

# Time Travel and Wormholes

by Roland Michel Tremblay

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## **Time Travel, Wormhole and Vortex**

"A man gets sucked through a vortex into and during an event that happened some years ago. Is there an explanation of a vortex that could make this possible? A hole in time theoretically?"

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Yes, theoretically this is possible. There are many ways for this to be possible. Just grab the book Contact and read about it on the net. I suggest you grab a copy of the DVD, there might be information about the science that supports their wormhole (they really thought about it). As well, they always manage to do it in Star Trek, especially in the movies of the original series. But hey, you cannot really use that stuff, because you need to be original and talk about ideas that are totally new. That is hard to do, but I might be able to help.

I understand that this is only the mean for you to tell a story, and that the techno babble will only be for a few minutes of the script. Still, if you really wish to get the attention and present a great and plausible idea without getting too complicated, it can go a long way (instead of just presenting a wormhole without explaining how this is possible).

I am pretty certain that many people can tell you all about how wormholes are formed or could be formed. That is not very interesting, but here how it goes. The universe is like a sheet of rubber all distorted depending on the speed you are travelling at and the gravity surrounding you. It is not something linear or anything like what you are seeing when you look at the sky. It is all bumpy, and if a star is massive enough, gravity surrounding it is great, making a curvature in space, and eventually a hole if it is massive enough. Theoretically, a huge amount of energy could open a hole in space and bring you somewhere else in the universe instantly, because the universe is so weirdly shaped that if two places are really distorted the configuration of the universe could link those two places together. Now, if you could somehow control this with some future technology, you could open wormholes even if most likely you would be crushed. Poetical license, you do not get crushed on TV.

But you are not looking for that, you are looking for a vortex that will get you to travel through time. So read below.

## **Relativity and Time**

"In Einstein's theory of Relativity, does he talk about time not being linear so that an event in time can happen simultaneously with other events? IE - Living in the year 2000 and visit an event that has happened in 1900?"

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Einstein's theories are not helping science fiction too much these days. Fortunately there are a lot of problems with Einstein's theories and many people out there are coming up with great new ideas. Basically the universe is more like a lot of different bubbles in which time and space are different for each point of view or frame of reference. Time and space are relative means that if your dad is on Earth, time runs normally. If you go in a space ship around the sun (like in Star Trek), gravity and speed makes your time runs at a different rate. You could make your time run slower or faster than your dad who would have stayed on Earth. That is one way of going back in time and coming back.

Another way that I thought of, without even getting into my weird new theories, is that space and time are relative and changing depending on your speed and the gravity around. Since the Earth is always moving in space at different speeds and influenced by every stars and perhaps black holes you can see in the sky, our speed and the gravity are not constant, therefore explaining the Déjà Vu phenomena and possibly a lot of the ghosts story we hear these days (you would just be amazed by how many of those stories we hear here in England). Very often some old pubs/hotels are mixed with two generations sometimes 100 years apart. I explain this by the fact that if gravity was very high in a certain time, and not in another, and if we were speeding much more or much less depending on whatever in the galaxy is influencing our solar system, then theoretically two times can meet.

I heard many stories of people today seeing sometimes other people (ghosts) in their pubs, looking at them like if they were strangers, even though the people of today think that the ghosts were the strangers. I think these are events where two different times meet because of the relativity of Time and Space, of the spacetime continuum. Sometimes, even weirder, people were in the past for hours, and described things that existed only centuries ago. These things appear to be happening where the magnetic fields of the Earth are converging and sometimes cancel each other out (the magnetic poles). Also where there are cracks in the Earth, therefore changing the magnetic flows on the Earth, without forgetting the main power lines of electricity who could influence spacetime. Apparently you do not need a vortex. You only need a natural phenomenon, strange magnetic fields influencing space and time and a slight change in luminosity.

## **Quantum Physics**

Quantum physics is all about the weird way particles are acting. It has been proven that they can be at many places at the same time but I do not believe they truly understand what is happening. They see many times the same particles at different places because these particles, in my opinion, are moving faster than the speed of light. So when they do a measurement, that same particle moving at for example 10 times the speed of light, register as being at ten different places at the same time. The problem comes from the fact that they are using Einstein's equations to calculate this, and that is not reality. I believe that things are moving faster than the speed of light in the universe, and many experiences in the world at the moment are confirming this even though most of the scientific community just doesn't want to hear about it since they cannot explain it. See my ideas about this on my page [Universal Relativity](#). Star Trek would have been much different, no need for warp

speed, getting out of space (in subspace), creating a warp bubble and warping space in order to travel faster than the speed of light.

So, the likes of Stephen Hawking are saying that if a particle can be at many different places at the same time, then perhaps whole universes can exist at many different places at the same time. And if, according to Einstein, matter and energy are the same thing and interchangeable, then everything is energy and more energy can change the configuration of space and time. Even your brain could influence this since it is all electrical currents and energy, and pretty much everything is relative in this universe, relative to your point of view.

Energy = mass X the speed of light squared. I believe that the speed of light is not a limit. If you go into space in a rocket that goes at 20 times the speed of light, you certainly change your time rate a lot. And your mass does not become infinite, as it is thought in science today. Because mass is relative to the point of view, exactly like time and space are. In fact, pretty much everything is relative, including your speed and the speed of light. So if you are going at 20 km an hour, you are only going at that speed from your point of view. For someone not moving, your speed is less than 20 km an hour. For someone going very fast, his time will be much faster and his distance will be shrunk, therefore, when calculating your speed and time rate, it would be different than yours.

I hope I gave you food for thoughts. I have not explained here the basics on how this is possible because it is well explained in the first 20 pages of my theories at this URL:

[www.themarginal.com/relativity.htm](http://www.themarginal.com/relativity.htm)

Even better, I talk about the applications and possibilities in the résumé and explanation of my novel at this URL:

[www.themarginal.com/universe.htm](http://www.themarginal.com/universe.htm)

## **Creating a No Man's Land where the Laws of Physics are Weird**

If you are to create a whole television series on some identified sets, it helps to create a bubble where something critical happened affecting the laws of physics in that very area. In Star Trek they have it easy, the ship is going into space where no one has gone before, where anything weird can happen at any given time. Even better, they have all the labs and instruments to scan, identify and act on anything that needs attention. For the purpose of this report, everything is happening on Earth in an identified area surrounding a scientific lab. Without getting into any more details, I can say that we needed a huge explosion using strong magnetic fields in order to create our No Man's Land where the laws of physics went crazy for years to come. Of course this can be adapted to any other story in space or on Earth.

## A Machine and an Explosion

The lab experiment could have something to do with opening a hole in space using strong magnetic fields, you would then need some huge magnets rotating rapidly (like in Contact). But unlike in Contact, the strong magnetic fields created could have been disturbed by the natural magnetic fields of the Earth, causing the explosion. Since then the normal flow of the magnetic fields going from one pole to the other would have been mixed up altogether creating some sort of bubble in time in one specific area where two different times now meet.

