unger**; **Max Tegmark**)

-- CHANCE (**Peter van Inwagen**; **Alex Vilenkin**)

-- NO EXPLANATION IS NEEDED (**David Hume**, as another of his suggestions -- anything could suddenly begin to exist, for no cause; **Bertrand Russell**, **Adolf Grünbaum**; **Derek Parfit**, as a suggestion; **Fred Hoyle**)

-- “EXPLAINING THE EXISTENCE OF THE COSMOS” IS MEANINGLESS (**Kant**, **Carl Hempel**; many physicists/cosmologists, even today)

-- SOME ABSTRACT FACTOR CREATED EVERYTHING (**Plato**, **Nicholas Rescher**, **John Leslie**; **Roger Penrose**; perhaps **Hawking-and-Mlodinow**)

ETERNAL COSMOS? ..often seen as making belief in God unnecessary.

-- [Eternal space and atoms of **Democritus** and **Epicurus**.]

-- [**Ludwig Boltzmann**'s eternal recurrence: Large regions in an eternal universe develop low entropy, just by chance. --- Wrong, since it is far more likely that the situation *in just this room* is a chance fluctuation: see **Roger Penrose**, page 634 of editors S.W.Hawking and W.Israel, *General Relativity* (1979).]

-- **George Gamow**: Infinitely long gravitational collapse came before the Big Bang [*Scientific American* March 1954, reprinted in editor John Leslie, *Modern Cosmology and Philosophy* (1998)].

-- **Fred Hoyle/ Herman Bondi/ Thomas Gold/ Jayant Narlikar**: Eternal "Steady State" universe with constant creation of new atoms, either as a fundamental law (Hoyle, chapter 20 of *Frontiers of Astronomy* (1955)) or else (as in later Hoyle and Narlikar) through a negative-energy field producing matter, much as in the Inflationary Cosmology of **Guth** and of **Linde** (J.V.Narlikar, *Journal of Astrophysics and Astronomy*, 1984: 5, page 67).
(Eternal Cosmos *continued on next three slides*)

((Eternal Cosmos?, *second of four slides*))

-- Eternal Oscillations: -**William Bonnor** in H.Bondi, W.B.Bonnor, R.A.Lyttleton, G.J.Whitrow, *Rival Theories of Cosmology* (1960): “no need to hand over to God 8,000 million years ago”. -**John A.Wheeler**: probabilistic changes in the fundamental properties of the universe at each Big Crunch: see his chapter 44 of *Gravitation* (1970) by C.W.Misner, K.S.Thorne, J.A.Wheeler. -**A.E.Sikkema and Werner Israel**, ‘Black-Hole Mergers and Mass Inflation in a Bouncing Universe’, *Nature* 349 (1991) page 45, solving **R.C.Tolman**’s problem of increasing entropy at each bounce (but **Paul J. Steinhardt** instead solves it by “smoothing” during each Big Squeeze: see *Scientific American* April 2011, page 43 of Steinhardt, ‘The Inflation Debate’). -**Roger Penrose**, *Cycles of Time* (2010): when cosmic expansion has destroyed all clocks, the cosmos forgets its size and can therefore start off again, highly compressed, in a new Big Bang.

-- **Steinhardt-Turok** “ekpyrotic” theory: Our universe is at the surface of a higher-dimensional “brane”. Repeated collisions between this and another brane are successive Big Bangs. [**P.J.Steinhardt and Neil Turok**, *Endless Universe* (2007).]

((Eternal Cosmos, *third of four slides*))

[12]

-- Eternal Inflation of **Andrei Linde**: 'The Self-Reproducing Inflationary Universe', *Scientific American* November 1994. Our Big Bang universe is a region in which very fast expansion has slowed down. [**Linde** says Inflation has perhaps occurred for infinite past time. -**Alex Vilenkin**'s cosmos inflates for infinite *future* time, but at some past time the cosmos "tunnelled from nothing": *Many Worlds in One*, 2006. -**Alan Guth**, writing that a universe "which has always existed" is "very appealing, since it frees us from all questions about how the universe was created", comments that Vilenkin's proof that the universe had a beginning makes controversial assumptions: pages 248-249 of Guth, *The Inflationary Universe* (1997).]

-- Circular Time: -**Paul Davies**, 'Closed Time as an Explanation of the Black Body Radiation', *Nature Physical Science* 240 (1972) page 3: Big Bang and Big Crunch singularities *are identified*. -**J.Richard Gott and L.-X. Li**, 'Can the Universe Create Itself?', *Physical Review D*, 29 May 1998, 23501-23543 (after a long, very complex career, the universe creates itself at its first instants).

