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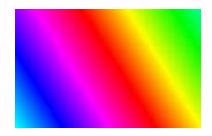
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# **Nasty Little Truth About Spacetime Physics**

Nothing Can Move in Spacetime! By Definition!



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"How often is science improved, and turned into new directions by non-scientific influences! it is up to us, it is up to the citizens of a free society to either accept the chauvinism of science without contradiction or to overcome it by the counterforce of public action." Paul Feyerabend

"The nasty and shocking little truth is that time does not change, a million wormhole and time travel fanatics wearing their little Klingon and Ferengi outfits notwithstanding."[\*]

### The List

## Are We Being Taken to the Cleaners by Spacetime Physicists?

Some of the most famous physicists in the world are not telling the truth about one of the most taken for granted concepts in scientific history. They are not telling us how they can come up with their fanciful time travel theories (wormholes, advanced and retarded waves traveling in spacetime, etc...) using a model of the universe that precludes the possibility of motion. Nothing can move in spacetime or in a time dimension-axis by definition. This is because motion in time is self-referential. It is for this reason that Sir Karl Popper compared Einstein's spacetime to Parmenide's unchanging block universe[\*], in which nothing ever happens.

The following is a short list of notorious time travel and spacetime crackpots, not necessarily in order of crackpottery. Some, like Hawking, Wheeler and Feynman, are venerated by the physics community and are considered by many to be among the most brilliant scientific minds that ever lived. Too bad they believe in time travel.

Before I continue, lest I be immediately branded as an anti-relativity crank, let me make it perfectly clear that I agree with the mathematical and predictive correctness of both the Special and the General Theory of Relativity.

Stephen Hawking Kip Thorne John A. Wheeler Richard Feynman Michio Kaku John Gribbin Carl Sagan John Kramer J. Richard Gott III Hans Moravec David Deutsch Igor Novikov John Baez Ronald Mallett Jack Sarfatti Kurt Gödel **Paul Davies** Albert Einstein

- I include Dr. Feynman and Dr. Wheeler in the list because of their Absorber Theory in which they posited the existence of advanced and retarded waves that can travel in spacetime. Here is a quote from Feynman's "The Reason for Antiparticles" in "Elementary Particles and the Laws of Physics The 1986 Dirac Memorial Lectures": "... So the requirements of positive energies and relativity force us to allow creation and annihilation of pairs of particles, one of which travels backwards in time." This gem of poseudoscience comes from one of the most celebrated physicists of the twentieth century.
- Dr. Sarfatti, of course, is the well-known internet crackpot who believes in all sorts of paranormal phenomena, time travel being just the tip of the iceberg.
- Dr. Kip "Wormhole" Thorne, long revered by science fiction fanatics, is renown for his time travel theories which he "derived", of course, from the mathematics of general relativity. Dr. Thorne believes it is possible to travel into a wormhole and reappear some time in the past. More than anyone else, Dr. Thorne has legitimized one of the most absurd concepts in science and turned it into a cult. A quick search on Google for 'wormhole' will give one a sense of the extent of the cult and its hold on the public's imagination.
- Dr. Michio Kaku is an evangelizer for string theory. String theory postulates that time is one of the 10 dimensions of nature and that dimensions can be "compactified" or curled up into tiny little balls, so tiny, in fact, they can never be detected. The brains of string theorists can be described in a similar fashion.
- Dr. Carl Sagan is the noted astronomer and science popularizer who spent a good part of his life trying to contact aliens and had a special fondness for the possibility of time travel. It is a pity Dr. Sagan passed away because I liked him, crackpot or not.
- Dr. David Deutsch, an Oxford physicist, is well known for his ideas on the "many-universes interpretation" of quantum mechanics, a sort of fanciful way of looking at time travel that attempts to solve the obvious contradictions. The many-universes interpretation suffers from the same fatal flaw as the single-world spacetime interpretation: they are equally motionless. But this does not seem to trouble Dr. Deutsch in the least. In fact, he has built a career out of what he calls "quantum computers", fictitious magical machines conjured up out of an equally magical hat filled with zillions of changeless parallel universes. Dr. Deutsch is a veritable magician when it comes to making voodoo appear like legitimate science.
- Dr. Hans Moravec is a noted roboticist at Carnegie Mellon University in Pennsylvania. In his weird science book, Mind Children, Moravec claims that it will be possible to achieve immortality by uploading the contents of one's brain onto a digital computer but somehow forgets to explain how he proposes to transfer the brain's consciousness into the computer. Needless to say, he has no clue as to the nature of consciousness, any claim to the contrary notwithstanding. Dr. Moravec's belief in time travel is on a par with his equally wacky ideas on artificial intelligence and the mind.
- **b**r. Igor Dmitrievich Novikov is a renown Russian physicist who specializes in black holes. His book "The River of Time" is a favorite of time travel devotees. "River of Lies" would be a more appropriate title, in my opinion.
- Dr. J. Richard Gott III is a professor of astrophysics at Princeton University and is the author of the time travel book, "Time Travel in Einstein's Universe: The Physical Possibilities Of Travel Through Time". Dr. Gott believes it might be possible to travel back in time using hypothetical cosmic strings to curve spacetime. Strange, I never knew that Einstein had his own universe.
- Dr. Ronald Mallett is a professor of physics at the University of Connecticut who would like to achieve his childhood dream of going back in time to warn his father of the dangers of heavy drinking and smoking. According to a recent article in New Scientist, Mallett believes he has found a way to the past by using, not a wormhole, but twisted light. Twisted science is more like it.
- Dr. John Baez, a physics professor at the University of California at Riverside, is also a famous usenet denizen. Dr. Baez is a rather curious individual in that he can hold two contradictory beliefs simultaneously. He accepts that nothing can move in spacetime but he does not let this little fact bother him. On the contrary, he embraces a temporal dimension and asserts that there are infinitely many "nows", past ones and future ones, all existing together. He conveniently declines to explain how we are able to move from one "now" to the next, given that nothing can move in spacetime.
- No need to introduce Sir Stephen "Black Hole" Hawking. The man is a legend in his own time. Check out his "A Brief History of Time", not that he needs the money, of course. Sir Stephen is undoubtedly the Pope of the time travel religion while Kip Thorne is his number one Cardinal. Note: I had previously heard from a source that Sir Stephen had been knighted but apparently the information is incorrect. However, considering that Sir Stephen, in his brilliance, figured out that the impossible is possible, I will continue to use the honorific 'Sir' in deference to his uncommon achievement.
- \*\*Wrt Gödel (how could I forget him?) is one of the gods of the voodoo science pantheon. Gödel is certainly the most often quoted yet inconsequential mathematician of the world. He is known for his incompleteness theorem, the most non-scientific, chickenfeather-voodoo nonsense ever penned by a member of the human species. In 1949, Gödel announced to the world that Einstein's general theory of relativity allows time travel to the past via "closed time-like curves." The only thing Gödel proved, in my opinion, was the incompleteness of his frontal lobe.

- Paul Davies is a prolific science popularizer and a theoretical physicist at the Australian Center for Astrobiology at Macquarie University in Sydney. He recently wrote an <a href="article">article</a> for Scientific American in which he writes that time dilation "illustrates a limited type of time travel." I include both Davies and the editors of Scientific American on my list of notorious time travel crackpots. In my opinion, Scientific American is mostly a propaganda rag for the charlatans and crackpots of the scientific community. Their dependence on advertising revenues makes them suspect at best. Their idea of science publishing is to develop a readership among wild-eyed Star-Trek fanatics. Hence their penchant for articles on time travel, black holes, parallel universes, wormholes, warped space and the like.
  - Having said that, I must make an exception for SciAm author Gary Stix who had the courage and honesty to admit that the "pace of living quickens continuously, yet a full understanding of things temporal still eludes us." SciAm does not deserve Stix.
- I placed Albert Einstein at the bottom of the list because he, of all people, should have known better. The man needs no introduction, of course, but why is he on the list? Because he (reluctantly but who cares?) agreed with his good friend, Kurt Gödel, that the spacetime of general relativity allows time travel to the past via closed time-like loops even though other prominent thinkers, including Sir Karl Popper, had pointed out that nothing happens in spacetime. See Popper below.
- The others on the list are, for the most part, hangers-on although they are notorious in their own right. I shall expand the list as more names come to my attention.

### The Crackpottery

#### Michio Kaku

Michio Kaku Online: Black Holes, Worm Holes and the 10th Dimension

"Because of the enormous amount of work done by theoretical physicists within the last 5 years or so, Hawking has since changed his mind, and now believes that time travel is possible (although not necessarily practical)."

[...] "In conclusion, don't turn someone away who knocks at your door one day and claims to be your future great-great-great grandchild. They may be right."

#### John Gribbin

#### Time travel for beginners

"In the 1980s, though, Kip Thorne, of CalTech (one of the world's leading experts in the general theory of relativity), and his colleagues set out to prove once and for all that such nonsense wasn't really allowed by Einstein's equations. They studied the situation from all sides, but were forced to the unwelcome conclusion that there really was nothing in the equations to prevent time travel, provided (and it is a big proviso) you have the technology to manipulate black holes."

## **Nothing Can Move in Spacetime**

## **General Relativity and Time Travel**

There is a common thread that weaves itself around time travel theories and their authors' arguments. It is Einstein's theory of relativity and, in particular, the general theory of relativity. For close to a hundred years relativists have claimed that there is a time dimension (i. e., a degree of freedom on a par with the other three spatial dimensions) and that gravity is due to bodies following their geodesics in curved spacetime. In other words, relativists believe in time travel in one direction, toward the future. They continue to teach the same fallacy in countless books, articles, peer-reviewed papers and physics classes around the globe at this very moment. They do it even in the face of irrefutable arguments that show that motion in spacetime is logically impossible. Spacetime is frozen from the infinite past to the infinite future by definition.

Of course, when this is pointed out to them, the usual response is either outright denial or a mountain of obfuscation. When push comes to shove they will insist that physicists mean something different when they speak of motion in spacetime. Never mind that motion has always been defined as a change in position in a coordinate system. This definition of motion has not changed in millennia.

