1995

JOHN DOBSON
1801 GOLDEN GATE AVENUE
SAN FRANCISCO CA 94115
(415) 567-2063

ENTROPY

It's easier to scramble an egg than to unscramble it.

Entropy is a measure of the scrambledness of the energy, and because there are more ways to be scrambled than to be unscrambled, the scrambledness of the energy tends to increase. The entropy tends to go up.

Energy is simply the nature of the underlying existence showing through in space and time, and its amount remains constant. It is only the quality of the energy, its usableness, that gets degraded. And entropy is a measure of this degradation.

"Die Energie der Welt bleibt konstant; die Entropie strebt einem Maximum zu."
(The energy of the world remains constant; the entropy strives to a maximum.)
—*Rudolf Clausius (1822-1888)*

This is a statement of the first and second laws of thermodynamics. And the term laws doesn't mean edicts, but only statements about how matter behaves. Physics is about how matter behaves, and these are statements about that. This is simply a statement that although the energy in the Universe remains constant, the entropy tends to go up.

Negative entropy is a measure of the usableness of the energy. Gravitational energy and the kinetic energy of large moving objects is completely usable. Heat energy is not, because the directions of the motions of the particles have been scrambled. That's what we call heat. And temperature is a measure of the mean kinetic energy of the molecules.

When you panic stop on the freeway, the kinetic energy of your large moving vehicle gets scrambled to heat by friction in the brake drums and the brake shoes, the tires and the road. If you could unscramble it, it would once again be the kinetic energy of your large moving vehicle. Now if, instead of being scrambled by friction in the brakes, the energy had been run into a flywheel (which is a large moving object), you could have used it to re-start your car. That's how they re-start the mail trucks and the milk trucks in Europe.

Since all living organisms must find and use a source of energy less scrambled at the start, life is impossible except in a world that is going from bad to worse. All living organisms live in this cascade of increasing entropy by directing streams of the increase through their forms. For all living organisms, negative entropy is food. When you eat it, it's cake; when you're through with it, you push the plunger.

In the last century, and in the early days of this century, it was usually taken for granted that the mix of the chemical elements in the Universe was given at the time of creation, if there was a creation, or had been around forever, if there was a forever. (It was not known then that the other chemical elements are fashioned from hydrogen in the bellies of the stars.) And it was thought that if you just shuffled the mix long enough, it might come out in the present configuration again. But there was the problem of entropy. It was already known that entropy tends to a maximum and would surely go up. (In those days the expansion of the Universe had not been noted, nor its extent.) Then, considering the consequences of the continuously increasing entropy, it was thought that the Universe would eventually reach a "heat death." It was thought that eventually every chemical reaction that could have taken place would have taken place, and that everything that could have fallen would have fallen. And it was thought that when all these other energies had gone to heat, the Universe would be just a little warmer and life would be snuffed out.

Now it turns out that, like life, the formation of galaxies and stars would also be impossible except in this cascade of increasing entropy. A galaxy could not be formed by stars falling together because the stars would be too lonely to collide. The entropy would not go up because the stars would not collide and therefore the energy of falling would not be scrambled to heat. Galaxies are formed when clouds of hydrogen fall together because the clouds are big enough to collide. The clouds, unlike the stars, are large with respect to the spaces between them. So the particles of each cloud collide with the particles of the other cloud and thus scramble their motions to heat. (Stars like the Sun have a density of more than a pound per pint, whereas the density of the interstellar clouds is closer to a pound per billion cubic miles.) It is because of their large sizes that the clouds collide, and the energy of falling is transformed to heat. We say that the entropy has gone up.

Similarly, stars are formed when clouds of gas and dust collide because the entropy goes up as the energy of falling is transformed to heat. (Stars are not hot because of nuclear fusion at the core. They are hot because the energy of falling has been transformed to heat. The heat released by fusion simply keeps them from collapsing further and thus getting too hot. But it's only temporary.)

Locally, within the Universe, the entropy goes up. However, for the Universe as a whole, the entropy may not go up. The observable Universe has a border, some fifteen billion light years distant in all directions, imposed on us by what is called "the expansion." It is imposed on the observer by the fact that all the distant objects appear to be moving away. At some fifteen billion light years from us (at the present apparent rate of expansion), they are estimated to be receding at the speed of light. It is this apparent" expansion" that imposes a border to the observable Universe because things receding faster than the speed of light are not observable. And if the rate of expansion were increased, the border would of course be closer.