General Comment on Eternal Cosmos: These theories *certainly seem not to answer* why there is a cosmos instead of complete emptiness:

- **Pope Pius XII** seems wrong to have welcomed the Big Bang theory as proving God's existence much more clearly than the Steady State and the Oscillating Universe (Pius XII, 'Science and the Catholic Church', *Bulletin of Atomic Scientists* June 1952, volume 8, pages 142-6 and 165).
- **Thomas Aquinas**, in *De Aeternitate Mundi* (1271): the world needs a creative cause *even if existing eternally*.
- **Descartes** in *Meditation Three* (1641): the world would immediately vanish if God stopped giving it creative support (this was then, and still is, *standard theology*).
- **Leibniz**, 'On the Ultimate Origination of Things' (1697): Even if books of geometry were copied from earlier books *ad infinitum*, why any books at all?, and why about geometry?
- **Islamic doctrine** that the Koran is co-eternal with Allah: Allah is still needed to explain the Koran's existence.
- Absurdity of **a time machine that "creates itself" through going round a temporal loop.**

HOWEVER, **David Hume** and **Bertrand Russell** suggest that in an eternal universe, where each event is caused by an earlier event, the question of *why any events existed* would in fact have been answered adequately: see **Cleanthes** in Part 9 of *Hume's Dialogues Concerning Natural Religion*, and see **Russell** in the **Russell-Copleston** radio debate of 1948. [**Hume**: When causes have been given for each of twenty particles, do not ask for a cause of the whole twenty. **Russell**: Every human has a mother, but the human race needs no mother.]

CREATION BY QUANTUM PHYSICS?

Edward Tryon: ‘Is the Universe a Vacuum Fluctuation?’ *Nature* 14 December 1973, pages 396-7. The universe is “closed”, so its gravitational binding-energy, “*negative energy*”, can balance the energy of its contents (matter, light rays, etcetera). Tryon says he offers “**the modest proposal that the Universe is simply one of those things that happen from time to time**”. But he admits that he needs “some larger space in which our Universe is embedded”, a space filled with quantum fluctuations---and this space is clearly “something”, instead of “nothing”.

[..Similarly in the case of **Robert Brout, François Englert, and Edgard Gunzig:** ‘The Creation of the Universe as a Quantum Phenomenon’, *Annals of Physics* (1978), 115: pages 78-106.

And when **Frank Wilczek** writes, in his ‘Cosmic Asymmetry Between Matter and Antimatter’, *Scientific American*, December 1980, pages 82-90, that “**the answer to the ancient question, ‘Why is there something rather than nothing?’**”, would be “**that ‘nothing’ is unstable**”, he specifies that by “nothing” he means simply “**a vacuum**” in which “**no matter existed**”.]

((.. Continued on next slide))

((Cosmos created by Quantum Physics, *continued*))

Hartle-Hawking model: ‘Wave Function of the Universe’, James B. Hartle and Stephen W. Hawking, *Physical Review D* 28, 15 December 1983, pages 2960-2975; Hawking, *A Brief History of Time* (1988). Universe-state is the sum of all possible quantum histories that are non-singular (“**the boundary condition of the universe is that it has no boundary**”). Time *is more and more space-like* at moments that are more and more early. Quantum uncertainty means there is no definite earliest moment. There is no Time before the cosmos, just as none of Earth’s surface is north of the North Pole; therefore there is no need for God to *start* the universe.

Hawking explains in his *Black Holes and Baby Universes* (1993, chapter nine) that during a period of Inflation the universe “**borrowed heavily from its gravitational energy**”--“**negative**” energy--“**to finance the creation of matter**”. “**When the universe was a single point, like the North Pole, it contained nothing**”, so that Inflation “**produced all the contents of the universe quite literally out of nothing**”. ..The end of chapter 9 suggests that there might be *only a single possible set of consistent physical laws*. Yet, Hawking says, there is still the mystery of “**what breathes fire into the equations and makes a universe for them to govern**”; “**Is the ultimate unified theory so compelling that it brings about its own existence?**” ((.. *See the next slide*))

Hawking-Mlodinow: In *The Grand Design* (2010), by Stephen Hawking and Leonard Mlodinow, the authors are *PERHAPS* saying that the unified theory *does* “bring about its own existence”: “Abstract considerations of logic lead to a unique theory that predicts and describes a vast universe” (final paragraph of chapter 8, the final chapter).

(A) THEY MAY BE SAYING ONLY that if physical laws had been slightly different, then the universe would be chaotic: without something like gravity and Conservation of Energy there would be “no reason that bodies could not appear anywhere and everywhere”, the book says, but with gravity and energy-conservation the universe can appear without a need for God to “light the blue touch paper” of the cosmic firework. ..Hawking and Mlodinow write that, given the law of gravity and Conservation of Energy, “the universe can and will create itself from nothing”, but this might be only poor writing (of the sort that sells books!) expressing the idea that gravitational *negative energy* means that energy-conservation would not be violated.

(B) However, Hawking and Mlodinow MAY INSTEAD BE SUGGESTING that Pure Logic forced the universe to exist. Almost all modern philosophers, and probably most physicists, would call this theory absurd. [Steven Weinberg in the *New York Review of Books*, 31 May 2011: “We can already imagine sets of laws of nature that, as far as we can tell, are completely consistent mathematically but that do not describe nature as we observe it.”]

(C) OR ELSE HAWKING AND MLODINOW MAY THINK that *physical laws are abstract principles that can create universes*. Though very speculative, this can seem less absurd. Plato thought that the universe exists because of something abstract----an ethical need for it to exist.

((Quantum Creation, *continued*))

Alex Vilenkin's model: 'Creation of Universes from Nothing', *Physics Letters B*, 4 November 1982, 25-28; 'Quantum Creation of Universes', *Physical Review D*, 15 July 1984, 509-511; *Many Worlds in One* (2006), chapter 17. [In *A Universe from Nothing* (2012) **Lawrence Krauss** says he had the same ideas as Vilenkin, but that Vilenkin published them first.] A tiny universe which began by expanding fast enough to avoid collapsing at once, and which then entered an inflationary stage in which matter-creation was balanced by "negative" gravitational energy, *could "quantum-tunnel" into existence*. Vilenkin writes: "I found to my surprise that the tunneling probability did not vanish when I allowed the initial radius of the universe to vanish"; "what I had was a mathematical description of a universe tunneling from a zero size – from nothing!" (*Many Worlds in One*, pages 179-180).