### Simple Proof that Nothing Can Move in Spacetime

Why is motion in spacetime impossible? It has to do with the definitions of space and time and the equation of velocity v = dx/dt. What the equation is saying is that, if an object moves over any distance d x, there is an elapsed time d t. Since time is defined in physics as a parameter for denoting change (evolution), the equation for velocity along the time axis must be given as v = dt/dt which is self-reference comes from having to divide dt by itself. dt/dt always equals 1 because the units cancel out. This is of course meaningless as far as velocity is concerned.

To emphasize, it is logically impossible for the t coordinate of an object to change because such a change is self-referential. Et voilà! It is that simple. No time travel, no motion in spacetime, no spacetime and no time dimension. They are all abstract mathematical constructs without any counterpart in nature.

[You may skip this part if you want to. It does not add to the proof against motion in spacetime. I just use a little math notation for those who are so inclined.]

The above explanation can be rephrased using simple 4-D spacetime manifold math. If the world-line (a path in spacetime) of a moving particle is parameterized thus:

(t,x(t),y(t),z(t))

we can obtain the "4-velocity" of the particle:

(1,dx/dt,dy/dt,dz/dt)

The t-axis or time-axis velocity component is 1, a dimensionless number. Now there are relativists who will insist that it is perfectly acceptable to express velocity in time with a dimensionless number but the rest of us with our head on our shoulders, know that it is not true. We know that a dimensionless number such as 1 has absolutely no meaning in as far as expressing velocity or any sort of change. Velocity must be given in units of velocity such as meters per second or whatever standard units are being used. For this reason, there is no motion in spacetime.

[I receive emails from people who insist that there is nothing wrong with saying that motion in time occurs at the rate of 1 second per second. First of all, dt/dt does not equal 1 second per second. The units cancel out. Second, dt/dt is always the same (1) regardless of the actual rate of velocity.]

Note that I put 4-velocity in quotes above. This is because it is not a velocity at all since nothing can move in spacetime. There is only 3-velocity in 3-D space: (dx/dt,dy/dt,dz/dt), t being a mere evolution parameter. True 4-velocity (dw/dt,dx/dt,dy/dt) would require a 4-D manifold having 4 spatial dimensions and no time dimension. Now that is an interesting idea, four spatial dimensions, an idea I certainly would not object to. But time travel? Absolutely not!

One of the amazing things about this time travel business is that a position in spacetime is usually represented by (ct,x,y,z). What this means, is that every second a body moves exactly 299792458 meters, or a light-second in the fourth dimension. (This tool is convenient in explaining what is called a particle's light cone because it allows the sides of the light cone to slope at 45 degrees.) However, note that, using this convention, the fourth dimension is no longer a temporal dimension but a spatial one. Why? because ct resolves to meters, not seconds. Does this means that time travel is suddenly allowed? Of course not since c is a constant and t is not a variable. It is just that most relativists cannot bring themselves to the point of accepting a fourth spatial dimension. They are forever stuck with spacetime for historical reasons.

There is an unyielding mental barrier that I am still in the process of identifying. I wonder if it is just intellectual inertia or a vestige of the historical origin of relativity, kind of like the way an atom is not really an atom in the literal sense of the word. Somehow, I don't think so. By acknowledging the unchanging nature of spacetime, many relativists would have to admit that they have been teaching crackpot science (the teaching of geometry as an explanation of gravity) from the beginning. That is unacceptable, of course. Still, it is no excuse to conjure up all sorts of voodoo nonsense and retard progress in our understanding of gravity for close to a century.

Note: the representation of a position in spacetime is conventionally given by (ict, x, y, z) where i is the square root of -1, an imaginary number (the crackpottery never ends). However, this is a mere detail, one which does not take away from the changeless nature of spacetime.

#### Meta-time

Here is another way of looking at it. According to the definition of motion, to move from one position to another takes a certain time interval. Time is an evolution parameter that is used in physics to denote change, regardless of the type or rate of change. Therefore, to change position in time would require a meta-time, i.e., a second time dimension orthogonal to the first. This meta-time would itself require a meta-meta-time and so forth. Before we have time (pun intended) to realize it, we find ourselves mired in an infinite regress dilemma.

### A Time Dimension Forbids Motion or the Case of the Missing Time Dimension

What I am about to say may sound amazing but do not take my word for it. Figure it out on your own, for your own satisfaction. The moment one postulates the physical existence of a time dimension (as in string theory, for example), motion immediately becomes an impossibility. Note that, in this context, dimension is defined as a degree of freedom such as an axis in a coordinate system. And it is not a matter of motion in time being possible in one direction only as most people assume. A time dimension forbids motion altogether, forward or backward, or any other direction. Conclusion: There is no time dimension along which we move in one direction or the other. There is only the ever changing present. The so-called "arrow of time" is an absurdity and to speak of the possibility of time travel through wormholes is the ultimate in crackpottery.

#### Passage of Time?

People often talk about the passage of time. They say that time flows or changes. However, logically speaking, it is a fallacy that time changes. Clocks change, physical processes change but time is invariant. Why? Because, again, 'changing time' is self-referential. The truth is that nobody has ever observed time changing. We only use the changes in our clocks to derive unchanging time intervals. The nasty and shocking little truth is that time does not change, a million wormhole and time travel fanatics wearing their little Klingon and Ferengi outfits notwithstanding.

The above may come as a shocking revelation to many but it is a logical fact, one that makes a lot of celebrated time travel and wormhole physicists look rather silly.

## Should We Stop Using Time?

Of course not. As long as time is seen for what it is, an abstract evolution (change) parameter, there is no problem. The whole thing is analogous to the unemployment rate. No one is arguing for its physical existence but it is nevertheless useful. The same goes for time. Just as the unemployment rate is derived abstractly from the number of employed and unemployed people, time is also derived abstractly

from the magnitude or rate of motion or change. The greater the magnitude of the motion or the change, the shorter the time. It is only when one decides to make time an independent variable or a dimensional axis (degree of freedom), that one moves into crackpot territory.

#### Is Relativity Wrong?

Does the impossibility of motion in spacetime invalidate Einstein's relativity? The answer depends on whether one takes spacetime to be physically existent (as relativists do) or as an abstract, non-existent, mathematical construct for the historical mapping of measured events. If one chooses the former, one is obviously a crackpot or a fraud, or both. If one chooses the latter, then general relativity is to be seen as a mere math trick: the physical mechanism of gravity is still out there and it is incumbent upon physicists to find it.

#### **Not Against Relativity**

I get angry emails from people accusing me of badmouthing relativity, one of the most corroborated theories of physics. I am not. In my opinion, the special and general theories of relativity are mathematically correct and make correct predictions. What is wrong are all the obviously false claims made on the basis of their correctness. Relativity does not allow motion in spacetime or time travel, as Dr. Wheeler, Sir Stephen Hawking, Dr. Kip Thorne and the others claim. It forbids motion in spacetime! It is important that people see relativity for what it is, a mathematical trick for the prediction of macroscopic phenomena involving the motion of bodies in a spatial coordinate system. Spacetime is an abstract mathematical construct, that is all. The other stuff (motion in spacetime, time travel, advanced and retarded waves, wormholes, etc...), is pure hogwash. This stuff is so trivially proven wrong in fact, that it is insulting to the lay public, the same public that funds most scientific projects. Even the relativity-derived notion of time dilation is hopelessly misleading. Time does not dilate (as if time could change!). On the contrary, it is the clocks that slow down (for whatever reason) resulting in longer measured intervals.

#### What About Gravity?

What about gravity, you say? Well, spacetime physicists understand doodley-squat about the true physical mechanism of gravity. It is dishonest and counterproductive for relativists to teach young people that, unlike Newton, they know what gravity is. All they have is a mathematical description of it and a hopelessly misleading and misinterpreted one at that. By now the reader should realize that there is no such thing as spacetime and that gravity does not have anything to do with the curvature of a physical spacetime. There is something else out there that causes bodies to fall, without a doubt, something physical, something material. Over the last century or so, relativists have steadfastly and sometimes deviously rejected any suggestion that space is not empty and that there is a need to invoke some sort of material substance or aether to explain phenomena like gravity. Given that spacetime is a fictitious math construct, it is obvious that it cannot possibly account for gravity. However, acknowledging one's ignorance is the first step toward acquiring knowledge. So all is not lost. Back to the drawing board!

#### Fourth Dimension?

There are very good reasons to suppose that there is a fourth dimension in which matter is moving at c in one direction. This fourth dimension, if it exists, is certainly not time since a temporal dimension is illogical as I have shown above. It would have to be a spatial dimension. I will have more to say about this in a future addition to the site.

### One Sentence Proofs

The following are one sentence proofs that motion in spacetime is impossible.

## One Sentence Proof #1

Moving in spacetime is impossible because it requires motion in time and motion in time is self-referential.

#### One Sentence Proof #2

Moving in spacetime is impossible because an evolution parameter (time) cannot be its own evolution parameter.

# What Exactly Is Time?

### Lip Service

Theoretical physicists pride themselves in that their science is firmly based on empirical evidence but pay only lip service to empiricism when it suits their agenda. In an <a href="mailto:essay">essay</a> titled "Objective Knowledge", Karl Popper wrote "... this is a field from which the observer was exorcised, slowly but steadily, by Einstein himself." The observation of change is not empirical evidence for a time axis. It is evidence for, well, change.

## Time is the Abstract Inverse of Change

Since a time axis does not exist, there is only one way to look at time. It is an abstract parameter derived from change. When we use a clock, we may fool ourselves into thinking that we are measuring something physical that we call time, but what we are doing is detecting change. The accepted convention is that the greater the magnitude of the change, the shorter the time interval. Thus time is the abstract inverse of change. This inverse proportionality is the reason that "t' is the denominator in the formula for velocity. However, some prefer

to call time 'change' and that is fine with me. As such, it can be used as an evolution parameter with which to compare the magnitude of the change occurring in one process to the calibrated change of another.