The purpose of the experiment could have been to try to send a message to the future or the past to the humanity in order to prevent something terrible to come and that they knew about, or something that has happened thousands of years ago. Another civilization before us that would have died and left a great heritage unknown until now. And eventually people could be transported there and meet those other people, discovering a new world who knew more than us about science. Opening a lot of new avenues about the possibilities of science.

The experiment could also have been to develop a new transportation device to bring people to other galaxies. Perhaps some people could find themselves in the past at a time when the machine was not yet destroyed, and they could use the machine to go to another planet with a green sky and green oceans. These are only ideas.

## Vortex

From Encarta, the plain and simple definition:

<http://dictionary.msn.co.uk/find/entry.asp?search=vortex>

- 1. whirling mass:** a whirling mass of something, especially water or air, that draws everything near it towards its centre
- 2. something overwhelming:** a situation or feeling that seems to swamp or engulf everything else

[Mid-17th century. From Latin, a variant of *vertex* (see [vertex](#) ).]

So the Vortex would be the manifestation, the opening of the Wormhole, the whirling thing. And Vertex could be how the old civilization call the Vortex (they could use old Latin words to describe similar things than us).

## Wormhole

<http://dictionary.msn.co.uk/find/entry.asp?search=Wormhole>

- 1. hole made by worm:** a hole made by a burrowing worm, for example in wood (or an apple)

**2. hypothetical passage between parts of universe:** a hypothetical passage in space-time connecting widely separated parts of the universe

## **Negative Mass or Exotic Matter is needed for Wormholes**

Negative mass and exotic matter are theoretical concepts. In my mind, the negative is not exactly negative. It becomes negative (which is impossible according to science, but science foresaw its existence and they cannot explain it) only because they wish to stick to Einstein. Well, theoretically, I don't. The mass in the universe is also relative and changing from your point of view. And if the mass of an object becomes negative it is only a perception. It means that basically the object is to be seen at another scale, a scale that the limitation of the speed of light cannot really show us. Anything going faster than the speed of light cannot be seen by us, it then becomes Exotic Matter or of a Negative Mass, because it appears to exist even though we cannot see it. So the missing mass of the universe, or Dark Matter, is not really missing, it is there, we just don't see it. (These are my ideas from my own theories, no one else would tell you something like that. The Missing Mass is one of the Grail quests of physics.)

I don't really think you would be using these concepts too much to explain a vortex or a wormhole, but I remember reading in the Star Trek Technical book that they invented some sort of Exotic Matter to maintain their wormhole open (since this is impossible to justify in the actual science of today). I could go back and read more about this if there is a need, I know where to look, I have a whole library of books about science. You might want to buy "The Physics of Star Trek" and "Beyond Star Trek" by Lawrence M. Krauss. He explains how all the Star Trek science could become reality one day and if not, how Andre Bormanis solved the problems by inventing things. Andre Bormanis, the science expert of Star Trek, also wrote an interesting book about this: "Star Trek Science Logs".

On top of this, three more books should do the trick and get you up to speed with everything there is to know about science fact vs. science fiction: Stephen Hawking: "A Brief History of Time", Michio Kaku: "HyperSpace" and "The Elegant Universe" by Brian Greene. All these books are for the layman and are easily understandable even if you know nothing about science. None of these books bring you equations to justify anything (but obviously I have many more books that do that I could suggest).

Ok, as I mentioned about the negative mass, it is something you would need in order for a wormhole to be stable and stay open. The thing is, that exotic matter with a negative mass (that may have existed at the time of the Big Bang) is just as theoretical than the wormholes themselves. So, in my own theory of how the wormhole is possible, I don't get into this negative energy, because it is impossible to justify.

You would need it to keep it open, but you don't really need to talk about it (they don't on Star Trek Deep Space Nine or barely as the Aliens inside are how the wormhole exist and can be used). One way or the other, you cannot really say that the experiment created exotic matter of a negative mass, no one knows how such

things could be created, and it would be very difficult if not impossible to create as much as is needed for a big wormhole. That is why they were hoping to find it in a natural state in nature. But that has not happened yet. Please read at the end something I found on the Internet and that is clear about the subject. The section is called [Articles about Wormholes](#).

My idea is that times are co-existing. Now, some sort of wormhole (or Einstein-Rosen bridge, if you wish to use a synonym) could connect two times already co-existing. Even though I would prefer to talk about the amount of energy necessary to create one, instead of the negative mass. Also because negative mass of exotic matter is only one solution to create a wormhole, there are some others. So ultimately you could forget that hypothetical mass or exotic matter, but you would still need a huge amount of energy in any case.

As well, if two times are co-existing already, there is not really any need for this negative mass, because it is obvious that naturally we have reached a breakthrough in science that can connect different times without the use of those impossible wormholes (which, REMEMBER!!!, need to be created artificially in the first place!!!). 1) You need to maintain your wormhole artificially. 2) You need that hypothetical exotic matter. 3) You need a lot of it.

So I would use wormholes if you need them, because who knows, it could be possible that such a manifestation could permit shifting between two times when the two times are not exactly and completely co-existing together, but I would forget the actual theoretical way of explaining how these wormholes are possible. Because from my point view and according to my theories, they would be something different than the normal way of explaining what they are. My wormholes are not your usual Contact (Kip Thorne) wormhole. It is some sort of manifestation of the shift between two co-existing and different times. Now, you can show that the way you want, but you need to be careful about how you explain it. As I said before, they are not needed. And believe me, it is easier for you to explain everything without using Contact wormholes explanation.

## **Wormholes connecting two different points in space and time**

Spacetime can bend in order for two points in space and time to be linked together. In this case it is less a bending of the timeline than a problem in the balance of the gravity surrounding the Earth in two different times in history. As well the Speed at which the solar system is going at in those two particular times, and the magnetic fields of the Earth getting involved with the magnetic fields of the experiment. These are your means to tell the story you wish to portray.

This path to explain what you want can go really far and brings new ideas never thought of before that could explain scientifically ghosts, or at the very least 50% of the ghosts stories not involving actual dead people. Many ghosts stories I heard on a bunch of British TV series are about two different times being linked together in the same space. You will also be able to justify poltergeists.

And I have plenty more ideas that could be explored. Like communication between two worlds (the one of the past and the one of the present), transportation via shifts and will, discovery of other times than those two, understanding why those two particular times are linked together and therefore, by calculating the actual gravity and speed of the solar system, you could in theory link your time to another one and have your own time machine. Anti-gravity is another possibility, I will have to get back to you about how to proceed about this and how it could be incorporated in a story. As well, all the idea of modifying the timeline or affecting future events whilst in the past. Even more interesting, the déjà-vu.