Vilenkin sees the problem that the quantum laws governing the tunneling must "be 'there' even prior to the universe itself" (*Many World in One*, page 205). He comments: "The laws are expressed in the form of mathematical equations ... Does this mean that mind should predate the universe?"

((.. next slide has more on Vilenkin))

Could theories like that of Vilenkin be helped by Time-without-Change?

Vilenkin, like Hawking, and like St. Augustine in Book 11 of *Confessions* (A.D. 398), sees Time as coming to exist only when the universe does; therefore his “tunneling probability” cannot be like the probability of an atom decaying within a second or an hour. But after Sidney Shoemaker’s ‘Time without Change’ (*The Journal of Philosophy*, 19 June 1969, pages 363-381) philosophers have doubted Aristotle’s idea (*Physics*, book 4, written in about B.C. 330) that Time can exist only when there are *changes* in something.

The General Introduction to *The Mystery of Existence*, editors Leslie and Kuhn, includes discussion of a universe filled with motionless particles. Changes in this universe occur only through particles beginning, at random instants, to *fade away into nothing*.

Eventually, so few particles remain that there are *STRETCHES OF TIME* during which *no* particles are fading away.

Time would continue to “flow” even when *all* the particles had faded away. Time would then pass *because it would still be logically possible that changes were happening*. .. For instance, at any moment in this kind of Time a new universe might spring into existence; this would not be a logical contradiction, like the springing into existence of a round square. *Models similar to Vilenkin’s model could use Time of that kind.*

MULTIPLE UNIVERSES, FINE-TUNING, GOD, ANTHROPIC PRINCIPLE

Cosmologists now talk of *many “universes”* (huge cosmic regions, largely or entirely separated from one another).

Sources include: **Paul Davies**, *Other Worlds* (1980) and *The Accidental Universe* (1982); **John Barrow and Frank J. Tipler**, *The Anthropic Cosmological Principle* (1986) ; **John Leslie**, *Universes* (1989, expanding an article in *American Philosophical Quarterly*, April 1982); articles by **Bernard Carr**, **Brandon Carter**, **Andrei Linde**, **Edward Tryon**, **John Archibald Wheeler**, in editor Leslie, *Modern Cosmology and Philosophy* (1998); **Martin Rees**, *Before the Beginning: Our Universe and Others* (1997) and ‘Cosmology and the Multiverse’, pages 57-75 of editor B.Carr, *Universe or Multiverse?* (2007).

Multiple Universes *do not conflict with Occam’s Razor* (“entities must not be multiplied without necessity”) because:

1. It would be odd if a universe-creating mechanism operated *only once*.
2. Many universes exist *in the simplest forms of many physical theories*.

WAYS OF GETTING MULTIPLE UNIVERSES include:

--Cosmic Oscillations (Big Bang, Big Squeeze, Big Bang, etcetera). **Wheeler** was a pioneer of this idea, as in his chapter 44 of *Gravitation* (1971) by C.W.Misner, K.S.Thorne and J.A.Wheeler.

--Continuing Inflation; universes like ours are regions where the inflation has become slower. [**Andrei Linde**, *Inflation and Quantum Cosmology* (1990); **Alex Vilenkin**, *Many Worlds in One* (2006).]

-- Universes which are Branches of the Hartle-Hawking cosmos; they are “a consequence of the no-boundary condition” (**Hawking and Mlodinow**, *The Grand Design* (2010), page 164).

-- Universes as Quantum Fluctuations of a Larger Space (**Tryon, Brout-Englert-Gunzig**).

-- Universes which are many **Vilenkin**-type “Tunnelings from Nothing”.

-- Universes as regions in a String Theory “landscape” containing perhaps 10 to the power of 500 regions (**Leonard Susskind**, *The Cosmic Landscape*, 2006).

-- Universes of Many-Worlds Quantum Theory ((.. see the next slide))

((Ways of getting Many Universes, *continued*))

-- Universes of Many-Worlds Quantum Theory, as first imagined by **Hugh Everett**: The cosmos becomes continually *more differentiated* in ways corresponding to all possible events allowed by quantum theory: see Bryce DeWitt, 'The Everett Interpretation of Quantum Mechanics', pages 167-197 of J.D.Barrow, P.C.W.Davies and C.L.Harper, editors, *Science and Ultimate Reality* (2004).

Interaction -- "jostling" -- of quantum branches explains the results of double-slit experiments. In these experiments, patterns *as if of interacting waves* are slowly built up, even when particles are fired *only one at a time* towards the two slits---so that it looks as if *every* particle passes through *both* slits.

[Note: As allowed by **David Deutsch**'s version of Everett's theory, the *increased differentiation* imagined by Everett must be like that of a group of men in which half take off their hats *without the total number of men increasing*. Otherwise *WE COULD NOT TRUST OUR CLOCKS*: the many *instances of ourselves* who observed later hours would hugely outnumber those who observed earlier hours, and this factor *would hugely outweigh all apparent evidence that we existed at those earlier hours*. See **John Leslie**, 'A difficulty for Everett's many-worlds theory', *International Studies in the Philosophy of Science* 10:3 (1996), 239-246, written with the help of quantum theorist **Don Page**.]