Now, when we consider matter near the border, its radiation, as seen by us, would be redshifted (lowered in frequency) much as the pitch of the fire engine's bell is lowered when the fire engine has passed us and is going away. But if the energy of the radiation of the distant particles is lowered, so too is the energy of the particles themselves, and therefore also their mass. (We know from Einstein's 1905 equations that what we see as matter is just potential energy. Swami Vivekananda had suggested this to Nikola Tesla some ten years earlier. But Tesla had failed to show it.) Now there are two very interesting consequences of this apparent lowering of the mass. First, radiation running through a field of low-mass particles would be so often picked up and re-radiated that it would be thermalized to 3K and would appear as the background radiation discovered by Penzias and Wilson in 1965. Second, if the mass of the particles approaches zero, their momentum must also approach zero (because the momentum is the mass times the velocity, and the velocity approaches a constant). But if the momentum approaches zero, so does our uncertainty in that momentum. Then, by Heisenberg's uncertainty principle, our uncertainty in where they are must approach totality. (According to Heisenberg's uncertainty principle, if we can know where a particle is, we cannot know its momentum. Likewise, if we can know its momentum, we cannot know where it is. So if we can know the momentum of a particle at the border, we cannot know that it's at the border. We cannot know both its momentum and its position.) Now if the particles thus recycle by "tunneling" back into the observable Universe as hydrogen (with its gravitational energy thus restored), then the entropy of the whole Universe might not increase.

FAITH

"It was dark before we started thinking; and it will be dark again when we stop" - Randall Meyers

Swami Ashokananda once said that it's not sufficient to realize; one must also understand. That is, one must also think about it, and what it means against its philosophical background. At first I thought that he had said it wrongly, and that what he had meant to say was that it's not sufficient to understand something in your intellect; one must also realize it in one's heart, in one's life. But he wouldn't have made that kind of mistake. He must have meant it the way he said it. He must have meant that it's not sufficient simply to have what is called a spiritual experience; one must also understand that experience against its philosophical background. Otherwise it may lead to fanaticism.

Fanaticism arises through a lack of understanding of ones own position and a lack of appreciation of the positions of others. This is primarily a failure in education. But since all these religious experiences happen in this world, they must be understandable if we can understand this world. That's where our education and our thinking are usually at fault. Very few of us have an educational background wide enough to take in all the varieties of spiritual experiences; very few indeed, otherwise religious fanaticism would, long since, have died a natural death.

Education begins with questions and thinking. In India it began with questions like the one those old physicists asked long ago. "If what exists is changeless, how do we see change" and they said, "It can only be by mistake." So they studied mistakes. But they had an earlier question. "If the world which we see is "The Changing," against what does it change?" and they saw that underlying the world which we see there must be an existence not in time and space, and therefore, Changeless, Infinite, and Undivided. And they also saw that the Underlying Existence must show through in what we see because you can't mistake a rope for a snake without seeing the rope.

The educational background in early India was colored by the answers to questions like these which made it difficult for religious fanaticism to take hold. Spiritual experiences tended to be taken as glimpses of what underlies the world which we see. All the gods and goddesses, as well as natural phenomena, were taken to be manifestations of that one Underlying Existence.

In Europe and Arabia things went the other way. The underlying existence was largely overlooked and the questions were asked about the visible world. What we call science arose with its emphasis on atheistic materialism, and it was at war with religion. And the religious groups quarreled over the interpretations, of their own experiences, and the religious fanaticism held sway.

Now Columbus's people were Jewish, and they lived on the Balearic Islands off the coast of Spain because they were afraid of religious fanaticism, and they lived in terror of the Spanish Inquisition. They were looking for a way to get to India where they would be safe from religious persecution. But they didn't dare cross Arabia where the Muslims held sway. So they tried to get to India by the back door. The rest you know.

So Columbus's people settled in the Rio Grand valley where the name Colombo is common still, and where, till now, the people follow the old Jewish custom of turning the Christian pictures to the wall on Friday nights, on the eve of the Sabbath.

Now the curious thing is this, that all the religious groups, regardless of what they say from the pulpit or what they write in their books, believe that seeing the world as we see it is due to a mistake. Otherwise, faith would play no part in spiritual practice. If your house has burned down, faith that it hasn't will get you nowhere. But if it's a mistake, faith will get you out.

But what has happened is that the religious groups have interpreted that faith as faith in their own religious superstitions. And religious fanaticism is rife.

Until we wake up and ask the right questions I don't think this problem will be resolved.