#### No Arrow of Time

Dr. Joe Rosen, the retired former physics chair of the University of Central Arkansas said it best:

What has been has indeed objectively been and is no more. What will be, objectively is not and has not been (and, in fact, is not even fully determined, according to quantum indeterminacy). All physical systems ride the universal wave of becoming. Any awareness (ours or that of other intelligences) of past and future reflects the objective wave of becoming. There is no problem of "the arrow of time." There simply is no arrow of time, as if time could go one "way" rather than another. That metaphor is an unfortunate result of spatializing time. The picture of time as a line along which one might travel in one direction or the other is a conceptual disaster. Time is becoming. Becoming is change. The undoing of a change is also a change. There is no "unbecoming.

From "Time, c, and nonlocality: A glimpse beneath the surface?" Physics Essays, vol. 7, pp. 335-340, 1994

Contrast the above with the claim by Dr. Thorne et al that one can travel in spacetime. Note also that, if one accepts the existence of an unchanging spacetime and frozen world-lines (as so many relativists do), there is no arrow of time either. An arrow is only meaningful if there is change or motion.

#### The NOW

One of my many enraged detractors tried to ridicule me by mentioning that "the great physicist George Carlin once said, "There's no present. There's only the immediate future and the recent past." Of course, it was his way of mocking my ideas since George Carlin is the well-known American standup comedian. Little did my "critic" realize, however, that Mr. Carlin is light years closer to the truth on time than some of the most "brilliant" minds of the physics community.

As in everything else in nature, there is a yin-yang principle that underlies all including the present (I personally prefer to call it the NOW). What Mr. Carlin should have said is that there is only the NOW and that it consists of the immediate *past* and the immediate *future*. The latter is continually unfolding into the former. A particle undergoing change has an immediate *past* state that will no longer be and an immediate *future* state that is about to become immediate past. In an unchanging particle, its immediate *past* and *future* states are equal.

I italicize past and future here because they do not have the normal meaning of past and future. The immediate past and future of a particle are discrete, coexisting states of the dyadic properties of the particle. At any given moment, based on a universal conservation principle, nature must decide whether or not to change those properties.

### Why Do People Believe in an Arrow of Time?

Here is what one or my readers (19 year-old Preston Sumner) wrote in this regard:

I think the reason so many latch onto an "arrow of time" is because of the human mind. We store memories and information in our brains, and so we have a "past" that exists in our heads. All our lives we have this mental function and never question it, and because of this, it's easy to envision that the past is actually "alive" and a co-existing plane of existence of some sort. The concepts of past and future become so engrained in our worldviews that we can't separate ourselves from it. Sci-fi also aids in this.

I often marvel that young people can have so much more insight into the nature of things than some of society's most celebrated and admired scientists and thinkers. Is it because the young have not yet been completely indoctrinated into the Borg-like hive mentality that is so prevalent in society. A mind is terrible thing to assimilate.

### Isn't it Amazing?

Isn't it amazing that Dr. Kip "Wormhole" Thorne and his time travel colleagues at Caltech and elsewhere can claim that the mathematics of general relativity does not forbid time travel even though it does exactly that?

Is it not also amazing that physicist <u>Julian Barbour</u> felt it necessary to write an entire book to demonstrate "The End of Time" when it can be shown in a single sentence? Why should it take an entire book to convince the old school that there is no time dimension? It is not as if one is trying to deprogram a cult. Or is it?

Isn't it strange that Dr. Thorne, Dr. Wheeler, Dr. Deutsch, Sir Stephen and company were not aware that nothing can move in spacetime? Being the celebrated mathematicians that they are, one would suppose it would be their business to know and understand something so trivial that it can be explained to high school kids. After all, it is not as if there is not a single physicist in the world who knows about this. I know of many who do. Could not just one of them write a line to Dr. Thorne or Sir Stephen and alert them of their error? How did they get their time travel papers past peer review? How did they get so darn famous? Did I hear someone say fraud? Or is it just plain incompetence and crackpottery?

And isn't it interesting that Sir Stephen was present at a recent symposium at the famous Caltech Institute in Pasadena, California, honoring the scientific achievements of Dr. Thorne? Birds of a feather? You bet!

#### A Crackpot Is a Crackpot

#### Crackpottery in High Places is the Most Dangerous form of Crackpottery

Readers should feel free to suggest more names to include in my list of notorious time travel crackpots. Please use the email address at the bottom of the page. This is important because the correctness of humanity's fundamental understanding of nature is crucial to further progress. Crackpottery in high places is the most dangerous form of crackpotteryl. It condemns generations of young people to believe in lies and, as a result, scientific progress suffers. In fact, this whole motion in spacetime nonsense has already cost humanity close to a century of wasted time and wasted minds. In my opinion, we would have figured out the exact causal mechanism of gravity by now if our young people had not been falsely taught that Albert Einstein had already figured it out close to a century ago.

#### Do Not Be Afraid

If you decide to enter a name for the crackpot list, do not be afraid of legal repercussions or your standing in the scientific community. When all this stuff comes out in the open--and it will, you will congratulate yourself on your bravery. Consider also that a crackpot is a crackpot regardless of how famous he or she is, or his/her reputation in the scientific community, or even how many lawyers he or she can muster. Some of the people on the list are obvious frauds, in my opinion.

And by the way, should some in the physics community choose to take offense, they are welcome to chip in to form a legal fund that they can use to sue the heck out of everybody in order to preserve the good names of their favorite gurus. Fire away.

#### **Email Me If You Care**

Having said that, I know that there are many physicists and other thinkers out there who understand and have known for quite some time that nothing can move in spacetime and that, as a result, there is no such thing as time travel or a time axis along which we move in one direction. Should some of you have enough courage to stand up to this crackpottery and want to have your names associated with this effort, do not hesitate to drop me a line. I would gladly attach your name to a list I am preparing. My email address is at the bottom of the page.

#### If Your Name Is On the List

If your name is on my list of spacetime crackpots and you wish to write a rebuttal, or an admission that you were wrong, I will be glad to publish it on this site. Along with my comments, of course.

#### **Weird Science Links**

Did anybody say "crackpottery"?

**Time Travel** 

**Time Travel Research Center** 

Stephen Hawking's Universe

Michio Kaku

John Gribbin

Hans Moravec

Carl Sagan on Time Travel

### **Notorious Quotes**

[Here are a few transcripted excerpts from Nova Online. My comments are bracketed .]

**KIP THORNE**: If you have a wormhole, then you can turn them into time machines for going backward in time. We thought, how could we have been so stupid? We should have realized that. That's obvious.

[From Mr. Wormhole himself.]

**CARL SAGAN**: As a youngster who was fascinated by the possibility of time travel in science fiction, to be in any way involved in, in the possible actualization of time travel is, it just brings goose bumps.

[Here Dr. Sagan is acting like a wild-eyed "Trekkie". I feel sorry for the man.]

**STEPHEN HAWKING**: A physicist working on the possibility of travel into the past has to be careful not to be labeled a crank, or accused of wasting public money on science-fiction fantasy.

[Note that Sir Stephen is implying that it is alright for a physicist to talk about time travel into the future. The man truly believes in a time dimension and an arrow of time. It never occurs to him that time travel is time travel regardless of the direction of travel. This is a common misunderstanding among relativists.]

KIP THORNE: If I now go into this wormhole mouth today, I will come out of that mouth yesterday.

[Amazing, isn't it?]

**JOHN WHEELER**: I like to think of space and time as analogous to the ocean, and changes in it as analogous to waves on the surface of the ocean, but those waves, of course, don't show up when one's miles above the ocean. It looks flat. Then as one gets down closer to the surface one sees the waves breaking and the foam. I see no way to escape the conclusion that similar foam-like structure is developing in space and time.

[Dr. Wheeler is obviously completely unaware that spacetime is changeless. And he is one of the world's foremost experts in relativity, having written and co-authored many of the college textbooks on general relativity. One wonders, what else has he gotten wrong?]

**KIP THORNE**: My concern was the word time machine in the title and my worry was that the popular press would see this paper and would start to ballyhoo it in a manner that caused our serious scientific colleagues to pay no attention to it as being crackpot stuff.

[And crackpot stuff is exactly what it is. Luckily for Dr. Thorne, the popular press gets its marching orders from the physics community.]

STEPHEN HAWKING: Time travel might be possible, but if that is the case why haven't we been overrun by tourists from the future?

[Here Sir Stephen is a skeptic regarding time travel to the past although, he subsequently changed his mind and now believes that time travel is possible. Still he believes in time travel toward the future and that makes him a time travel crackpot.]

**JOHN WHEELER**: I do not see a way to make time travel possible. However, if I heard that somebody else, some other country was doing this, I think I might plunge into the game.

[Dr. John A. Wheeler (I assume it's the same Wheeler) is one of the authors of the famous Wheeler-Feynman Absorber theory in which they postulate the existence of waves traveling in spacetime. In both directions!]

**DAVID DEUTSCH**: I myself believe that there will one day be time travel because when we find that something isn't forbidden by the over-arching laws of physics we usually eventually find a technological way of doing it.

[Dr. Deutsch boldly puts his foot in his mouth. But that is to be expected. Time travel pales in comparison to his magical quantum computers spread over multiple universes. Dr. Deutsch gives new meaning to the term "voodoo physics."]

[I left one of my favorite quotes for last. This one is from Sir Stephen's own site:]

STEPHEN HAWKING: Since we can't change the way the universe began, the question of whether time travel is possible, is one of whether we can subsequently make space-time so warped, that one can go back to the past. I think this is an important subject for research, but one has to be careful not to be labeled a crank. If one made a research grant application to work on time travel, it would be dismissed immediately. No government agency could afford to be seen to be spending public money, on anything as way out as time travel. Instead, one has to use technical terms, like closed time like curves, which are code for time travel. Although this lecture is partly about time travel, I felt I had to give it the scientifically more respectable title, Space and Time warps. Yet, it is a very serious question. Since General Relativity can permit time travel, does it allow it in our universe? And if not, why not.

[It's a beauty, isn't it? Aside from the blatant contradiction with the fact that General Relativity does not permit time travel, we are now presented with a rather arrogant notion: it is no longer a question of whether or not nature allows the existence of a certain imagined phenomenon but whether a man-made theory allows the phenomenon to exist in "our universe." The questions that come to my mind are: "is this science or is this a cult run by charlatans? Have physicists managed to be so untouchable or so immune to public scrutiny that they feel free to act as gods in the presence of us mere mortals?"]