## **Wormholes Facts vs. Science Facts**

Since using wormholes are not exactly proven science, your guess about how they work is as good as mine. You could use the same one to get back, or use another one. It does not have to be the same one, so the logic is OK.

In Sliders they are sliding between parallel universes and I don't believe it was clear how they did it. I remember the first episode, I did not get much out of it. Only Star Trek makes an effort to try to justify and explain how these things are done, which might explain their success. Movies generally will explain these things, though.

I understand also that the science stuff is less important for you. Ultimately you have your story in your head and you just want to make sure that it can be done and sort of explained in some lines. So, if I start with the assumption that you want a wormhole, the question is: how can this be done?

Since Contact, wormholes can exist. If you can produce more energy than we can today, like an enormous amount of energy, you can. That is why the knowledge of these aliens was essential, because we cannot do that today. The problem is that you would need to generate the wormhole artificially. I cannot really think how it could happen by itself, and grab the right people at a convenient time. In Sliders they have this "magical" and unexplained remote control doing just that. But then again, it has been done before.

If you wish to go along with a vortex and a wormhole, it would be more difficult to see it as a natural phenomenon and harder to justify using my explanation of the experiment. Playing around with natural phenomena like magnetic fields would not really create vortex and wormholes. In fact, nothing could create such things unless you do a leap of faith like in Contact: a lot and a lot of energy could open a hole, no more explanation necessary. Like in Contact, they say that we do not truly understand the alien technology, we can just guess. Don't forget that the wormholes, the corridors, had to be created and built by an even older civilization (it cannot be natural).

## **How to show the Shift between the two Times**

Wormholes are for linking two very distant points in time instantly. In Contact, a fraction of a second was 18 hours when Jodie Foster was back. And from what I read



in other scientific books, you could use them to travel through time. At the very least, if you keep the idea of wormholes, the best vortex I saw was in Star Trek the Next Generation, the episode where Beverley Crusher was stuck in a Warp Bubble and some manifestation was happening, like a vortex, in order to bring her out of the bubble. The episode is called "Remember Me" (number 79, Season 4). There is no wormhole, just a vortex (the opening) and it was like a window that she went through. Again, you cannot justify any of this in science. She was in a Warp Bubble! Warp is all hypothetical, and thought (thinking) was part of the equation which created that.

My previous answer about the experiment still stand. Though I would prefer a change in the atmosphere, electrical currents like thunders and winds to show the shifts in time instead of a wormhole. It would be more credible and perhaps more frightening. It would also look more natural, it could justify the magnetic fields going around, it goes well with invisibility (I will explain why later in this message). Also, it can happen at any time without anyone controlling it. All the surroundings are changed, the person is like in a different time without exactly going through anything like a window or a wormhole.

According to most of the ghosts stories, you do not need that, you don't need a wormhole or a window to go from one time to the other. Both times co-exist together in the same space and people from both times can see each others. Hey there is not even big electricity in the air. But you can make it more interesting for the TV. As I said, in the first movie of Highlander you see how I picture this every time a Highlander chop the head of an opponent, also in the first Terminator movie when Arnold is shipped naked into the past (our present).

## **Times co-existing vs. Parallel Universes with a Wormhole to link them**

Also a wormhole implies a parallel universe, travelling somewhere, no interaction between the two times without first going through the wormhole or the window. A slight change in the surroundings, the wondering about in which time you are, could be more interesting. But all this talk is just about the manifestation or the process used in order to shift through time, to go from today to the past. It is not the explanation about how this is possible. And the only solution I can myself come up with that makes sense in science and that is not pushed to the limits with just a minimum of justifications, is below and does not go that well with a wormhole. Different times co-exist already in the same space, no need for a wormhole to link them up.

## **Wormhole/Vortex could still be used**

But a wormhole/vortex could still be used, because ultimately, if you are to use a wormhole or a window without using my ideas below, nothing could really explain it. You would have to talk vaguely, say nothing interesting other than: Oh, that exists,

because they were working on a weird and unexplained experiment generating a lot of energy, and now look, there is a portal to another time. I think that if you are not taking my idea, this is how you will end up doing it. Do you want a portal to another time, or two times co-existing? You see the difference and the advantages of times co-existing, implying interacting together at many levels.

The bottom line on wormholes is that you need a huge amount of energy to construct one. You would need to manipulate energy billions of times larger than what we can generate today. Nice fact, it would be  $10^{19}$  billion electron volts.

## **Black Hole**

You should not mix black holes with wormholes. You would not necessarily speak about black holes if you have a story with wormholes in it. A black hole is a region in space that is really massive. We have micro-wormholes (that could be useful to send a signal) but we have no micro-black holes.

Black holes definition:

<http://dictionary.msn.co.uk/find/entry.asp?search=black+hole>

1. object in space: an object in space thought to contain a celestial object with such a strong gravitational pull that no matter or energy can escape from it. Black holes are believed to form when stars collapse in upon themselves. Also called collapsar
2. place where things get lost: a place or thing into which objects disappear and are not expected to be seen again (humorous)

## **Surviving in a Black Hole**

Now that is a subject that interests me. And I have just the craziest ideas about how you can survive in a Black Hole without getting crushed. It has something to do with relativity. Since space is relative and changing, then distance is relative and changing. Therefore, one meter here, could equal for the argument's sake 1 mm in a Black Hole. But this is only relative to your point of view, as Einstein says. Meaning, according to myself, that if you were in a Black Hole, you would be shrunk too from the point of view of Earth, but over there you would not be shrunk. It would be a normal universe like here. And, the weirdest thing, when you would look back at the Earth from inside the Black Hole, Relativity would play the same trick on you. The Earth would appear to be in a Black Hole, because from your point of view, your meter in the Black Hole would equal 1 mm on Earth.

Relativity plays tricks on you. A Black Hole could be an illusion, it could be an area where gravity is very strong and from our point of view light could not reach us. But it does not mean that light cannot come out of the Black Hole or that nothing can come out of it. It just means that at that scale, it would take forever to reach us. The scale at which things are existing inside a Black Hole are just beyond our PERCEPTION, because our perception is based on the speed at which light reaches us. That is a valid argument, and I am not the only one to think that. It could

somehow be exploited. Again, all my ideas about this are on my [Theoretical Physics](#) page.

## Déjà-Vu, Gravity and Missing Time

Unlike the Matrix, Déjà-Vu are not a glitch of the Matrix. It is due to the fluctuations of our speed and gravity exerted on us in the universe. Magnetic fields could provoke a lot of Déjà-Vu, symptoms of what is happening. And distortion in time more localized. Like the feeling that five hours have just passed but we don't know how or where it went, like in alien abductions. (All this are again my own ideas and I have not read that anywhere else. Why I can have so many ideas are because of my theories, I have reach a point where it has opened a floodgate that explains a lot of things).