((Ways of getting Many Universes, *continued*))

[22]

TEGMARK and **LEWIS**: All logically/ mathematically possible universes really exist in the Modal Realism of philosopher **David Lewis** (*On the Plurality of Worlds*, 1986) and at “Level Four” of the Multiverses described by **Max Tegmark** (‘Parallel Universes’, *Scientific American*, May 2003, pages 41-51). However, this seems a mistake. As argued by **Alex Vilenkin** on page 203 of *Many Worlds in One*, typical mathematical structures would be “**horrendously large and cumbersome**”, totally unlike our universe which has laws simple enough for us to discover. [In *Discourse on Metaphysics* (1686) **Leibniz** noted that *SOME mathematical equation* could be found to fit *JUST ANY* curve, and that the same point applied to just any possible universe.] .. If all logically/ mathematically possible structures existed, then *at every new microsecond the world could be expected to become disorderly* because there would be so many ways in which disorder could develop: for example, your body could explode or vanish (see **Holly Thomas**, ‘Modal Realism and Inductive Scepticism’, *Noûs*, September 1993, pages 331-354).

[.. **Lewis** says that, *because infinities at the same Cantorian level are all of the same size*, the logically possible universes that are disorderly *cannot be greater in number* than the logically possible universes that are orderly, law-abiding. Here he is like cosmologists who say “the measure problem” cannot be solved if there are infinitely many universes. But even in an infinite universe which contained infinitely many galaxies, we should not expect *to walk on water* through sufficiently many water molecules chancing to move upwards at the right moments; and similarly, we could not expect to see a black hole emitting “**a television set or Charles Darwin**” as a chance pattern of Hawking-radiation (this possibility is described by **Hawking and Werner Israel** on page 19 of *General Relativity*, their edited volume of 1979). So, in a very important sense, infinities at the same Cantorian level **can be** of importantly different sizes.]

WHAT APPEARS TO BE “FINE-TUNING” SUGGESTS MANY UNIVERSES, very varied in their properties; our universe is one of the rare universes that support observers, intelligent living beings. It is what persuaded **Leonard Susskind** and **Steven Weinberg** to accept Multiverse theories. [See an interview of Susskind in *New Scientist* 17 December, 2005, and see Weinberg, ‘Living in the Multiverse’, pages 29-42 of editor B.Carr, *Universe or Multiverse?* (2007).]

Many basic physical properties of our universe seem “fine-tuned” in the following sense: *that small changes to them would have prevented the existence of observers*. At first rejected by many physicists and cosmologists, this is today a very widely accepted theory. [John Leslie’s *Universes* gives details of the large literature supporting the theory that had accumulated by 1989, but at that date many physicists were violently opposed to it.] Electromagnetism, the nuclear weak force, the nuclear strong force, gravity, the neutron-proton mass difference, the masses of the superheavy particles that dominated early stages of the Big Bang, the cosmic smoothness and the early expansion speed, the conditions leading to Inflation (which might explain the smoothness and the expansion speed), Planck’s constant, etcetera, can all appear to have needed tuning, *often even to avoid a universe consisting only of light rays or of black holes* (see I.L.Rozental, *Soviet Physics:Uspekhi*, 1980,23: pages 293-305).

What particularly impresses **Weinberg and Susskind** is that *the cosmological constant* seems to have needed tuning *to one part in ten to the power of one hundred and twenty* for the universe to escape almost immediate collapse, or else expansion so fast that it would soon have become filled with near-vacuum. ..Physicists had hoped that Supersymmetry would make the cosmological constant *precisely zero*, yet it is now known to be *non-zero*. But could the value of the constant in our universe be explained by ANTHROPIC OBSERVATIONAL SELECTION ? ((.. See the next slide.))

ANTHROPIC PRINCIPLE

As defined by **Brandon Carter**, the Anthropic Principle concerns *observership*. (Note: *not* “HUMAN observership” .) The Principle has a “Weak” version, that *our region of space and time* MUST (obviously, since we are in it) have properties permitting the existence of observers; also a “Strong” version stating that *our universe* MUST (equally obviously, once again because we are in it) have such properties. [Carter, ‘Large Number Coincidences and the Anthropic Principle in Cosmology’, pages 291-298 of editor M.S.Longair, *Confrontation of Cosmological Theories with Observational Data* (1974).]

Although as obvious as “2+2=4”, these principles remind us of possible *observational selection effects*. We could not observe that we inhabited a region of space and time, or a universe among many universes, whose properties did not allow intelligent life to exist in it.

Note:

1. The distinction between “Weak” and “Strong” versions of the Anthropic Principle IS OFTEN VERY UNHELPFUL because what one cosmologist calls “*a large region of space and time*” can be what another cosmologist calls “*a universe*”.

2. *Carter’s Strong Anthropic Principle* DOES NOT state that the universe WAS FORCED TO HAVE *observer-permitting properties*, perhaps because “to exist” means “to be observed” [**Bishop Berkeley**, *Three Dialogues* (1713) and **John A. Wheeler** at some points in his writings], or else because God designed it.

GOD OR MULTIVERSE?

God selected our universe's life-permitting properties ?