#### **Reality Check**

The above hocus pocus notwithstanding, it remains a truism that nothing can move in spacetime, forward, backward or in any direction. As simple as that. No spacetime, no geodesics, no world-lines, no time dimension, no arrow of time, no aliens from the future or the past showing up at your doorsteps, no hanky panky with your great great-grandmother. And no voodoo wormholes either. There is only the present.

### They Owe the World an Apology

### What It All Means

What does "nothing can move in spacetime" really mean? What are the consequences of a motionless spacetime for the future of physics? Well, as I explained earlier, if one assumes the physical existence of a time axis, then the universe is motionless. Since we know empirically that this is not true, it follows that there is no time dimension. If there is no time dimension, there is no time travel either. And if there is no time travel then all the individuals listed above are either crackpots or frauds or both. In other words, they either do not have a clue or they are lying to the world and getting away with it. I think it is probably both.

The other consequence is that spacetime curvature is, of course, not the explanation of gravity. There are real physical things and processes that cause things to fall. I think that we fail to notice them with our minds' eye because one or more of our most cherished and taken-for-granted assumptions is false. When the real physical cause of gravity is finally explained to us, it will prove to be so trivially obvious and inevitable, we will kick ourselves in the rear for having been so blind for so long.

### Invasion of the Mind Snatchers

There is a cult led by a small but influential cadre of physicists and mathematicians whose credo is "physics is math" and who think they are free to create physics simply by manipulating spacetime equations using abstract what-if scenarios. Of course, this is an absurd way of doing physics because these people do not have the slightest clue as to the actual physical processes and mechanisms that give rise to the phenomenon we abstractly refer to as spacetime. We cannot extrapolate the existence of highly curved spacetime regions like black holes and wormholes unless we know exactly what causes our abstract spacetime to curve in the first place. The embarrassing truth is that, centuries after Newton and Galileo, we still have no idea what causes gravity, a million relativists insisting otherwise notwithstanding.

Contrary to what physicists suppose, math does not explain physical phenomena. It is our math equations that cry desperately for a physical explanation, for an ontological grounding. Physics should be about particles, their properties and their interactions. Everything else is either abstract or voodoo. So things like wormholes, black holes and time warps are pure crackpottery, glorified mathematical toys (I think of them as math hacks) invented by grownup nerds for the sole purpose of impressing their peers and amazing a mystified lay public.

## The World Deserves an Apology

The gentlemen on my crackpot list, especially Dr. Thorne, Dr. Wheeler and Sir Stephen Hawking owe the world an apology. All physics

teachers in the world who have taught our young students that there is a time dimension or that bodies move in spacetime or that relativity permits time travel should apologize to their students. Thanks to this ongoing brainwashing (intentional or not, it makes no difference in the long run), countless numbers of young aspiring physicists are left chasing after a red herring called spacetime. This sort of crackpottery coming from admired leaders is costing and has cost humanity decades if not centuries of wasted minds and wasted effort. There is no excuse for it.

### Karl Popper on Einstein's Block Universe

In his groundbreaking work "Conjectures and Refutations", science philosopher Sir Karl Popper wrote that scientific theories must be falsifiable, i.e., a clear method must be provided which makes it possible to falsify or test the predictions of the theory. One of the predictions of spacetime is that the universe is 100% deterministic and unchanging, a prediction reminiscent of the ideas of Parmenides. The following is an excerpt from Conjectures in which Sir Karl appears to be speaking of the mythical and unfalsifiable aspect of Einstein's spacetime:

At the same time I realized that such myths may be developed, and become testable; that historically speaking all — or very nearly all — scientific theories originate from myths, and that a myth may contain important anticipations of scientific theories. Examples are Empedocles' theory of evolution by trial and error, or Parmenides' myth of the unchanging block universe in which nothing ever happens and which, if we add another dimension, becomes Einstein's block universe (in which, too, nothing ever happens, since everything is, four-dimensionally speaking, determined and laid down from the beginning). I thus felt that if a theory is found to be non-scientific, or "metaphysical" (as we might say), it is not thereby found to be unimportant, or insignificant, or "meaningless," or "nonsensical." But it cannot claim to be backed by empirical evidence in the scientific sense — although it may easily be, in some genetic sense, the "result of observation."

Note that Popper is not advocating that relativity is meaningless. However, from my perspective, relativity, if taken at face value, fails the falsifiability criterion in an important area: even though it requires an unchanging universe, we, in fact, observe change in nature.

At first, I thought that Popper was pointing out a problem in spacetime. What threw me is that he recognizes that Einstein's block universe is changeless and 100% deterministic. However, he does not seem to realize that this would falsify the theory if spacetime is assumed to be an accurate representation or model of the universe. Why? Because we do observe change. This would be possible only if one assumes that one could move from one 3-D slice to the next in 4-D spacetime. Yet we know this is impossible because spacetime is changeless. If one claims the existence of a time dimension, one must be ready to face falsification. Thus spacetime is a myth, i.e., an abstract mathematical construct that does not model anything in reality. A more logical alternative would be an abstract 4-space in which we are all moving at c in the fourth dimension. I say "abstract 4-space" because I have excellent reasons not to believe in the existence of space at all. See my ideas on space for further details.

Personally I choose to view the spacetime of relativity not as a model of the universe (Einstein's clearly falsified position), but as a mere math trick, in the tradition of Ptolemaic epicycles.

### Why Einstein Misunderstood His Own Theory

Here is the reason that Einstein had a poor understanding of his own theory:

As mentioned earlier, in 1949, Einstein's friend, Kurt Gödel, announced to the world that the spacetime of general relativity allows time travel via closed time-like loops. Einstein agreed with Gödel's finding but he was not very happy about it. He could not fathom how his grand theory would allow something as ridiculous as time travel. This gives some credence to accusations by Einstein's critics that he was not the true author of general relativity and that he was a mediocre plagiarizer at best. Some say that Einstein's first wife, Mileva Maric Einstein, was the real author of relativity and that Einstein was forced to give her his entire Nobel prize money to keep her quiet. Just hearsay but one never knows.

The problem with Gödel's claim is that nothing can move in spacetime, i.e., no time travel, no particles moving along their geodesics in curved spacetime. Heck, no motion at all! In other words, spacetime is a fictitious construct that does not model anything in reality. It is to be seen as a mere graph, an abstract historical collection of 3-D spaces. But why did Einstein act as if he was unaware of this? The fact that nothing can move in spacetime was mentioned (see <a href="Popper">Popper</a> above) by several prominent thinkers during Einstein's lifetime. In fact, Gödel himself <a href="Concluded">Concluded</a> that, if time travel were possible, then one could no longer talk of a passing time. In other words, if the past exists, time stands still and spacetime is unchanging. Of course, this is a roundabout and contradictory way of showing something that can be proven in a single sentence, but this is to be expected of someone like Gödel. Why is Gödel's method contradictory? Because if time is unchanging (which it is), any talk of time travel to the past via time-like loops puts one squarely into crackpot territory. Gödel apparently failed to grasp the obvious inconsistency.

The Gödel-Einstein-time-travel connection is rather telling. It is as if Einstein was already publicly committed to his geometrical stance as the cause of gravity and could no longer retrace his steps less he loses some of his credibility. But then again, it could be that he did not understand the implications of an unchanging spacetime and that, as such, it refuted, not only Gödel's crackpot time travel claim, but also the geometrical interpretation of gravity. At any rate, Einstein's unchanging block universe made him twentieth century's Parmenides but, somehow, that did not prevent him from agreeing with Gödel. Damned if he did, damned if he didn't.

Now, years after the fact, a whole new generation of notorious and uninformed crackpots in high places have jumped in lunatic Gödel's time travel bandwagon. Examples are Kip "wormhole" Thorne, Stephen "black hole" Hawking, Brian "superstring" Greene, Michio Kaku (Mucho Kuckoo), David "multiple universe" Deutsch, etc... It is enough to make a grown man cry.

### A Call to Arms

### What Is So Wrong With Time Travel Speculations?

Time travel is a symptom of a deeper malady. It is part of a chronic malformation of our collective scientific understanding of the fundamental underpinnings of nature. It is the end result of an incestuous intellectual orgy that has been going on for over a century. It is also the culmination of a scientific coup d'état that took place in the early part of the twentieth century. A group of revolutionaries, fresh from the resounding empirical victories of Einstein's theory of relativity, established themselves as the sole interpreters and oracles of the new science. They fended off all public scrutiny by encircling themselves within an unassailable wall of scientific jargon and mathematical formalism. Any criticism of their world view is met with the usual sneering retort that relativity is one of the most corroborated theories in the history of physics. Dissenting views are given little exposure.

### Stop Acting Like Drones

The whole time dimension and time travel nonsense that is being fed to us by the aforementioned individuals (and their followers all over

the world) is part of a world view that has clouded and is clouding our thinking. Having an erroneous understanding of such fundamental concepts as motion and time is like having a monkey wrench in the works. Generations of bright young researchers have wasted valuable time chasing after wild geese when they should have been looking for real causal explanations of gravity and motion. And if they got time wrong, one is left to wonder how many other things they got just as wrong or worse. We need to discard our primitive and sterile notions of space and time and embrace a new clear-headed physical science, a science worthy of the twenty-first century. We need to break away from the hive and stop acting like mindless drones.

#### **Entrenched Orthodoxy**

Can we expect the spacetime physics orthodoxy to just accept that its understanding of time is flawed? Does anybody really believe that Dr. Kip Thorne, Sir Stephen Hawking, Dr. John A. Wheeler and the others are suddenly going to announce to the world that they were wrong about time? Do not hold your breath. You can catch a science fiction writer in an error and that is no big deal. But a scientist is betting his or her career. Still, should humanity suffer through hundreds of years of ignorance just because a few careers are at stake? The current scientific belief in the existence of a time dimension has been around for over a hundred years. Even though many people realized from its inception that spacetime was motionless, it has not stopped generations of physicists from believing in a time dimension on a par with the other three spatial dimensions. It is now a religious institution and its practitioners are entrenched more than ever. They will not accept defeat easily. It is a matter of prestige, authority, credibility and the fear of being displaced. They will fight teeth and nails all the way to the end.