The missed time is not due to the fact that you were unconscious while the aliens were dissecting you, but to the fact that if aliens are using anti-gravity devices, it does affect time and space around. Therefore time would go much faster for the poor person standing in the area. Even though your watch would appear to have stopped or gone faster, it is only when compared to a watch that was not around the affected area. Now, we don't need to bring the aliens in, we only need to bring a weird side effect of the experiment where time, space and gravity are all mixed up. The possibilities are infinite. God, I must be crazy giving you all these ideas, I feel like finishing my Sci-Fi novel tonight before going to work in the morning!

## Poltergeist

It might be weird to talk about poltergeist here. It was necessary for what we were working on at the time. The idea is basically how would someone trap between two different times or for example in a parallel universe could manifest himself in our reality.

Strong magnetic fields are the basis for Poltergeists and this is those fields that ghost busters are measuring with their instruments. It all goes well with my experiment idea and is fully credible.

### **Poltergeists**

<http://dictionary.msn.co.uk/find/entry.asp?search=poltergeists>

**noisy spirit:** a supposed supernatural spirit that reveals its presence by creating disturbances, for example by knocking over objects

[Mid-19th century. From German, literally 'noisy ghost'.]

The effect of a poltergeist can simply be the physical manifestation of someone in the other times, like if moving your hand in the past could bring chaos to the present

without it being your intention in the first place. It could only be one of the disappeared person or ghost trying to communicate with the present.

## Here is how you can travel in time

### The Experiment

**Purpose:** opening a hole in the fabric of space.

**Why:** in order to open a micro-wormhole to communicate anywhere almost instantly and through time, or in order to open a wormhole to travel anywhere almost instantly and through time.

**Why, simple version:** creating a time machine.

**How it works:** big magnets rotating very fast (could be any shape) with a little space in the middle to give a chance for a wormhole to appear (but it would be better if it was some magnetic fields turning around, like electricity and wind, than a wormhole like in Sliders). Rotating the magnets, at least two going in opposite directions, creates a big magnetic field and will eventually explode.

I wanted to say that rotating magnets would not be enough. You need two sets of magnets. One turning in one direction, the other one inside in the other direction. It is this constant movement of opposition between the positive energy and negative energy that creates the magnetic field. In Contact they have that, three small little circles turning around in different directions. That is what creates their wormhole. But you should not do the machine like that. Maybe a big metallic ball in the middle rotating, and other magnets in the outside ring turning in the opposite direction. As long as there are magnets turning one way, and other magnets turning the other way.

**The reason for the explosion:** the magnetic field has been caught into the natural magnetic fields of the Earth, creating the explosion and bringing the surrounding area into a bubble where magnetic fields are trapped or travelling in such a way that they are coming back into themselves (a nice little drawing can be done to show that instantly, the normal flow of the magnetic fields around the Earth suddenly going crazy around the area).

## You need more than the Experiment to justify two times meeting and travel in time

**You need more than the experiment:** At this point, so far, you cannot justify the meeting of two times. At the very least, what you could do with this is to send signals/messages through time like in the movie Frequency. In Frequency a dad in the past can speak with his son 30 years later using an amateur radio system (HAM). Because the Aurora Boreal in the sky brings back the signals years later (and years before) after a little tour in space following the magnetic fields of the Earth (proven

facts). Please have a look at the comments of Brian Greene on the DVD for more details.

**The point of the experiment:** times are usually co-existing already but we are not aware of it, only by the déjà-vu could we guess that it is true. The experiment will amplify the phenomenon and even permit interaction between the two times and make possible for persons to shift between those times. Like ghost stories, they seem to be more common in areas where people like in England lived years before us and were living in the same houses/pubs where we live, and most importantly, it happens where there is something wrong with the normal flow of the magnetic fields of the Earth.

**The form the shifts could take:** it could be a vortex/wormhole throwing you into the other time, it would be best if it was a change in luminosity with electricity in the air and suddenly your surroundings have changed, or someone is there. So there are signs that two times are interacting in the same space. The wormhole makes interaction difficult to explain. Why would the guy suddenly be invisible? You can easily justify that if he is between the two times. But he could still have gone through a wormhole or a window to reach the other time, and we could still feel his presence even if he was in the other time (objects moving, etc.).

**How to find portals if you go somewhere where there is no machine to bring you back:** Someone could say that the big magnets are creating a huge magnetic field that opened a hole in the fabric of space. This can be used to go to some other places and time. When they want to come back and the wormhole is closed, they can try to find a portal to come back to the machine or even anywhere else. Like if as a consequence of the explosion, wormholes now can connect two places in time without the use of the machine. They could observe weird phenomena, like time could be running at different rates in certain places of the area. They can also understand that in some areas gravity is stronger. From this it can be deduced that time might be running faster in those areas and that might be a way to find a portal to go back to the future or to go to the past.

To find a portal to the future, they need to identify where gravity is very light. To find a portal to the past, they need to find the spot where gravity is the strongest.

The problem is that gravity is different everywhere at the same time, it is a planet wide effect. I have adapted this for the wormhole, in order to have a localized portal between the times when really, you are living in both times at the same time already. In order for gravity to be different in certain areas, you need antigravity devices. Just the thing that alien ships appear to have. And everyone on the planet seems to think that antigravity devices will exist one day, some even claim that they already do but they cannot divulge the information just yet. So it is possible, even perhaps in nature, and it would be created by strong magnetic fields. So we are justified. I talk about [antigravity](#) later on in the articles from the Internet.

But if you are worried by this avenue, we could use another trick instead, that could be: modifying the magnetic field directly around them, it would then open the portal. And they could modify the magnetic field around them by getting closer to the machine itself. So by throwing themselves in the magnetic field of the machine, while it looks like it is going to explode, could be the leap of faith they need in order to get back. In that case, forget all the techno babble about the gravity stuff.

# **The Science behind how two Times can Co-exist**

**(new stuff, highly interesting for a show)**

**A fluctuating timeline:** the life of anyone on this planet is not as linear as we thought. Because of the theories of relativity of Einstein, space and time are not constant, space-time is relative. It means that time is running at different rates depending on the speed we are travelling at in space and the gravitational forces in action in our galaxy.

The rate at which time is going is not constant, it is changing all the time even if our watches and our clocks keep it linear. So the timeline is fluctuating a lot, the past can overtake the future and vice-versa. This is how past and present can meet.

## **Ideas for Inspiration**

### **Idea 1: The déjà-vu phenomenon**

We have the feeling that we have already done that, and in fact, we already did, but in the future. How is this possible? If in the future suddenly another solar system has made gravity higher upon us, or slowed us much more in space, then this future event of your life could in fact have happened before the present. You can even decide to not act the way you saw it or already did it. So the future is not certain, it is also fluctuating, and you can catch glimpses of it.

So things happening in the future could have happened in the past and by concentrating we can remember the future and change it (we would talk about the fluctuation of the timeline) the past and the present are not what they appear to be.