Or a Multiverse of very varied universes, Anthropic Observational Selection then guaranteeing that *our* universe has life-permitting properties ?

NOTE: These two ways of explaining the fine tuning *are compatible*, because God might well have created a very varied multiverse.

However, *many atheists do like a very varied multiverse because it allows them to believe in fine tuning without believing in God*. Often, they think of God as “an infinitely implausible Magician”.

A REASON FOR THINKING THAT GOD (*of some sort*, not necessarily any kind of Person) IS NEEDED TO EXPLAIN THE FINE-TUNING: **A force strength, or a particle mass, very often seems to need tuning to a particular narrow range *for several different reasons at once*. Why does this lead to no problems?**

ELECTROMAGNETISM, for instance, seems to have needed tuning (i) for there to be **steadily burning stars** like the sun, (ii) **for stellar carbon synthesis**, with the carbon largely avoiding being converted to oxygen, and then for scattering of the carbon by supernovas, (iii) **for quarks not to be replaced by leptons**, (iv) **for protons not to decay swiftly**, and for proton-proton interaction not to be too strong for chemistry, (v) **for chemical changes to occur reasonably fast**, (vi) for there to be **a firm distinction between matter and radiation**. [See Barrow and Tipler, *The Anthropic Cosmological Principle* (1986), or pages 2-6, 25-56, 64-5, of Leslie, *Universes* (1989).]

.... **Why did not electromagnetism need to be tuned *in six totally different ways to achieve these six purposes*?** Why did not tuning to satisfy any one of those purposes *destroy* tuning to satisfy the other five purposes? How was there *even a single possible combination* of force strengths and particle masses that was *life-permitting*? .. Here might be *a need for God, to ensure that fundamental laws were of the right kind for no problem to arise*. For though it is easy to see why such things as force strengths and particle masses could be “derived” factors that varied “naturally” from universe to universe -- perhaps because of varying scalar fields -- *variation in fundamental laws* would be far harder to accept in the absence of God. For the Principle of Induction, central to all science, encourages us to expect fundamental laws to be the same everywhere. ((.. *Continued on next slide*))

Suppose that God was in fact needed to ensure that physical laws allowed *at least one life-permitting combination* of force strengths and particle masses. (A) God might then create immensely many universes, relying on Chance to provide, in at least one universe, a life-permitting combination. (B) However, God might instead choose physical laws that dictated that *EVERY universe*, in a field of perhaps infinitely many universes, *would be life-permitting*---for would not Life be what God wanted?

.... All of this might be important to whether there could be A VACUUM-INSTABILITY DISASTER

Here is why A VACUUM-INSTABILITY DISASTER might occur:

-- Perhaps empty space, “the vacuum”, *is only metastable*, like a man standing on one foot. Experiments at very high energies might then lead to a disaster --- a reason suggested by **Martin Rees** for banning any accelerator experiments that would reach energy-concentrations greater than those of colliding cosmic rays [**Caution should surely be urged (if not enforced) on experiments that create energy conditions that may never have occurred naturally**]: Rees, *Before the Beginning* (1997), page 207. If particle accelerators became “**a hundred times more powerful**” then “**destroying our Earth**” could conceivably result: Rees, (2003), *Our Final Century*, published in North America as *Our Final Hour*, pages 120,122.] ..Possibly a few cosmic rays in our past light-cone have collided at energies like those of colliding rifle bullets, much higher than Large Hadron Collider energies. But **Steven Weinberg** wrote on pages 187-188 of *Dreams of a Final Theory* (1993) that, “**perhaps by using ionized gases to help transfer energy from powerful laser beams to individual charged particles**”, even “**the Planck energy**” could be reached. That is the energy not just of colliding rifle bullets, but of colliding Lear Jets --- small private jet aircraft. ((.. Continued on next slide))

((Danger of possible Vacuum Instability, *continued*))

[28]

-- If “fine-tuning” is real, then it may be present because scalar fields -- fields that give masses to physical particles and affect the strengths of physical forces -- **chance** in our region of the cosmos (“our universe”) to have life-permitting values.

-- The scalar fields may have reached those life-permitting values through “running down the hill” of potential energies and chancing to fall into “hollows” which they could leave through being *jolted*, kicked out, by experiments at very high energies. A field kicked out of its hollow would run further down the hill. A tiny bubble of new-strength field would then expand at nearly the speed of light, with enormous release of energy. After about 100,000 years, our entire galaxy would have been destroyed, the bubble then continuing its expansion. [Early articles include S.Coleman and F. De Luccia, *Physical Review D* 21, June 15, 1980, ‘Gravitational effects on and of vacuum decay’ ((they call call it “the ultimate ecological catastrophe”)); P.Hut and M.J.Rees, ‘How stable is our vacuum?’, *Nature* April 7, 1983, 508-509 ; M.Sher, ‘Electroweak Higgs potentials and vacuum stability’, *Physics Reports* 5 and 6, 1989 (reviews hundreds of articles but says that new findings might suddenly outdate them). ..Gian Giudice of CERN says that the recently detected mass of the Higgs, ~125 GeV, is about the minimum needed to avoid a constant chance of the vacuum “tunneling” to a new state **even without being jolted**: *New Scientist*, 10 November 2012, page 37.]

Conclusion: Do not call it “*MERE PHILOSOPHY*”, “*unimportant*”, whether

- (a) our universe has “fine-tuned”, life-permitting properties because it is a rare universe in which scalar fields **chance** to take suitable values, or whether instead
- (b) God fine-tuned physical laws to get those values.