#### This Is War!

In my considered opinion, no progress will be made in our understanding of motion, gravity and inertia by having civilized and polite discussions with an entrenched orthodoxy whose sole amusement is showing off how adept they are at manipulating math equations. There is no conspiracy, mind you, just a vested interest in continuing the status quo. Also a significant portion of physicists who believe in the existence of a time dimension do so religiously. They have a faith to uphold and a religion to protect. The only way to destroy their faith and abolish their religion is by forceful conquest and the imposition of a new religion. It is all about religion. That is the lesson of history, so let us not kid ourselves.

It is one thing to peddle snake oil to a sleeping public, it is another to imply that the public is too stupid to realize that it is being duped. Given the increased means of communication available, the public will suddenly wake up. People are not as stupid as the insufferably pempous physics community would have them believe. Soon they will no longer accept absurd dogma from an elitist group solely on the basis of authority. We, the people, are the authority on what will be done with our money. We will not stand by and allow a science funded with our money commandeered by a bunch of charlatans and crackpots, regardless of how secure they may feel.

The goal of the coming physics revolution is to eradicate all the nonsensical dogma of the spacetime orthodoxy. No stone must be left unturned. We need a new physics based exclusively on particles, their properties and their interactions. We need a physics that ask why instead of how. We need a physics that looks at phenomena from the point of view of the particles and not that of the observer. To succeed, the rebels must form a hostile political stronghold outside the walls and hope that they can gain enough converts from the the lay public (the despised peasantry) and enough defections from the enemy camp to eventually breach through. Once they are in, they must pillage and destroy the old order through terror. The leaders of the fortified castle must be put in chains, tarred and feathered and paraded through the streets for all to see (allegorically of course). This is war!

### Trouble In Paradise

Unless we (humanity) revolutionize our physical sciences, we are doomed because our teeming masses are fast exhausting the natural resources of our world. This in turn leads to all sorts of unpleasantness such as ecological disasters, diseases, societal friction and devastating wars. We need room to expand. We are certainly not going to colonize the solar system with our primitive chemical propulsion systems (or cockamamic contraptions like solar sails) let alone the star systems beyond. Even if we could move at the speed of light, mass migration to other stars is out of the question. And we do not have much time to find a solution. The ecological and societal clocks are ticking. We cannot wait another one or two hundred years for the spacetime physics establishment to realize its errors. We need a plan of action and we need it now!

### The Plan

Well, there is no plan yet. This is anticlimactic I know, but I am working on it. I have given this entire physics thing a lot of thought, time and motion being the tip of the iceberg. My ideas are unorthodox but I think we need unorthodox ideas. I have the vague notion in my mind of forming some sort of non-profit, think-tank, internet organization. I need unconventional thinkers, writers, disenchanted physicists, computer programmers and nature philosophers who are fed up with the dictatorship of the orthodoxy. In sum, I need rebels with axes to grind. Write to me and let me know what you can do. We need to pool our resources but, first of all, we need to spread the word and about the crackpottery of time travel and the famous spacetime physicists who ceaselessly preach their false religion to young people. Note: If you thought I was talking about going to war to literally tar and feather physicists, please do not bother writing.

"First they tell you you're wrong and they can prove it; then they tell you you're right but it isn't important; then they tell you it's important but they knew it all along."

Charles Kettering, former head of General Motors

"My ideas about time all developed from the realization that if nothing were to change we could not say that times passes. Change is primary, time, if it exists at all, is something we deduce from it."

Julian Barbour, JB-Ideas

"The conclusion of this lecture is that rapid space-travel, or travel back in time, can't be ruled out, according to our present understanding. They would cause great logical problems, so let's hope there's a Chronology Protection Law, to prevent people going back, and killing our parents. But science fiction fans need not lose heart. There's hope in string theory."

Stephen Hawking, Space and Time Warps Cont...

"According to Einstein's doctrine the world is a finite four dimensional sphere full with force-lines. No motion is possible in it since time is one of its geometrical dimensions, and there is no external time."

From Dr. Uri Fidelman, Methodologia

"There is no dynamics within space-time itself: nothing ever moves therein; nothing happens; nothing changes. [...] In particular, one does not think of particles as "moving through" space-time, or as "following along" their world-lines. Rather, particles are just "in" space-time, once and for all, and the world-line represents, all at once the complete life history of the particle."

From "Relativity from A to B" by Dr. Robert Geroch, U. of Chicago

"Defective theories must never be allowed to persist."

From "Nightfall" by Isaac Asimov & Robert Silverberg

"And how often does it not happen that the proud and conceited judgment of an expert is put in its proper place by a layman! Numerous inventors built 'impossible' machines. Lawyers show again and again that an expert does not know what he is talking about. Scientists, especially physicians, frequently come to different results so that it is up to the relatives of the sick person (or the inhabitants of a certain area) to decide by vote about the procedure to be adopted. How often is science improved, and turned into new directions by non-scientific influences! it is up to us, it is up to the citizens of a free society to either accept the chauvinism of science without contradiction or to overcome it by the counterforce of public action. Public action was used against science by the Communists in China in the fifties, and it was again used, under very different circumstances, by some opponents of evolution in California in the seventies. Let us follow their example and let us free society from the strangling hold of an ideologically petrified science just as our ancestors freed us from the strangling hold of the One True Religion!"

From "Against Method" by Paul Feyerabend

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# **Physicists Who Know That Nothing Can Move in Spacetime**



Mark Stuckey
Joe Rosen
Mark William Hopkins
FriedWardt Winterberg
Matej Pavsic
Andrew G. Williams
Chris Hillman
John Baez
Julian Barbour

The amazing thing about the impossibility of motion in spacetime is not that it is true. The amazing thing is that it is a well known fact by many in the physics community. After a quick search on <a href="Google.com">Google.com</a>, I was able to compile the following list of quotes from practicing relativists and other physicists who know that nothing can move in spacetime. The list also contains a few names of real physicists I've had the pleasure of corresponding with over the years. I'll add to this page from time to time as more names come to my attention. Click on the links to go to the page from which I obtained the quotes. My comments are bracketed in blue.

### **Mark Stuckey**

#### Elizabethtown College, Pennsylvania

[I first found out that nothing moves in spacetime from a message posted by Professor <u>Stuckey</u> on the astronomy discussion board on AOL back in the early 90s. His post took the resident relativist there at the time completely by surprise, a sight to behold. If I remember correctly, the resident relativity expert (I can't remember his name) immediately began to argue against it and did not shut up until he demanded that Professor Stuckey provides his credentials which he did. It was fun to watch.]

### Joe Rosen

[Professor Joe Rosen] is the retired former chair of the physics department at the University of Central Arkansas. Dr. Stuckey was the first to introduce me to Dr. Rosen's work. Dr. Rosen not only rejects the existence of a time dimension in which we are moving in one direction or the other, he also rejects the existence of space. He calls it *nonspatiality* and *nontemporality*. I completely agree with Dr. Rosen's views on these issues although we arrived at similar conclusions on space and time via different routes. Anyone interested in the nature of time should read his papers and essays. I especially recommend his "Time, c, and nonlocality: A glimpse beneath the surface?" Physics Essays, vol. 7. ]

### **Mark William Hopkins**

### "Nothing moves in spacetime."

[I must caution the reader about Mr. Hopkins. Although he, like Dr. John Baez, professes to believe that nothing can move in spacetime, they nevertheless continue to believe in the existence of a time dimension along which exist infinitely many "nows" (Baez). Hopkins believes he exists in his entire world-line, i.e., an extremely long (time-wise) Mr. Hopkins. Some time dimension crackpots would rather deny the existence of a now than the existence of a time dimension even though there is not a single empirical evidence for the existence of such a dimension. All the while they fail to provide any explanation for how it is that we are moving along our world-lines, given that nothing can move in spacetime. It's like talking through both sides of one's mouth.]

### FriedWardt Winterberg

[Professor. Winterberg, a former student of Heisenberg, is a professor of physics at the State University of Nevada. He is widely known for his work in plasma physics and nuclear fusion. In 1979 he was the recipient of the Herrmann Oberth Gold Medal and in 1981 he received a citation from the Nevada legislature. Professor Winterberg recently wrote to me in support of my efforts.]

### **Matej Pavsic**

"Of course, according to the special and general relativity as formulated in textbooks, nothing moves in spacetime."

[Dr. Pavsic of the famous <u>Jozef Stefan Institute</u> in Slovenia once mailed me copies of his published papers (around 1997 I believe) after reading my arguments on the sci.physics usenet newsgroups (for which I was thoroughly flamed) regarding the impossibility of motion in spacetime and the necessity for four spatial dimensions rather three. I doubt that Dr. Pavsic reads usenet anymore. He also sent me a list of references (I'm looking for it) to the published papers of advanced relativistic quantum physicists who know that time is a mere parameter for expressing change. It is a pity this simple truth is not taught in most physics schools and colleges.]

#### **Robert Geroch**

"There is no dynamics within space-time itself: nothing ever moves therein; nothing happens; nothing changes."

[Dr. Robert Geroch is a professor of physics at the University of Chicago. He also taught at the Enrico Fermi Institute. The above excerpt was taken from General Relativity from A to B, (page 20)]

#### **Andrew G Williams**

"You should know that, by definition, nothing moves in spacetime."

#### **Chris Hillman**

"Are you aware that nothing physical "moves" in spacetime?"

"Another is that if you transport a vector in a loop in spacetime (this is not a physical motion, since nothing physical ever moves in spacetime"

"In Newtonian physics, we can speak of small objects moving in "space" over "time". In spacetime, however, nothing physical "moves" at all! Rather, we represent the entire history of motion of each small object by a curve in spacetime, called the "world line".

[Chris Hillman is a mathematician. He (she?), too, knows that nothing can move in spacetime as seen in the quotes above. However, being a friend of John Baez (see below) and a staunch defender of spacetime physics he'll argue that there is nothing wrong with time travel. He agrees with Hawking and Thorne that a closed time-like curve means that relativity does not forbid time travel. Go figure! Try to explain to Hillman that, if nothing can move in spacetime, there cannot be such as thing as time travel and you'll quickly discover how prone to self-delusion a religious person can be.]