"It was dark before we started to ask questions; and it will be dark again if we stop."

-John Dobson, Hollywood

March 13, 2004

FAITH

By John Dobson
Published 2004-10-22 13:29:45
From 2004
Read comments on this article

"It was dark before we started thinking; and it will be dark again when we stop" -Randall Meyers

Swami Ashokananda once said that it's not sufficient to realize; one must also understand. That is, one must also think about it, and what it means against its philosophical background. At first I thought that he had said it wrongly, and that what he had meant to say was that it's not sufficient to understand something in your intellect; one must also realize it in one's heart, in one's life. But he wouldn't have made that kind of mistake. He must have meant it the way he said it. He must have meant that it's not sufficient simply to have what is called a spiritual experience; one must also understand that experience against its philosophical background. Otherwise it may lead to fanaticism.

Fanaticism arises through a lack of understanding of ones own position and a lack of appreciation of the positions of others. This is primarily a failure in education. But since all these religious experiences happen in this world, they must be understandable if we can understand this world. That's where our education and our thinking are usually at fault. Very few of us have an educational background wide enough to take in all the varieties of spiritual experiences; very few indeed, otherwise religious fanaticism would, long since, have died a natural death.

Education begins with questions and thinking. In India it began with questions like the one those old physicists asked long ago. "If what exists is changeless, how do we see change" and they said, "It can only be by mistake." So they studied mistakes. But they had an earlier question. "If the world which we see is "The Changing," against what does it change?" and they saw that underlying the world which we see there must be an existence not in time and space, and therefore, changeless, infinite and undivided. And they also saw that the underlying existence must show through in what we see because you can't mistake a rope for a snake without seeing the rope.

The educational background in early India was colored by the answers to questions like these which made it difficult for religious fanaticism to take hold. Spiritual experiences tended to be taken as glimpses of what underlies the world which we see. All the gods and goddesses, as well as natural phenomena, were taken to be manifestations of that one underlying existence.

In Europe and Arabia things went the other way. The underlying existence was largely overlooked and the questions were asked about the visible world. What we call science arose with its emphasis on atheistic materialism, and it was at war with religion. And the religious groups quarreled over the interpretations, of their own experiences, and the religious fanaticism held sway.

Now Columbus's people were Jewish, and they lived on the Balearic Islands off the coast of Spain because they were afraid of religious fanaticism, and they lived in terror of the Spanish Inquisition. They were looking for a way to get to India where they would be safe from religious persecution. But they didn't dare cross Arabia where the Muslims held sway. So they tried to get to India by the back door. The rest you know.

So Columbus's people settled in the Rio Grand valley where the name Colombo is common still, and where, till now, the people follow the old Jewish custom of turning the Christian pictures to the wall on Friday nights, on the eve of the Sabbath.

Now the curious thing is this, that all the religious groups, regardless of what they say from the pulpit or what they write in their books, believe that seeing the world as we see it is due to a mistake. Otherwise, faith would play no part in spiritual practice. If your house has burned down, faith that it hasn't will get you nowhere. But if it's a mistake, faith will get you out.

But what has happened is that the religious groups have interpreted that faith as faith in their own religious superstitions. And religious fanaticism is rife.

Until we wake up and ask the right questions I don't think this problem will be resolved.

"It was dark before we started to ask questions; and it will be dark again if we stop."

John Dobson

Hollywood

March 13, 2004

FRUSTRATION

When I was in Los Angeles last winter I was walking downhill through Griffith Park following a tiny stream running down the edge of the road. And I was thinking about what the poets say, that the stream will be happy when it reaches the sea. But the poets are wrong you know. The stream won't be happy when it reaches the sea. The sea is desperately trying to fall to the center of the Earth, but the rocks are in the way. And the rocks are trying to fall to the center, but the iron of the Earth's core is in the way. And with thousands of miles of rock piled on top of it the iron itself is trying to collapse, but the size of the atoms themselves prevents it.

Now why must the atoms be so big? Why can't the electrons just sit down on the nucleus? And why are the electrons spaced out in shells?

Enter Heisenberg's Uncertainty Principle and Pauli's Verbot.

Heisenberg's Uncertainty Principle keeps the electrons from sitting on the nucleus. And Pauli's Exclusion Principle keeps them spaced out in shells, because it states that no two spin-one-half particles can occupy the same energy state. These are the two reasons why atoms are so big. This is why they can't collapse. But why does Heisenberg and Pauli rule? Because we live in a world in which we see an *electromagnetic duality* set against a *gravitational totality*. And since the duality and the totality exist by contrast to each other, neither can allow the other to collapse.