MAY THE COSMOS EXIST FOR NO REASON AT ALL?

-- Fred Hoyle, *Frontiers of Astronomy* (1955), chapter 20: “Why is the Universe?” is “meaningless and unprofitable”. “When the origin of matter becomes a law of physics it is completely protected from such prying questions as: where does matter come from?”

-- Bertrand Russell and Frederick C. Copleston in their radio debate of 1948 (in *The Collected Papers of Bertrand Russell*, editor J.G.Slater): COPLESTON: We must ask for the cause of the whole series of causes, “how the total, or anything at all, came to be there”, “why something rather than nothing?” RUSSELL: “Every man who exists has a mother, and it seems to me that your argument is that therefore the human race must have a mother.”

-- Derek Parfit (well-known British philosopher of today): Reality must be *either* empty of all things, *or else* non-empty. “When, and how, could any selection be made?” ---a selection, for instance, of a non-empty cosmos. Parfit answers: “This is not a real problem. Since it is logically necessary that reality be in some way or other, it is necessary that one way be picked to be the way that reality is. Logic ensures that a selection is made. There is no need for hidden machinery.” [From ‘Why Anything? Why This?’, in *The London Review of Books*, 22 January and 15 February, 1998.]

((..Continued on next slide))

((May the Cosmos Exist for No Reason?, *continued*))

-- **Peter van Inwagen** argues like this: *There were INFINITELY MANY logically possible ways of there being Something, at least one existing thing. There was AT MOST ONE possible way of there being Nothing. Therefore the existence of Something would have been INFINITELY PROBABLE, even without any Creative Cause.* [‘Why Is There Anything At All?’, pages 95-110 of *Aristotelian Society* supplementary volume 70, 1996.]

-- **Adolf Grünbaum** is confident that the Universe needs no explanation. He agrees that Nothing – a totally empty universe – might be *simpler* than Something, but says its simplicity *would not justify the claim that there would be Nothing “in the absence of an overriding cause”*. [One example of “an overriding cause” might be some necessity that produced the existence of God.] ..Nobody, says Grünbaum, would ask why a man remained a man *instead of suddenly changing into an elephant* -----although changing into an elephant was certainly logically possible (unlike a round square). So, he asks, why should we be astonished that there is not Nothing, “*that something does exist instead*”? ..There is, Grünbaum insists, *no cosmological evidence* for the theory that “*it is natural for our universe not to exist, rather than to exist*”. [‘Why Is There a Universe AT ALL, Rather Than Just Nothing?’, in editors C.Glymour et al., *Logic, Methodology and Philosophy of Science* (2009).]

((May the Cosmos Exist for No Reason?, *continued once again*))

Hoyle, Russell, Parfit, van Inwagen, Grünbaum, are all reprinted in editors Leslie and Kuhn, *The Mystery of Existence*, since their arguments are interesting and even strong. But there are also strong ways of arguing against them.

For instance, a Reality that was chosen randomly from among all logically possible Realities, as imagined by van Inwagen, might be expected to be very disorderly, unlike our universe.

And when Grünbaum asks for “cosmological evidence” that the Universe has a tendency *not* to exist, this can seem very unfair. [Suppose that our universe was in fact created by God, and also that, as theologians almost always think, it would vanish at once if God stopped renewing his “creative support” for its existence. How could cosmologists be expected to know this? .. Grünbaum argues that Lavoisier proved, by experiments which showed *conservation of mass* despite chemical changes, that Descartes was wrong in thinking that things would vanish if God ceased to keep them in existence. But, we can protest against Grünbaum, Lavoisier never put *magical screens* around his chemicals to ensure that God could not act on them, then looking to see whether they vanished.]

MIND HELPS TO EXPLAIN THE COSMOS?

I. GOD AS AN ETERNAL MIND, creating a universe, or many universes?

The Mystery of Existence (editors Leslie and Kuhn) reprints two philosophers, **William Lane Craig** and **Timothy O'Connor**, who make God the ultimate explanation of everything, even of “ $2 + 2=4$ ”. [O'Connor, *Theism and Ultimate Explanation* (2009); Craig, *Reasonable Faith* (2006).]

What, however, is responsible for God's own existence?

-- **Craig's** answer is that God exists “**through a necessity of God's own nature**”. Many philosophers judge that this short answer is excessively mysterious.

-- **O'Connor** thinks **Aquinas** might be correct in believing that God's so-called “other properties” *are identical with* God's property of existing necessarily; however, he says he cannot fully understand this. [..Aquinas, too, did not claim to have any full understanding of it. How could God's knowledge, for instance, be really no different from God's mercifulness or God's power? Even if God is “Pure Being”, “Absolutely Infinite Existence”, this seems to prove only that IF IN ACTUAL FACT God is real, then the reality that God possesses *is unlike the reality of “ $2+2=4$ ”*; it is the reality of something that exists in the same way as stars and humans exist.]

((..See next slide for more about Why does God exist?))

((Why does God Exist?, *continued*))

Anselm (*Proslogion*, written in 1078) argues that God is by definition Perfect and therefore possesses *Existence* (Chapter 2) and *Necessary Existence* (Chapter 3).