#### John Baez

[Dr. Baez knows that nothing moves in spacetime (how could he not know?) but, if cornered, he'll beat around the bush and mumble something about the definition of motion. Rather than discard the time axis, Dr. Baez believes that there are an infinite number of *nows*. Of course, he fails to explain how one moves from one "now" to the next one so as to perceive motion. He'd be hard pressed to do so since nothing can move in spacetime. But Baez is full of contradictions. While he claims that spacetime is a changeless collection of *nows*, he nevertheless continues to talk about motion in spacetime, witness this excerpt from his own site:]

"So when you combine electrodynamics with general relativity, the geometry of spacetime doesn't just affect the motion of light through spacetime - it's also affected by the motion of light through spacetime! More generally, the curvature of spacetime affects the motion of matter, while matter curves spacetime."

[This begs a couple of questions. How can something that is changeless affect anything and 2) How can something that is changeless be affected by anything? I've always found it hard to understand how someone can live with such blatant contradictions and still fool others into believing he has a clue. Note that Dr. Baez dreams of unifying General Relativity with Quantum Mechanics. We should all wish him a lot of luck because he's going to need it.]

### Julian Barbour

"My ideas about time all developed from the realization that if nothing were to change we could not say that times passes. Change is primary, time, if it exists at all, is something we deduce from it."

[Dr. Barbour not only knows that time is but an evolution parameter derived from change, he denies the existence of a time dimension in which we are moving in one direction or another. I recommend Dr. Barbour's book "The End of Time" to anyone interested in these issues. In my opinion, Dr. Barbour does not go far enough. I hope the title of his next book is "The End of Space and Time."

Also check out his his other book "Absolute or Relative Motion" and A Talk With Julian Barbour.]

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## **Devil's Advocates**



Time Dilation
Arbitrary Evolution Parameter
Proper Time
One Second per Second
Delta Is Change
Why Now?

I receive emails daily from many people, scientists and laymen. About half of them are sympathetic. The others take strong issue with my views on spacetime and time travel. Most of my critics seem to be recent physics graduates and undergraduates, although a small percentage are physics teachers and retired physicists. About a third of my detractors are righteously offended: "How dare you call professional physicists *crackpots*?" They then go on to call me worse names.

The others fall into two main groups. The first group is adamant that motion in spacetime is possible. The second group readily accepts that nothing can move in spacetime but is nevertheless convinced that a changeless spacetime does not preclude the possibility of time travel. Note that the existence of at least two mutually contradicting factions within the physics community does not add to its overall credibility in this matter, especially when the matter in question has to do with something as crucial as the nature of motion and time!

What follows are some of the more common objections and my rebuttals. I will add to this page from time to time as I receive more criticisms in the mail. Please read the main page first.

### **Time Dilation**

### **Devil's Objection**

Time travel exists because we have undeniable empirical evidence that clocks run slower under the influence of gravity and during motion at high speeds.

### Rebuttal

This argument is a favorite of misguided relativists, Nobel prize winners among them. I agree that processes run slower under gravity. I just disagree with the interpretation. Relativists claim that clocks run slower because time dilates. This is like saying that unemployment is up because the unemployment rate is up. Sometimes I find myself wondering whether the field of relativity physics has been taken over by charlatans masquerading as scientists. Time does not dilate for the simple reason that time, by definition, cannot change. The slowing of clocks is more likely due to energy conservation principles that come into play when a huge number of particles are interacting locally.

But let's put that aside for a moment and assume that a clock or some other body has a time coordinate that can change in a certain direction. Let's take the extreme view of a clock that is moving at the speed of light with respect to us. According to relativity, the clock completely stops. The question that immediately comes to mind is this: if the clock had traveled in time relative to us, why is the clock still visible? If it had really slowed in some time dimension that we all share, it would simply disappear from view.

Time dilation is an unfortunate misnomer, in my opinion, because it gives the impression of an independent time variable (an oxymoron) that causes things or processes to slow down. Again, clocks run slower, not because time dilates, but because their internal processes slow down due to energy conservation principles. "Time dilation" = process slowdown. There is no causal link between the two. They are equivalent.

The problem is with the use of the expression "time dilation". If the framers of relativity had understood that time is unchanging and abstract, they would have never used it. Time is neither relative nor can it change. One can indeed talk of a fundamental yet abstract time interval, one which is fixed and absolute. Since it is abstract, this fundamental interval must be derived from a fundamental length and speed. But that is a subject for a future article.

### **Arbitrary Evolution Parameter**

### **Devil's Objection**

We don't have to use time to describe motion. We can parameterize motion in spacetime as a function of an arbitrary variable and this should get rid of the annoying dt/dt = 1. For example we can use the variable P to express 4-velocity in spacetime thus:

(dt/dP, dx/dP, dy/dP, dz/dP)

### Rebuttal

This is a common misconception. It is prevalent mostly among mathematicians who are prone to equate math with physics. It may be "ok" in calculus to use any arbitrary variable to parameterize "change", but not in physics. Note that I put "ok" and "change" in quotes because I think it's a bad practice that leads to all sorts of misunderstandings. Math is a unitless system. For example, the coordinates of a point are just numbers. Nothing in the system identifies its physical relevance. The axes could represent anything from temperature to distance to loudness. Asserting that one coordinate is a function of another does not express change or motion. It assumes the a priori existence of change and describes how the evolution (another word for change) of one coordinate is related to or dependent upon the evolution of another.

One of the lessons one learns in physics is the importance of units of measurements. Time is measured in seconds and distance is measured in meters for a reason. The reason has to do with their identity or meaning. It is also important to note that, in physics, motion is not defined as a function of an independent variable called time. On the contrary, it is time that is a dependent function of motion/change. Motion/change is observed and a time interval is abstractly derived. Time itself is never observed; it is abstract. The derivation of time from motion is precisely given: the faster the change, the smaller the interval. It is for this reason that time is the denominator in the equation of velocity. The derived interval can be calibrated and serve as a parameter with which to compare the rate of change of one phenomenon to that of another.

There is only one valid evolution parameter in physics: time. Time is a dependent parameter and is expressed in seconds so as to distinguish it from other variables. If a parameter is not measured in seconds, it is not parameterizing any sort of change or motion. The definition of change/motion is a very rigorous one and must not be tampered with so as to fit crackpot ideas like time travel

#### **Proper Time**

### **Devil's Objection**

The time-like coordinate of spacetime is parameterized by the proper time (tau). Therefore one can speak of an evolution in spacetime and of time travel in at least one direction.

#### Rebuttal

First of all, my site is directed at the lay public (who pays for scientific research and expects to get good science for its money). The only time that is relevant to the lay public is historical time (i.e., tau or proper time in physics terminology). In the context of time travel this is the only time that matters. tau is an invariant evolution parameter that is used in physics as a calculational tool with which to describe a rate of motion or change. Since tau is invariant, any talk of time travel is crackpottery.

Second, coordinate time (the so-called time-like coordinate) is a highly misleading misnomer, a twentieth century legacy of misguided relativists (fortunately for us, not all of them are). The fourth dimension is not a temporal dimension. It should be measured in meters, not seconds. In fact the 4-position of a particle in "spacetime" is given as (ct, x, y, z). As anyone can see, ct is measured in meters just like x, y and z. This means that a change in position in the fourth dimension is a spatial evolution, one which has absolutely nothing to do with time travel.

Third, it is a fallacy that proper time, as given in the equation  $d(tau)^2 = dt^2 - dx^2 - dy^2 - dz^2$ , means that t can vary anymore than it means that tau can vary. Both tau and t are used to obtain invariant temporal intervals. Certainly, one clock can change slower or faster relative to another clock but, as I said elsewhere, changing clocks are not evidence of a time dimension. They are only evidence that clocks change. The ct example makes it clear that, for every one second interval, an object travels exactly 299792458 meters in the fourth dimension. It does not mean that the object travels 1 second in a temporal dimension.

Fourth, there is indeed an evolution at c in the fourth dimension (from which we get the light cone) but, like all evolutions, it is a spatial evolution. Moving in any direction in the fourth dimension of 4-space (not spacetime) does not constitute time travel. If one could move in the opposite direction, one would not be traveling backward in time to the past as the pundits would have it. One certainly would not find one's great grandmother going about her business.

In conclusion, to speak of time-like paths is sheer crackpottery.

### One Second per Second

### **Devil's Objection**

There is nothing wrong with dt/dt = 1. All it means is that time is changing at the rate of 1 second per second. Therefore we are traveling toward the future.

### Rebuttal

This is, by far, the most common argument for time travel. It comes from laymen and physicists alike. In my opinion, it is the easiest one of all to demolish, and yet, some people never seem to get it. Others understand it immediately and still others have to think about it for a long time before they do.

First of all, dt/dt does not mean 1 second per second. The units cancel out. This fact alone destroys the argument and there really is no need to go further. However, I feel it is important to emphasize the following fact regardless of how shocking or implausible it may be to some:

There is no such thing as the passage of time!

The commonly held notion that time changes is as fallacious as it is detrimental to our understanding of motion. Why? Because "time changes" is a self-referential statement. It is hopelessly illogical! We never observe time changing. We observe changes in physical processes from which we derive *static* time intervals. We then use these static intervals to quantify the rate of change of various other processes.

### **Delta is Change**

### **Devil's Objection**

Someone objected to my use of the nonsensical dt/dt to express motion in time. The rationale given is that a change in time is already expressed in the use of dt (delta t). Likewise motion in space is implied by dx. The term 'delta' is said to be a synonym for change.

#### Rebuttal

I think it is important for the reader to understand the difference between the word *change* as used (by some) in calculus and *change* as it is used in physics. A change in calculus is the difference between two numbers. dx, for example, is the vector *difference* between two positions. dx simply represents distance. Likewise dt is the difference between two measured times, i. e., an interval.

A change in physics is something else altogether. It is an event or phenomenon that is conventionally expressed with the use of the evolution parameter t (time). Examples of change in physics are motion (a change in position) and acceleration (a change in velocity). The decay of a subatomic particle is also a change.