### **Idea 2: Ghosts and Invisibility**

Ghost stories where the past and the present meet, when some other people appear to be living in your house and appear to be wondering what you are doing in their house (it is the story of *The Others*, but in that case Nicole Kidman is dead). Or suddenly you see a castle right there that existed only 300 years ago, sometimes only half of it. And for a time you can climb the stairway, and sometimes you cannot. The level of possible interactivity is changing, sometimes you can talk with the people of the past, and sometimes you cannot. This is also link to [Invisibility](#) which is covered in a whole report if you follow the link.

Note: in those situations, most people have seen the same thing. I am not talking or explaining another weird phenomenon which involved ghosts of dead people hunting a house. In those particular cases, some people see the ghosts, some others don't. Kids (like mediums) are better in perceiving other living beings moving things around.

### **Idea 3: Time running at different rates and gravity fields**

Sometimes time appears to be going faster or slower (not in the case of a perception because we enjoy or hate something we do). Some people, without getting into aliens and abductions, have said that sometimes they have noticed that 2 hours or even 5 hours are missing and they don't know where these hours have gone. There are many people who reported period of missing time. They must have hit a point in space where specifically gravity was very high or very low for some reason, and their time rate has suddenly gone very fast or very slow.

If the time rate is different in certain areas, objects can freeze in space or people can be running on a different time, giving them the chance to miss days compared with the others. To unfreeze someone or something, you will have to learn that by applying more gravity or less gravity in the area of the object, you can change the rate at which the time goes around the object, and therefore unfreeze it.

### **Idea 4: Travelling in Time**

I had some more ideas that could be interesting. My idea of the experiment does not stop you from linking more than two times together, and eventually have a control over this in order to travel through time and eventually, perhaps, travel at some other places. I understand that you don't want to make another Sliders or Stargate out of this, so it does not have to be overused, like another place or time to go at each episode. There are a lot of advantages to have your own time machine and go in different times, just by finding the right portal.

At the very least they could visit that old civilization and discover this very futuristic society and sort of not believe that there are no traces of their existence. We could then learn that if our civilization would die today, nothing would guarantee that in thousands of years another civilization would find traces of our own existence. Therefore it is important to protect ourselves from asteroids that could potentially destroy our planet (it could be the reason why the old civilization disappeared, and this could be the conclusion that the scientists reached by learning more about them). We could have a nice little speech about the universe. How Jupiter is so large that it attracts most of the asteroids that otherwise would come and crash on Earth. It should also be known that a relatively small asteroid could destroy a whole city like New York and that there are a lot of smaller asteroids hitting the Earth every year. (If you want that particular speech about asteroids, ask, and I will give you something interesting.)

Using a telescope we can review what is the universe, its scale and life story. We should also get to know where stars, planets and galaxies are and where we are in our own galaxy the Milky Way. They could be finding a way to travel in time by figuring out the speed at which the solar system is going at right now, and the speed it was going at during these different periods in history they wish to go to. They would figure that out by looking at all the other solar systems and galaxies, the gravity that has been exerted on our solar system, and finding a way to calculate these things. Remember, the rate at which time is ticking is calculated using the speed we are travelling at in space and the gravity surrounding us at a given time. You can link your time to another one if somehow you can adjust your gravity and your speed, this will affect your time and could correspond to another period of time



in the past or the future. This is at the root of all the phenomena like déjà-vu and premonition. Past, present and future are not linear, we are living on a fluctuating timeline.

### **Idea 5: Ice Age**

What could be interesting is if one day it would snow all around the area because the time would be linked to an ice age period. All the signs would be there to prove that the experiment was a nuclear one. Radioactive snow, people getting vaporized (shifting between the two times), other strange phenomena. We would also understand more about the fact that different times co-exist in the same place, and this is because of the natural magnetic fields of the Earth being trapped in our No Man's Land bubble. And obviously we could talk about what is a nuclear explosion, radiation and the consequences of that.

### **Idea 6: The Infinities**

This is the story of my novel [The Relative Universe](#). We could have a story about a weird device that could be used in some exploration of the very small, the atomic world. We could study Quantum Mechanics, but incorporate that into another story with a crisis and a solution involving Quantum Mechanics. If distance is relative as stated by Einstein, than the size of object is also relative. Which means that an atom can be as big as a star even though our perception of it is that it is in the infinitely small. You could in theory travel to the atomic world, which would be the equivalent of travelling very very far from here in space. This is based on my theories of Universal Relativity where just about everything is relative now, not only time and space. You can read all about it on my page [The Universal Relativity](#) and the applications in my [novel](#). You could adapt some of these ideas to your stories.

### **Idea 7: The Table of Elements - Chemical Reactions**

Find a situation, a crisis that can only be solved by figuring out the interactions between certain elements (chemical reactions) and applying them. We could learn that we are made of Carbon, and computer intelligence from Silicon, and that ultimately none is better than the other.

It is a bit the story of Evolution, the Movie. The Aliens are made of nitrogen instead of carbon, therefore their poison, instead of being arsenic, it was selenium. But we could do something like Plutonium decaying and involve the story of Pierre and Marie Curie, discovering radioactivity and dying from radiation poisoning. The weird situation in the bubble would have, for example, transformed some normal matter into radioactive matter. We will then see how we can take matter and transform it into something else.

### **Idea 8: Melting Pot**

Other possible science that could be used in stories could be thunder and electrical storms. Also Fire Balls (have you ever heard about this phenomenon? Fire Balls appearing out of nowhere and chasing people before exploding into something. Very



interesting and frightening). Other subjects related to science: force and energy, light, sound (waves), electricity, electronics and telecommunications. I have plenty more if you run out of ideas. Please contact me: [rm@themarginal.com](mailto:rm@themarginal.com).

## Articles about Wormholes

### Wormholes

<http://www.sciam.com/askexpert/physics/physics34.html>

And another reply comes from Matt Visser, an assistant professor of physics at Washington University in St. Louis:

Wormholes are hypothetical entities that show up in theoretical analyses of Einstein's theory of gravity (general relativity). Nobody has yet seen a wormhole, nor are we certain that they exist, but they seem to show up so easily when we do calculations that many physicists suspect that they might actually be out there in the real universe.

There are two main types of wormhole of interest to physicists: Lorentzian wormholes (general relativity) and Euclidean wormholes (particle physics).

Lorentzian wormholes are essentially short-cuts through space and time. They are mainly studied by experts in Einstein gravity, and if they exist in real life would be more-or-less similar to the wormhole on Star Trek: Deep Space 9. (But remember, the show is just entertainment, so don't try to extract detailed physics from DS9; at best it will give you a vague general idea of what is going on.)

The good news about Lorentzian wormholes is that, after about ten years of hard work, we cannot prove that they do not exist. The bad news is that they are very strange objects: If they exist at all they need large amounts of negative mass to hold them open and stop them from collapsing. (Negative mass is not anti-matter, it's a region where the energy of the universe is less than that of ordinary vacuum--- definitely weird stuff.) We can get small amounts of negative energy in the laboratory (the Casimir effect), but getting the large amounts needed to hold a decent size Lorentzian wormhole open looks to be hopeless with current technologies. (And there may be deep issues of principle preventing us from collecting a lot of negative energy in one place.)