Alvin Plantinga, well-known philosopher of religion, thinks that Necessary Existence is needed for perfection, and that it could well be a possible property --- in which case God's existence *follows logically* from God's perfection (*God, Freedom, and Evil*, 1977).

Richard Swinburne, also well-known, thinks God's perfection *does not* imply necessary existence; instead, God is perfect but exists *for no reason at all* (*The Existence of God*, 2004). But Swinburne argues that God is easy to accept since God is *the simplest possible thing*, because God can be described so simply. ["God knows ALL that is now knowable"; "God can do ALL that can be described without contradiction". This is like the simplicity that the physicist **Max Tegmark** sees in "ALL possible mathematically-structured worlds have actual existence" ('Parallel Universes', *Scientific American*, May 2003).]

...But why would God create a world containing billions of other minds, all of them infinitely inferior to God?

Spinoza answers [*Short Treatise*, written in 1662; *Ethics*, published in 1677 after his death] that God *DID NOT* do this. Instead, *God is the only reality*. Stars and humans are simply patterns inside God's mind. ..This is like **John Barrow's** suggestion ['Living in a simulated universe', pages 481-486 of editor Bernard Carr, *Universe or Multiverse?* (2007)] that our universe is a pattern of activity inside *an artificial mind, a huge computer created by an advanced civilization*.

II. MIND AS ESSENTIAL TO PHYSICAL REALITY?

-- Physicists influenced by Hindu thought, such as **Erwin Schrödinger** (*Mind and Matter*, 1958; *My View of the World*, 1964), believe that quantum physics shows *that everything is mental*.

-- **Andrei Linde** argues (on pages 449-451 of 'Inflation, Quantum Cosmology, and the Anthropic Principle', in J.D.Barrow et al., 2004, *Science and Ultimate Reality*) that consciousness **"may exist by itself, even in the absence of matter"**, and that our perceptions **"may be, in a certain sense, even more real than material objects"**.

-- In 'Laying Down the Laws', *New Scientist*, 30 June 2007, pages 30-34, **Paul Davies** defends **John A. Wheeler's** ideas

(1) that *DELAYED-CHOICE double-slit experiments* by quantum physicists *prove that the present can affect the past*;

and (2) that living beings *can affect, by their observations*, even how physical laws "congealed", crystallized, when the Big Bang began to cool.

Like Wheeler in 'Genesis and Observership' [pages 3-33 of editors R.Butts and J.Hintikka, *Foundational Problems in the Special Sciences* (1977)], **Davies** suggests **"a self-explaining loop"** which is basic to all reality. Observations ensure that the laws congealed in a "fine-tuned" way that permitted observers to evolve, and --- **Davies**, page 303 of *The Goldilocks Enigma: Why Is the Universe Just Right for Life?*(2006) --- **"only self-consistent loops capable of understanding themselves can create themselves"**; therefore universes can exist only if they are, at some points in time, *mind-containing*.
 ((.. See next slide for Delayed-Choice experiments))

((Mind as Perhaps Essential to Physical Reality, *continued*))

Double-slit experiments: When particles pass through two slits, interference patterns on photographic plates, patterns suggesting wave-interaction, are formed ONLY IF the experimenter *does not look* to discover which slit each particle goes through.

DELAYED-CHOICE double-slit experiments: The experimenter decides whether or not to look *only after the particles have gone through the slits* . But, once again, interference patterns are seen ONLY IF the experimenter decides not to look.

Do delayed-choice experiments prove the correctness of the Wheeler-Davies theory that the present can affect the past?

Perhaps they do not. For an alternative explanation is that “quantum wave-collapse” occurs *AT THE POINT IN TIME WHEN*

-- (1.) the experimenter looks to see which slit a particle has gone through,

-- or (2.) the particle hits the photographic plate after the experimenter has decided not to look.

A PLATONIC EXPLANATION FOR GOD, OR FOR EVERYTHING?

-- In *The Republic*, of about B.C. 380, Plato suggests (Book Six, 509) that The Good – something which is itself “beyond being”, not any kind of existing thing -- *acts creatively*; it itself *is directly responsible* for the existence of all things.

This theory is found also in *The Enneads* of the “neoPlatonist” Plotinus (about 260 A.D.) and in the writings of many philosophers and theologians, including modern theologians such as Paul Tillich (*Systematic Theology*, 1953 -1963) and Hans Küng (*Existiert Gott?*, 1978). Tillich and Küng suggest that God is a creative force, instead of an existing thing.

Without using the word “God”, the influential philosopher of science Nicholas Rescher argues very similarly in *Axiogenesis* (2010).

-- Aristotle (in books Alpha and Lambda of *Metaphysics*, written about 340 B.C.) uses Plato’s central idea --- that *ethical (or, as Rescher prefers to say, “axiological”) needs can themselves explain actual existence* --- to explain the existence not of everything, but instead of a divine mind (“the First Mover”, “God”). This theory is defended by the philosopher A.C.Ewing in chapter 7 of *Value and Reality* (1973), by Keith Ward (Oxford’s Regius Professor of Divinity) in chapter 8 of *Religion and Creation* (1996), and by John Polkinghorne in chapter 3 of *The Faith of a Physicist* (1994).

-- Spinoza (in *Ethics*, and in his earlier *Short Treatise*) uses the word “God” as another name for the universe. He believes that the reason why the universe exists is Platonic. God is an infinite mind, a mind carrying all the patterns of the things and events in the universe (they do not exist anywhere else). This infinite mind exists because its existence *is ethically/ axiologically required*. Hegel developed the same theory, for instance in the first part of his *Encyclopedia of the Philosophical Sciences* (1830).