Whenever there is motion (a change in position) there is also velocity. In physics we express the rate of motion with the expression dx/dt, not just dx. dx by itself does not represent a change in position but is a static measure of length or distance. Likewise, dt is not a change in time but a static measure of some interval. To emphasize, it is the combination dx/dt that describes a change of position in physics, not dx by itself or dt by itself.

#### Why Now?

### **Devil's Objection**

Why is it that something that seems so simple and straight forward as the impossibility of motion in spacetime should take so long to become known? Why am I finding out about it on your site? Why did I not learn about it in school from my physics teacher or in a physics text book? And if it is so simple, why is it that brilliant physicists like Stephen Hawking and Kip Thorne have not figured it out?

#### Rebuttal

In my opinion, a lot of it has to do with peer review and the political climate within the physics community. No physics author can get published unless he or she is approved by their peers. Authors therefore try to write papers that agree with the prevalent views of the more famous physicists. Political correctness is alive and well in science just as everywhere else. Relativists have claimed for close to a century that they know the cause of gravity and that it has to do with the metrics of curved spacetime. Thus anybody who argues that there are no such things as spacetime or a time dimension in nature, will either be branded as a crackpot or given little exposure. And if famous physicists like Thorne, Wheeler and Hawking say that time travel is possible in principle, who is brave or powerful enough to contradict them?

And those who do not like to see the state meddling in scientific matters should remember the sizeable chauvinism of science: for most scientists the slogan 'freedom for science' means the freedom to indoctrinate not only those who have joined them, but the rest of society as well.

As I mention <u>elsewhere</u> on this site, I first learned that nothing can move in spacetime from a relativity professor who teaches at Elizabethtown college in Pennsylvania. There are a lot of <u>relativists</u> who know and understand that spacetime is an abstract math construct with no counterpart in nature. They know that nothing can move in spacetime. Self preservation, however, is sometimes more important than truth. Publicly disagreeing with heavy hitters like Hawking, Wheeler and Thorne is not a good way to advance one's career. Some, like <u>Dr. John Baez</u>, may think it is more prudent to advance absurd notions such as the existence of an infinite number of *nows* than to reject the concept of a time axis altogether. I suspect also that one reason has to do with people wanting to protect the reputation and dignity of their profession. It's almost like a religion to them: we are right and the others are wrong and that is that.

As to why famous physicists like <u>Stephen Hawking</u> or <u>Kip Thorne</u> have not figured out that time travel is pure crackpottery or something as simple as the impossibility of a time dimension, I have no idea. I guess somebody will have to ask them the question and see what they have say. I encourage my readers to write to them and ask them if they so desire. You can find their email addresses on their respective sites.

I would not be surprised to hear, despite all that they have written on the subject, that they suddenly claim that they have suspected or have known these things from the beginning. My bet is that they will insist that they have been misunderstood and/or that I am a crackpot who should not be taken seriously. Do not underestimate the capacity of human nature for deception and cowardice. This is the reason that I say to my readers, please do not take my word for any of this stuff. Figure it out for yourselves.

In conclusion I find this quote from <u>Paul Feyerabend</u>, one of last century's most famous philosophers of science, to be quite inspiring:

"And a more detailed analysis of successful moves in the game of science ('successful' from the point of view of the scientists themselves) shows indeed that there is a wide range of freedom that demands a multiplicity of ideas and permits the application of democratic procedures (ballot-discussion-vote) but that is actually closed by power politics and propaganda. This is where the fairy-tale of a special method assumes its decisive function. It conceals the freedom of decision which creative scientists and the general public have even inside the most rigid and the most advanced parts of science by a recitation of 'objective' criteria and it thus protects the big-shots (Nobel Prize winners; heads of laboratories, of organizations such as the AMA, of special schools; 'educators'; etc.) from the masses (laymen; experts in non-scientific fields; experts in other fields of science): only those citizens count who were subjected to the pressures of scientific institutions (they have undergone a long process of education), who succumbed to these pressures (they have passed their examinations), and who are now firmly convinced of the truth of the fairy-tale. This is how scientists have deceived themselves and everyone else about their business, but without any real disadvantage: they have more money, more authority, more sex appeal than they deserve, and the most stupid procedures and the most laughable results in their domain are surrounded with an aura of excellence. It is time to cut them down in size, and to give them a more modest position in society."

From Against Method by Paul Feyerabend

A candid look at Stephen Hawking can be found here: The Hawking of Stephen Hawking.

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# **More Nasty Little Truths About Physics**



Nasty Little Truth About Exclusive Relativity

Nasty Little Truth About Space

Nasty Little Truth About Size

Nasty Little Truth About Motion

Nasty Little Truth About Matter

One is left to wonder, if so many celebrated physicists can be so <u>wrong</u> about their understanding of time and motion, what else have they gotten wrong? This is the page where I comment on more nasty little truths about physics. Over the coming weeks or months I will add new items, time permitting.

### **Nasty Little Truth About Exclusive Relativity**

#### The Crackpottery

We have all been taught that there is no such thing as absolute motion or position or that every motion and position in the universe is relative. This unsubstantiated belief, which I have named *exclusive relativity*, has been around for centuries, even before the advent of Albert Einstein and the theory of relativity. It was not until early in the twentieth century, however, that exclusive relativity became in vogue. Nowadays most physicists consider the concept of absolute motion to be no more credible than the flat earth.

## Simple Proof #1 That Exclusive Relativity Is Bogus

If all positions are relative, then we have a self-referential system in which every position is ultimately relative to itself. For example, suppose we have a two-body universe. Body A's position is relative to body B's position and vice versa. Since both positions are relative to the other and there are no other bodies, each body's position is ultimately relative to itself. Of course, it does not matter whether there are only two bodies or a billion. Since every position is relative to every other position, the system is self-referential.

Exclusive relativity amounts to saying things like, "you are as tall as you are" or "this sound is as loud as itself" or "pick yourself up by your own bootstraps." Of course this is silly but this is the sort of silliness we have to believe in if we accept exclusive relativity.

### Simple Proof #2 That Exclusive Relativity Is Bogus

Suppose there is a force acting on a particle so as to accelerate it. The particle has as many relative velocities as there are possible frames of reference, an infinite number in fact. Which of the myriads of relative velocities does the force change? How does the accelerating agent know about them so as to change them all? Answer, it does not. Only one velocity is changed by the force because it has no access to the others. The others are abstract, i.e., non-physical.

### Simple Proof #3 That Exclusive Relativity Is Bogus

Let's consider the motion of a particle. How does a particle "know" about its motion or rest relative to extrinsic frames of references so as to move or be at rest relative to them? Are particles psychic? I think not. No particle in the universe can make use of the relative because it has no access to it. It follows that the universe does not use the relative. The only properties that it can use are absolute ones.

### The Nasty Little Truth

The nasty little truth turns out to be the exact opposite of what we have been taught to believe. The only type of motion or position in the universe is absolute. The relative is abstract and dependent on the absolute. Exclusive relativity is part of what I have been calling *chicken feather voodoo physics*, because if we subscribe to it, we have to believe that things happen as if by magic.

#### The Relativist's Objection

Exclusive relativists will immediately retort that if it cannot be measured or observed, it does not exist. Never mind for now that physics is bloated with concepts and models (time dimension, spacetime, curled up dimensions, etc...) that are impossible to test empirically.

First of all, it is a misconception that we measure the relative directly. We perceive only absolute sensations (such as photons impinging on the light detectors in the retina) and we interpret them as meaning that object A is moving relative to body B. Sure, it's a logical and sensible interpretation but it is an indirect one nonetheless. It must be inferred.

Second, a truth that can be deduced logically is just as valid as a truth that can be experienced first hand. Is it not more beneficial to know the fundamental truth of absolute motion than it is to bury one's head in the sand and act as if it does not exist? Which is better, ignorance or knowledge? And who knows what new insight may come out of it?

### **Absolute Space?**

Does this mean that one should believe in an absolute space à la Newton? Absolutely not. In the physical universe there exist only particles, their properties and their interactions. Since all properties are intrinsic to particles, they are therefore absolute (independent) by virtue of being intrinsic. I'll have more to say about this when I discuss the next nasty little truth about physics. Besides, the absolute does not need a reference frame to be relative to. That is the definition of the relative. Absolute means independent.

### **Nasty Little Truth About Space**

#### The Crackpottery

We've already seen that spacetime cannot possibly be a model of reality. But what of space? Is there such a thing as a space in which we exist and move? Is space a collection of positions or points? Does matter occupy space? Ever since Newton legitimized the idea of space most physicists have believed in some sort of physical space existing separately from matter. To Newton, space was absolute. Einstein's revolution did not do away with the idea of an independent physical space but transformed it into the concept of spacetime.

### The Nasty Little Truth

Physical space is given as a collection of positions. The idea is that, in order for any physical entity or property to exist, it must exist at a specific position in space. But if a position is a physical entity that exists, it too, must exist at a specific position. In other words, if space exists, where is it? As with time, one can posit a meta-space but this quickly turns into an infinite regress. The nasty little truth is that there is no such thing as space.

#### Abstract Space

The concept of a space existing separately from matter has not been without its detractors. Sir Isaac's nemesis, none other than the great German mathematician and philosopher Gottfried Leibniz, rejected the concept of space, absolute or otherwise. Leibniz wrote that "space is nothing else but an order of the existence of things, observed as existing together; and *therefore* the fiction of a material universe, moving forward in an empty space cannot be admitted." Leibniz believed that the position of an object is not the property of an extrinsic space but an intrinsic property of the object. These properties, taken together, form an abstract order that he called space. I fully agree with Leibniz on this issue.

#### **Everything Is Absolute**

The most immediate consequence of nonspatiality is that all physical properties in the universe are absolute. The relative is abstract (in our minds) and is dependent on the absolute. The reason is that, since there is no space, all properties are intrinsic to (belong to) individual particles. They are absolute by virtue of being intrinsic. We've been told that absolute motion and position do not exist and that only the relative exists. The truth is that the relative is abstract and only the absolute exists.