If Lorentzian wormholes do exist, then it seems classically to be relatively easy to turn them into time machines. This embarrassing feature has led Stephen Hawking to promulgate his Chronology Protection Conjecture. According to this conjecture, quantum effects will conspire to effectively prevent time travel even when it looks like classical physics might allow time travel to occur.

Euclidean wormholes are even stranger: they live in "imaginary time" and are intrinsically virtual quantum mechanical processes. These Euclidean wormholes are of interest mainly to the particle physicists (quantum field theorists). You cannot give them a nice classical interpretation in terms of a well-behaved classical gravitational field, and unfortunately have to know a lot of quantum physics to appreciate even their basic properties.

A good popular level description of Lorentzian wormholes can be found in the book *Black Holes and Time Warps: Einstein's Outrageous Legacy* by Kip. S. Thorne (Norton, New York, 1994).

The BBC has a documentary in the Horizon series: *The Time Lords*, Judith Bunting, December 2, 1996.

If you know some differential geometry, some general relativity and some quantum field theory (not for the faint of heart), you might want to take a look at *Lorentzian Wormholes: from Einstein to Hawking* by Matt Visser (AIP Press, New York, 1995).

### **Time travel back on the agenda**

[http://www.biols.susx.ac.uk/home/John\\_Gribbin/Time\\_Travel.html](http://www.biols.susx.ac.uk/home/John_Gribbin/Time_Travel.html)

This is the latest twist in a story that began in the late 1980s, when Kip Thorne and colleagues at the California Institute of Technology suggested that although there might be considerable practical difficulties in constructing a time machine, there is nothing in the laws of physics as understood at present to forbid this. Other researchers tried to find flaws in the arguments of the CalTech team, and pointed in particular to problems in satisfying a requirement known as the "weak energy condition", which says that any real observer should always measure energy distributions that are positive. This rules out some kinds of theoretical time machines, which involve travelling through black holes held open by negative energy stuff.

"At present," he says, "one should not completely rule out the possibility of constructing a time machine from materials with positive energy densities."

### **Wormhole engineering**

[http://www.biols.susx.ac.uk/home/John\\_Gribbin/Time\\_Travel.html](http://www.biols.susx.ac.uk/home/John_Gribbin/Time_Travel.html)

There is still one problem with wormholes for any hyperspace engineers to take careful account of. The simplest calculations suggest that whatever may be going on in the universe outside, the attempted passage of a spaceship through the hole ought to make the star gate slam shut. The problem is that an accelerating object, according to the general theory of relativity, generates those ripples in the fabric of spacetime itself known as gravitational waves. Gravitational radiation itself, travelling ahead of the spaceship and into the black hole at the speed of light, could be amplified to infinite energy as it approaches the singularity inside the black hole, warping spacetime around itself and shutting the door on the advancing spaceship. Even if a natural traversable wormhole exists, it seems to be unstable to the slightest perturbation, including the disturbance caused by any attempt to pass through it.

But Thorne's team found an answer to that for Sagan. After all, the wormholes in *Contact* are definitely not natural, they are engineered. One of his characters explains:

There is an interior tunnel in the exact Kerr solution of the Einstein Field Equations, but it's unstable. The slightest perturbation would seal it off and convert the tunnel into a physical singularity through which nothing can pass. I have tried to imagine a superior civilization that would control the internal structure of a collapsing star to keep the interior tunnel stable. This is very difficult. The civilization would have to monitor and stabilize the tunnel forever.

But the point is that the trick, although it may be very difficult, is not impossible. It could operate by a process known as negative feedback, in which any disturbance in the spacetime structure of the wormhole creates another disturbance which cancels out the first disturbance. This is the opposite of the familiar positive feedback effect, which leads to a howl from loudspeakers if a microphone that is plugged in to those speakers through an amplifier is placed in front of them. In that case, the noise from the speakers goes into the microphone, gets amplified, comes out of the speakers louder than it was before, gets amplified . . . and so on. Imagine, instead, that the noise coming out of the speakers and into the microphone is analysed by a computer that then produces a sound wave with exactly the opposite characteristics from a second speaker. The two waves would cancel out, producing total silence.

For simple sound waves, this trick can actually be carried out, here on Earth, in the 1990s. Cancelling out more complex noise, like the roar of a football crowd, is not yet possible, but might very well be in a few years time. So it may not be completely farfetched to imagine Sagan's "superior civilization" building a gravitational wave receiver/transmitter system that sits in the throat of a wormhole and can record the disturbances caused by the passage of the spaceship through the wormhole, "playing back" a set of gravitational waves that will exactly cancel out the disturbance, before it can destroy the tunnel.

But where do the wormholes come from in the first place? The way Morris, Yurtsever and Thorne set about the problem posed by Sagan was the opposite of the way everyone before them had thought about black holes. Instead of considering some sort of known object in the Universe, like a dead massive star, or a quasar, and trying to work out what would happen to it, they started out by constructing the mathematical description of a geometry that described a traversable wormhole, and then used the equations of the general theory of relativity to work out what kinds of matter and energy would be associated with such a spacetime. What they found is almost (with hindsight) common sense. Gravity, an attractive force pulling matter together, tends to create singularities and to pinch off the throat of a wormhole. The equations said that in order for an artificial wormhole to be held open, its throat must be threaded by some form of matter, or some form of field, that exerts negative pressure, and has antigravity associated with it.

Now, you might think, remembering your school physics, that this completely rules out the possibility of constructing traversable wormholes. Negative pressure is not something we encounter in everyday life (imagine blowing negative pressure stuff in to a balloon and seeing the balloon deflate as a result). Surely exotic matter cannot exist in the real Universe? But you may be wrong.

## Antigravity

The key to antigravity was found by a Dutch physicist, Hendrik Casimir, as long ago as 1948. Casimir, who was born in The Hague in 1909, worked from 1942 onwards in the research laboratories of the electrical giant Philips, and it was while working there that he suggested what became known as the Casimir effect.

The simplest way to understand the Casimir effect is in terms of two parallel metal plates, placed very close together with nothing in between them (Figure 6). The quantum vacuum is not like the kind of "nothing" physicists imagined the vacuum to be before the quantum era. It seethes with activity, with particle-antiparticle pairs constantly being produced and annihilating one another. Among the particles popping in and out of existence in the quantum vacuum there will be many photons, the particles which carry the electromagnetic force, some of which are the particles of light. Indeed, it is particularly easy for the vacuum to produce virtual photons, partly because a photon is its own antiparticle, and partly because photons have no "rest mass" to worry about, so all the energy that has to be borrowed from quantum uncertainty is the energy of the wave associated with the particular photon. Photons with different energies are associated with electromagnetic waves of different wavelengths, with shorter wavelengths corresponding to greater energy; so another way to think of this electromagnetic aspect of the quantum vacuum is that empty space is filled with an ephemeral sea of electromagnetic waves, with all wavelengths represented.