-- John Leslie develops something similar to Spinoza's theory in *Value and Existence* (1979), in chapter 8 of *Universes* (1989), in *Infinite Minds* (2001), and in *Immortality Defended* (2007):

a.) Even if no *things* existed, there would be *Platonic truths*: for instance, that if three sets of five lions were to exist, then there *would be* fifteen lions.

One Platonic truth might be that if a world containing nothing but terrible tortures were to exist, then this would be *bad*.

Another could be that if a world of a certain sort were to exist, then its existence would be *good*----and, if it did not exist, then this would be *unfortunate*.

[These would not be truths about anyone's *duties*. Even if no things existed, not even God, so that nobody *had a duty* to create a good world, the coming into existence of a good world could be fortunate, *ethically/axiologically required*.]

b.) Logic DOES NOT STATE that Plato was correct when he suggested that ethical/ axiological requirements have the power to create things. However, Logic also does not say that they *do not have* this power. And, since they are requirements for things of certain types *to exist*, they are at least "*the right sorts of reality*" for acting creatively. This is agreed even by the firmly atheistic philosopher J.L. Mackie when he discusses the Platonic creation story (chapter 13 of Mackie, *The Miracle of Theism*, 1982).

((.. *Continued on the next slide*))

((Leslie's Platonic Creation Story, *continued*))

c.) That our universe ***exists simply because of its ethical requiredness*** does not say that wicked actions, and disasters such as earthquakes, never occur. The ethical need for them not to occur *might be outweighed, overruled*, by other ethical needs which were more important. [So, for instance, Leslie can defend **Brandon Carter**'s "doomsday argument": see chapter 5 of Leslie, *The End of the World: the science and ethics of human extinction* (1996). Using Carter's Anthropic Principle, the doomsday argument draws attention to the *prima facie* improbability that humans of today are unusually early -- for instance, in the earliest 0.01% -- among all humans who will ever have lived. An environmental disaster, or germ warfare, might soon kill all humans.]

d.) A Platonic creation story does not tell us that our universe is "the best of all possible universes". Instead it leads to a Spinozistic position. *Nothing exists except divine thinking*. Divine thinking is thinking *about everything that is worth thinking about, including the patterns of infinitely many universes*. The universe inside which we exist as patterns in the divine thoughts (this is like **John Barrow**'s idea that we, and all the things of universe, are patterns inside a huge computer) could be far from being the very best universe ----- but if we could annihilate it by pressing a button, then we'd have a duty not to press the button.

THE DOOMSDAY ARGUMENT which **Brandon Carter** derived from his Anthropic Principle:

-- “Anthropic” reasoning can consider not only factors absolutely necessary for observers to exist, but also where an observer *is likely to be*. [Not, for example, flying out of a black hole as a pattern of Hawking-radiation.]

-- **Carter** asks where a human *would probably* find himself/ herself inside the total spatiotemporal spread of the human race. **Richard Gott** estimates that the chances of a human finding himself/ herself *in the earliest 5%*, for example, of all humans who will ever have lived, *is 5%* (Gott, ‘Implications of the Copernican principle for our future prospects’, *Nature*, May 27, 1993, pages 315-319). Since humans have recently had a population explosion -- roughly one in ten of all humans born before today *are alive now* -- this suggests that the human race will not survive long, and will definitely not spread through its entire galaxy. [**Frank Tipler** thinks spreading across the galaxy could require as little as 600,000 years.]

((..Continued on next slide))

((Doomsday Argument, *continued*))

The **Carter-Leslie** version of this “doomsday argument” [Leslie, ‘Time and the anthropic principle’, *Mind*, July 1992, 521-540, and other articles leading to *The End of the World* (1996) and summarized in ‘The Risk that Humans Will Soon Be Extinct’, *Philosophy*, October 2010, 447-63; Carter in letters promising to “mutter support from the trenches”] *is more complex* than **Gott**’s version. **Carter and Leslie** instead start with a “prior probability” for DOOM SOON (extinction of all humans inside something like the next 500 years) estimated after looking at various risks (environmental disaster, nuclear bombs, germ warfare, etcetera). They then apply *Bayesian reasoning*, using our observed position in time as evidence for *revising* that probability. .. If DOOM DELAYED means the human race continuing for many thousand years, even at only its present size with no spreading through the galaxy, then asking where a human would be likely to find himself/ herself can lead to a *Bayesian Shift* in the direction of the theory that DOOM SOON *is much more probable* than DOOM DELAYED. ..The Bayesian Shift is particularly great if we believe (with some quantum physicists) that the universe is fully deterministic.

Perhaps, however, believers in God will say that humans will not be permitted to drive themselves to extinction. That, for instance, God chose physical laws so that no particle accelerator will ever produce a vacuum-instability disaster.

For more on the risk of human extinction in the near future, see **Martin Rees**, *Our Final Century* (2003) (in North America published as *Our Final Hour*). Also editors Nick Bostrom and Milan M. Cirkovic, *Global Catastrophic Risks* (2008).

THE MYSTERY OF EXISTENCE

WHY IS THERE ANYTHING AT ALL?



John Leslie and
Robert Lawrence Kuhn

 WILEY-BLACKWELL