### Paradoxes That Never Were

All of the nasty problems and paradoxes associated with the existence of space disappear in one fell swoop. We no longer have to ponder the notion of an impossibly infinite space or whether or not it has an edge. Of course if space was finite, the impossible question would be, what's on the other side? None of these things are of any importance any longer because space is a mere illusion that arises from the properties and interactions of particles. It does not exist. Particles do not move from one location in space to another. Motion is just a type of change, a change in the intrinsic positional property of a particle.

### Quantum Nonlocality and Nonspatiality

In the early eighties physicist Alain Aspect and colleagues performed an experiment that confirmed the so-called Bell's Inequality Principle. Without going into the details of the experiment, I'll just say that it proved a major prediction of quantum theory, one that Einstein objected to in a famous paper describing a thought experiment that became known as the EPR (Einstein, Podolsky, Rosen) paradox. Two entangled photons can be millions of miles apart and yet, if the polarity of one photon flips, the other will flip simultaneously. To a lot of classical physicists such as Einstein, the existence of nonlocal phenomena would mean that the two photons are communicating at superluminal speeds which is a no-no. Einstein called it "spooky action at a distance." Many have refused to accept the completeness and even the correctness of QM for this reason. But the superluminal objection is flawed in my opinion, because it assumes the physical existence of space.

As soon as one realizes that there is no space then it is easy to see that there is no superluminal or any sort of communication

taking place between the entangled photons. Particles do not exist in space, they just exist. There is no spooky action at a distance because there is no distance between particles. This is not the same as saying that the distance is zero; distance simply does not exist: it is **abstract**. More precisely, it is the abstract vector difference between two positional properties. The entangled polarities are facets of the same coin. In other words, nonlocality is equivalent to nonspatiality. Nature is able to apply its principles of conservation "everywhere" because the universe is one. Not one in the sense of a single point or location (there is no location) but one in the sense of yin-yang complementarity.

#### **Exciting Consequence of Nonspatiality**

By far the most exciting consequence of nonspatiality is that it should be possible for a particle to move almost instantly from one position to any other without going through the intervening positions. Normally a particle moves by making a quantum jump, i.e., its intrinsic positional property changes from one discrete value to another. This fundamental abstract distance is on the order of the Planck Length (about 10^-35 meters \*), a very minute distance. However, there is no reason to suppose that the positional property of a particle cannot change by amounts larger than the fundamental value. Note that this is not the same as moving faster than light. Superluminal motion only means that a quantum jump happens at a speed faster than c. This is not the case with *long distance jumps* because the particle does not travel through the distance between departure and destination positions.

We are already seeing evidence of nonspatiality and instant long distance travel in the phenomenon known as <u>quantum</u> <u>tunneling</u>. In certain circumstances, particles are observed going through barriers in ways that defy classical physics.

Interestingly, they seem to do so at speeds greater than the speed of light. Of course, according to this author's hypothesis, there is really no faster-than-light movement taking place because the particles never travel through the intervening positions.

What's even more exciting about this is that it opens up the future possibility of visiting other star systems and even other galaxies hundreds of light years away without having to go into stasis during the voyage. Closer to home, long distance jump technologies would revolutionize our way of life by eliminating conventional modes of transportation. Imagine waking up in New York City and having breakfast in Paris or Rome and lunch in Rio de Janeiro! What kind of world would we have?

This form of travel, which should be called *quantum transportation*, is not to be confused with teleportation. The latter, popularized by the Star-Trek television series, consists of deconstructing individual atoms and reconstructing them at a different location. In quantum transportation, by contrast, the actual body is physically moved from one position to another, almost instantly, regardless of distance jumped.

#### Is Nonspatiality Too Wild?

I have received several emails from people who agree with most of my arguments against a temporal dimension but consider my ideas on nonspatiality to be as wild and as far fetched as wormholes and time travel. Let me point out that I argue against time travel and the like, not because they look or sound far fetched, but because they are illogical. I find the existence of space just as illogical as the existence of a time dimension.

### **Nasty Little Truth About Size**

### The Crackpottery

Most people assume that all particles must have size. Their rationale is that if something could reduce to zero size, it would cease to exist. This is a fallacious reasoning because few people stop to consider that size introduces an infinite regress problem as seen below.

## The Nasty Little Truth

If a particle has size, what is it composed of? And if the components have size, what are they composed of? and so on, ad infinitum. The infinite regress forces us to accept the counter-intuitive notion that particles have no size and that size is a macroscopic illusion that arises from the way groups of particles interact. If we stop to think about it, is there a law in nature that requires entities to have a size in order to exist? Such a law would be illogical because it introduces the infinite regress problem as seen above. Note that this argument could just as easily be used to prove the non-existence of space.

### **Nasty Little Truth About Motion**

### The Crackpottery

Newton's first law states that a body at rest will remain at rest and a body in motion will continue in motion with constant speed in a straight line, as long as no unbalanced force acts on it. Most people assume that Newton's first law means that motion is acausal, that is to say, that bodies stay in motion for no reason at all. They are quick to dismiss Aristotle's conjecture that a body cannot move unless it is caused to move by something else. This assumption is so taken for granted and so universal among physicists and the lay public that it is not even debated. In fact it is mentioned as one of the great insights of Newtonian physics over Aristotelian logic. But is it true? Should we accept without question that particles move for no reason at all, as if by magic? After all, a change in position is an effect in need of a cause just as much as any other effect. If a particle at rest is caused to move in a certain direction, what keeps it moving in the same direction after the initial force is taken away? Can a particle move itself? Can an effect be its own cause? Of course not.

## The Nasty Little Truth or Aristotle Redux

It is important to think of motion as a series of quantum jumps whereby the position of a particle continually changes from one discrete value to another. If the particle is set in motion from a rest position, it must make the first jump. Suppose the cause of the initial jump is immediately removed. What causes the particle to take the next jump and the ones after that? My rationale is that every jump is an effect and every effect must have a cause. This is required by the law of causality, the most corroborated law in the history of science.

Obviously a moving particle must have some property or a set of intrinsic properties that represents or is associated with, not only the direction of its motion, but also its magnitude. However, these properties are passive properties, i.e., they merely indicate the velocity/momentum attributes of the particle. By themselves they cannot cause the particle to jump from one position to the next. The nasty little truth is that something else is needed for that. That something else is an interaction with another particle. In a future article, I will explain what an interaction is. For now, suffice it to say that an interaction is an imbalance, i.e., a violation of a conservation principle which must be corrected.

#### **Enormous Consequences**

The consequences of causal motion are enormous for the future of physics. Since nothing can change without being caused to change, the motion of any particle can only be sustained by a series of discrete interactions. The interactions cause the particle to jump from one discrete position to an "adjacent" position. It follows that all matter must be moving in an immense sea of wall-to-wall particles! One day soon, we will learn how to navigate and manipulate this sea of energy but first, we must deduce its composition, the properties of its constituents and the manner in which they interact with normal matter.

### **Nasty Little Truth About Matter**

#### The Crackpottery

We are all accustomed to believe that everything is made of something. We are taught that matter consists of molecules and that molecules are made of atoms which are themselves made of even smaller components. This line of reasoning makes sense initially but, as seen below, it cannot be sustained.

### The Nasty Little Truth

As with <u>size</u> and <u>space</u>, the notion that matter is made of something quickly leads to an infinite regress. If something is made of other things, what are the other things made of? And so on, ad infinitum. We are left with no choice other than to accept the nasty little truth that matter is made of nothing. But how can this be? How can something be made of nothing? What is the logic?

### The Yin-Yang Universe

The best way to understand the logic behind an ex-nihilo universe is to use an analogy. Just as zero is the sum of all positive and negative numbers, *nothing* is the sum of everything positive and negative. It sounds absurd but *nothing* is, in reality, everything. This means that all properties/things must come in complementary/opposite pairs so as to sum up to *nothing*. It follows that any imbalance (a non-zero sum) must be corrected so as to conserve *nothing*. Change/motion is thus nature's way of correcting a violation of the mother of all conservation principles, the conservation of *nothing*. This law is applied universally, i.e., non-locally. The universe is *one*, as its name implies.

### Consequences

There are many exciting and surprising consequences to a yin-yang universe, not the least of which is that the universe is discrete and nonlocal. As I will show in the next nasty little truth about physics (coming soon), a discrete universe is necessarily a probabilistic universe. Other surprising aspects of an ex-nihilo universe is that it is necessarily four-dimensional (no more and no less) and there is only one universal speed (nothing moves slower or faster!). More to come...

\* I have my doubts about the Planck length being truly fundamental because it was obtained, not from first principles, but through dimensional analysis.

Send all comments to Louis Savain

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# Humor



## My Dinner With André, the Lapdog Physicist

#### Scene 1. Act 1

[Loosely based on a true story]

## Lay-person:

You mean that it is possible to travel in time through a wormhole and visit my great-great-great grandmother? But that's preposterous!

### Lapdog physicist:

Well, you don't understand. When physicists say 'time travel', what they really mean is a closed time-like loop.

#### Lay-person:

You mean a closed time-like loop is not time travel?

## Lapdog physicist:

Well, you see, you need to understand the difference between the model and the world. The model is not the world.

### Lay-person:

Are you saying that when Kip Thorne talks about visiting his forebears in the past, he is only talking about the model and that the model does not have to reflect the world?

## Lapdog physicist:

No. What I am saying is that you have to spend a lifetime of study before you can understand this stuff.

### Lay-person:

So which is it? Do Kip Thorne, Stephen Hawking and John Wheeler claim that one can move in spacetime or not?

### Lapdog physicist:

Well, you see, when we say motion in spacetime, we mean something else. We mean that the world-line of the object is fixed in a spacetime diagram. The object is its entire world-line.

### Lay-person:

If it is fixed then how can one enter a wormhole today and come out yesterday?

## Lapdog physicist:

Well, that is the difference between the model and the world

### Lay-person

[clearly frustrated]:
If I put my foot in your ass, would that be considered motion in the model or in the real world?
Lapdog physicist:
This is not a meaningful question since we do not model asses. Come to think of it, that would be a worthy subject for an undergraduate thesis.
End Scene 1, Act 1

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