This irreducible vacuum activity gives the vacuum an energy, but this energy is the same everywhere, and so it cannot be detected or used. Energy can only be used to do work, and thereby make its presence known, if there is a difference in energy from one place to another.

Between two electrically conducting plates, Casimir pointed out, electromagnetic waves would only be able to form certain stable patterns. Waves bouncing around between the two plates would behave like the waves on a plucked guitar string. Such a string can only vibrate in certain ways, to make certain notes -- ones for which the vibrations of the string fit the length of the string in such a way that there are no vibrations at the fixed ends of the string. The allowed vibrations are the fundamental note for a particular length of string, and its harmonics, or overtones. In the same way, only certain wavelengths of radiation can fit into the gap between the two plates of a Casimir experiment (Figure 7). In particular, no photon corresponding to a wavelength greater than the separation between the plates can fit in to the gap. This means that some of the activity of the vacuum is suppressed in the gap between the plates, while the usual activity goes on outside. The result is that in each cubic centimetre of space there are fewer virtual photons bouncing around between the plates than there are outside, and so the plates feel a force pushing them together. It may sound bizarre, but it is real. Several experiments have been carried out to measure the strength of the Casimir force between two plates, using both flat and curved plates made of various kinds of material. The force has been measured for a range of plate gaps from 1.4 nanometers to 15 nanometers (one nanometer is one billionth of a metre) and exactly matches Casimir's prediction.

In a paper they published in 1987, Morris and Thorne drew attention to such possibilities, and also pointed out that even a straightforward electric or magnetic field threading the wormhole "is right on the borderline of being exotic; if its tension were infinitesimally larger . . . it would satisfy our wormhole-building needs." In the

same paper, they concluded that "one should not blithely assume the impossibility of the exotic material that is required for the throat of a traversable wormhole." The two CalTech researchers make the important point that most physicists suffer a failure of imagination when it comes to considering the equations that describe matter and energy under conditions far more extreme than those we encounter here on Earth. They highlight this by the example of a course for beginners in general relativity, taught at CalTech in the autumn of 1985, after the first phase of work stimulated by Sagan's enquiry, but before any of this was common knowledge, even among relativists. The students involved were not taught anything specific about wormholes, but they were taught to explore the physical meaning of spacetime metrics. In their exam, they were set a question which led them, step by step, through the mathematical description of the metric corresponding to a wormhole. "It was startling," said Morris and Thorne, "to see how hidebound were the students' imaginations. Most could decipher detailed properties of the metric, but very few actually recognised that it represents a traversable wormhole connecting two different universes."

For those with less hidebound imaginations, there are two remaining problems -- to find a way to make a wormhole large enough for people (and spaceships) to travel through, and to keep the exotic matter out of contact with any such spacefarers. Any prospect of building such a device is far beyond our present capabilities. But, as Morris and Thorne stress, it is not impossible and "we correspondingly cannot now rule out traversable wormholes." It seems to me that there's an analogy here that sets the work of such dreamers as Thorne and Visser in a context that is both helpful and intriguing. Almost exactly 500 years ago, Leonardo da Vinci speculated about the possibility of flying machines. He designed both helicopters and aircraft with wings, and modern aeronautical engineers say that aircraft built to his designs probably could have flown if Leonardo had had modern engines with which to power them -- even though there was no way in which any engineer of his time could have constructed a powered flying machine capable of carrying a human up into the air. Leonardo could not even dream about the possibilities of jet engines and routine passenger flights at supersonic speeds. Yet Concorde and the jumbo jets operate on the same basic physical principles as the flying machines he designed. In just half a millennium, all his wildest dreams have not only come true, but been surpassed. It might take even more than half a millennium for designs for a traversable wormhole to leave the drawing board; but the laws of physics say that it is possible -- and as Sagan speculates, something like it may already have been done by a civilization more advanced than our own.

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## **Alternative to the overused Wormholes in Sci-Fi**

For time travel you do not necessarily need a wormhole, not only you don't need it, but you should not use it. It has been done too many times before.

What you would have is a space in which two times happens at the same time and you can shift sometimes easily and sometimes not.

If you really want something that resembles a wormhole, I suggest you create some sort of vague vortex using some CGI in order to have some magnetic fields turning around the whole room. Winds and things could be moving with it, but it should be milder. A bit like when the Terminator goes through time. Or when the Highlander finally kills someone and something appears to be happening, electrical currents and everything.

I asked one of my good correspondents, who knows more about physics than me, what he thought of these previous ideas, his name is William Taggart. I am copying here his answers. If you need to understand more about where he comes from with these ideas, you can read our previous correspondence here:

[www.themarginal.com/timedensitymass.htm](http://www.themarginal.com/timedensitymass.htm)

This is at the core of what is revolutionary and that both me and William have discovered independently. That is what the future Sci-Fi movies will be made of. But it is complicated and in order to use this, a lot of explanation will be needed. Even me have not yet grasp his way of seeing space and time, though I am fairly certain it is interesting and I feel he is right. He is the one who came up with the equation that I was looking for in  $E=mc^2$  where the C is modified to reflect its relative value (the speed of time is relative, changing, so all Einstein's equations need to reflect this).

### **First E-mail from William**

"I think you answer the questions very well, 'Contact' was a good reference to use as without that story the idea of a wormhole would never have existed. I'm not sure if you know about this, but Carl Sagan the author of Contact, approached Kip Thorne and mentioned to him that he had this idea of a story in which a person travelled into a black hole and was it actually possible in physics. Kip Thorne told him that in classical physics this was not possible as the person would be killed. However he went on to devise the principle of the wormhole. The rest is history."

"So 'Contact' is one sci-fi story which has directly influenced modern physics."

"[People in sci-fi] could be a bit more original though and Be right at the cutting edge, by quoting directly from ScR, in which such effects as causality etc get thrown out of the window. I.E in an ScR approach step from 2002 to say for an example 1066 would be as simple as walking across a room. (Normal Gravitational scale interaction.)"

Regards, William

### **Second E-mail from William**

Question: What do you mean by Normal Gravitational scale interaction?

"Normal gravitaional scale interaction. (NGsi)"

"NGsi is basically what we see around us, matter/energy in its past present and future form passes within our range of observation as we progress through the normal curvature of space time. To us this is the present state of matter/energy."

"Everything that we observe as being present is in fact in the past, we interact with snap shots of energy. Now that is easy to understand, something exists, energy reflects off or is emitted by and our senses detect that and interpret it as an object. For these reactions to take place takes time and in turn this means that everything is always in a past tense in our present."

"It becomes more complicated when you start to include the complexities of physical interaction throughout space time. Much like I explained before about how far this computer your monitor could be away from you in spatial distance terms. Physical objects also interact in space time terms."

"Thus if the matter/energy that makes up that computer monitor was on a curvature of space time in which it exists 10 years ago and at a relevant level of gravity per volume for that point in space time. How can you see it now?"

"Well in normal curvature of spaced time it has had to increase its gravity to interact with this point in space time, in other words its aged 10 years. However it is entirely possible for it to rapidly increase its gravity to that it interacts directly with 10 years ago then in the present. Thus negating the 10 years in between."

"NGsi is basically what I described as the time density signature (TDS) apart from it also describes the new curvature of space time that energy/matter follows."

"Imagine a single object that exists at the beginning of a time scale, because technically there are infinite divisible points to zero time. This means that infinite possible reactions can occur which set the rate of the increase of the objects gravity (the rate of curvature in space time)"

"This Would mean that a single object can evolve into every possible object on every possible curvature of space time."

"Meaning that everything is already defined. Yet because there is infinite complexity, this means that pre-defined fate, randomness and or freedom of choice can co-exist in the same medium yet they do not contradict each other unless you try to compare them."

"The only difference between something that is pre-defined and that which is random, is the amount of variables. In its true form nothing can be random it just becomes too complicated to calculate the patterns of that which is pre-defined."

"Our acceptance of unquestioned randomness is why we find it so hard to understand the complex interaction of different gravitational objects throughout infinite space time."

"Thus our normal perception excludes the time other than in local terms and only accepts the spatial interaction of objects. We find it hard to accept that physical states of matter or their given gravity at different points in space time can cause objects to interact with past present or future versions of itself."



"I.E we find it hard to accept that these objects already exist in past present and future and that what we observe as interactions is just a predefined path."

"You could say that ok I do something which alters that path, yet all you are doing is making it follow another predefined path. Alter that path and it follows yet another predefined path. Infinite pseudo variability(Ipv)"

"So once you understand the rules of physical interaction throughout space (Universal Gravity, UG) or just Gravity, you will also understand that any point in space time is just an alteration in gravity away from another. Or NGsi."

"NGsi,Ipv and UG are just different terms for specific parts of TDM."

Regards, William

NOTE from RM: I understand this is complicated, but it will make more sense if you read our previous correspondence here:

[www.themarginal.com/timedensitymass.htm](http://www.themarginal.com/timedensitymass.htm)

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## Definition of the Particles in the Universe

### photon

<http://dictionary.msn.com/find/entry.asp?search=photons>

**quantum of electromagnetic radiation:** a quantum of visible light or other form of electromagnetic radiation demonstrating both particle and wave properties. A photon has neither mass nor electric charge but possesses energy and momentum.

[Early 20th century]

**pho·ton·ic** - *adjective*

### molecule

<http://dictionary.msn.com/find/entry.asp?search=molecule>

- 1. CHEMISTRY smallest part of a chemical compound:** the smallest physical unit of a substance that can exist independently, consisting of one or more atoms held together by chemical forces
- 2. tiny amount:** a very small amount of something



[Late 18th century. Via French *molécule* from modern Latin *molecula*, literally "small mass," from Latin *moles* "mass."]

## atom

<http://dictionary.msn.com/find/entry.asp?search=atom>

**at·om** (*plural at·oms*) *noun*

- 1. smallest part of element:** the smallest portion into which an element can be divided and still retain its properties, made up of a dense, positively charged nucleus surrounded by a system of electrons. Atoms usually do not divide in chemical reactions except for some removal, transfer, or the exchange of specific electrons.
- 2. very small amount:** a very small part or amount - *not an atom of truth*
- 3. particle of matter in Greek philosophy:** the basic particle of matter, indestructible and indivisible, first proposed by ancient Greek philosophers as the fundamental component of the universe

[16th century. Via Latin *atomus* from Greek *atomos*, literally "unable to be cut," from *temnein* "to cut" (source of English *tome*, *anatomy*, and *epitome*).]

## quark

<http://dictionary.msn.com/find/entry.asp?search=quark>

**quark**<sup>1</sup> (*plural quarks*) *noun*

**basic component of particles:** any elementary particle with an electric charge equal to one-third or two-thirds that of the electron. Quarks are believed to be the constituents of baryons and mesons. There are six types ( flavors ) of quarks, each paired with an antiquark, and three properties ( colors ) that determine their role in interactions.

[Mid-20th century. Coined by American physicist Murray Gell-Mann (b. 1929), alluding to the phrase "three quarks for Muster Mark" in James Joyce's *Finnegans Wake* ; because originally there were thought to be three quarks.]

## neutrino

<http://dictionary.msn.com/find/entry.asp?search=neutrino>

**neu·tri·no** (*plural neu·tri·nos*) *noun*

**neutral elementary particle:** any of three stable neutral elementary particles of the lepton family with a zero rest mass and no charge. Neutrinos have a spin of 1/2.

[Mid-20th century. Coined from neutral + Italian *-ino* "small."]

## subatomic

<http://dictionary.msn.com/find/entry.asp?search=subatomic>

**sub·a·tom·ic** *adjective*

1. PHYSICS **part of or smaller than an atom:** occurring as part of an atom, or smaller than an atom
2. SCIENCE **on a smaller-than-atom scale:** on a scale smaller than the atom, or involving phenomena at this level

## particle

<http://dictionary.msn.com/find/entry.asp?search=particle>

**par·ti·cle** (*plural par·ti·cles*) *noun*

1. **tiny piece:** a very small piece of something - *airborne particles*
2. **tiny amount:** a very small amount of something - *There wasn't a particle of truth in anything he said.*
3. PHYSICS **body with finite mass:** a minute body that is considered to have finite mass but negligible size
4. PHYSICS **basic unit of matter:** any one of the basic units of matter, for example, a molecule, atom, or electron
5. PHYSICS **subatomic unit:** a unit of matter smaller than the atom or its main components
6. GRAMMAR **part of multi-word verb:** an adverb or preposition that occurs as part of a multi-word verb, such as "up" in "blow up"
7. CHRISTIANITY **piece of consecrated bread or wafer:** in the Roman Catholic Mass, a small piece of consecrated bread or wafer

[14th century. From Latin *particula* "small part," from the stem *part-* (see [part](#) ).]

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Thanks, Regards,

Roland Michel Tremblay  
Tel: +44 (0)20 8847 5586  
Mobile: +44 (0)794 127 1010

44E The Grove, Isleworth, Middlesex, London, TW7 4JF, UK

[www.themarginal.com/relativity.htm](http://www.themarginal.com/relativity.htm)  
[www.themarginal.com/universe.htm](http://www.themarginal.com/universe.htm)

[rm@themarginal.com](mailto:rm@themarginal.com)  
[www.themarginal.com](http://www.themarginal.com)