It was pointed out by Albert Einstein in 1905 that what we call matter is just potential energy. Gravitational rest energy, electrical rest energy, nuclear rest energy, and inertia or mass are all the same thing. It is energy itself which is hard to shake.

Now if we push two electrons toward each other, we must do work on them, and that makes them heavier. Similarly, if we squeeze the charge of one electron down to the size of one electron, we are pushing negative charge toward negative charge and we are doing work on it. The energy required to squeeze the charge of one electron down to the size of one electron is itself the mass of that electron. There is no "material particle" in there. There is just the electrical charge and the smallness of the electrical charge. There is nothing else in there.

But the proton is wound up against gravity as well as against electricity. That is why it is 1836 times as heavy as the electron. Just as we must do work to space things together in an electrical field, so we must do work to space things apart in a gravitational field. The work required to space a proton away from all the rest of the matter in the observable Universe is 500 atom bombs per pound. That is why all this stuff is so heavy. The proton is 1836 times heavier than the electron because of its gravitational windup. But the proton is wound up against electricity as well because electricity and gravity are two sides of the same coin. That is why the proton is so small. We see things spaced out by seeing them small. The electron is purely electrical while the proton is not. The proton is small and heavier than its electrical outrigger. The proton is the canoe, the electron is the outrigger.

It is not forbidden that an electron and a positron (an electron with a positive charge) should merge together and disappear (collapse) in radiation. These two particles are not gravitationally dissimilar. Although they have opposite charges, their masses are equal. In contrast, the proton is much heavier than the electron because of its gravitational windup, and in the presence of their gravitational dissimilarity inside the hydrogen atom the proton and the electron cannot merge and disappear in radiation.

Now back to Heisenberg. If an electron were to sit on the nucleus, our uncertainty in its position would be very small. As such, Heisenberg's Uncertainty Principle would then require that our uncertainty in its momentum should be so large that the momentum associated with that uncertainty would probably jump the electron off the nucleus. That is why the electrons, in the atom, stay out of the nucleus. But why are they spaced out in shells? That is because of Paul's Exclusion Principle. Only two electrons, with opposite spin, can occupy the same position in an atom. This is the other reason why the atoms are so big. If the nuclei were the size of garden peas, the electron shells would fill football stadiums around them.

And that is why the water, the rocks, and the iron can't collapse.

This world is made out of frustration. Maybe you didn't notice. But if we see what we see in space and time, it will necessarily be made out of frustration because we do not see things as they really are. That which is beyond space and time must necessarily be Changeless (beyond time), Infinite, and Undivided (beyond space). That which is Changeless is itself Infinite and Undivided. It can only be One; not three. But seen in space and time, it's a three-way frustration. Gravity wants everything to fall together to one place, to be undivided. Electricity wants the size of the particles to become infinite. And Inertia wants everything to stay just as it is.

Even if the atoms of the oceans, the rocks, and the core of the Earth could collapse, they'd still be unhappy because the Earth is trying, although constantly failing, to fall into the Sun. It fails to do so because its inertia is in the way. But the gravitational rest energy of the Earth - which wants the Earth to fall into the Sun - is itself its inertia which prevents it.

Meanwhile the Sun is trying to collapse by fusing hydrogen into Helium in its core. But the energy released by this fusion has kept the Sun bloated for nearly 5 billion years and it will continue to keep it bloated for another 5 billion years. Then, when the core finally collapses to the density of some 100,000 pounds per pint, the rapid fusion rate around the core will bloat the outer regions of the Sun up to the size of Earth's present orbit, and the outer regions will puff away, as we see it in the Ring Nebula. As the center condenses and the outside is blown away, the Sun will loss mass and relax its gravitational hold on the Earth, frustrating our effort to fall into it. The Earth will probably drift away to about the present orbit of Mars as a molten ball of iron and rock.

The Sun is too small for its gravity to overcome the electrical repulsion of nuclei larger than Carbon and Oxygen. So the Sun, after puffing its outside away, will end up as a Dwarf star made of Carbon and Oxygen. In its early days it will radiate in the ultraviolet spectrum and then slowly cool to black.

But the gravity of a larger star than the Sun would fuse its center to Iron which, in ¾ of 1 second, would collapse by gravity to the density of a 100,000 battleships in a one-pint jar. The energy released would be unbelievable. The energy of the explosion that blew Crater Lake was only 42 pounds and it blew 35 cubic miles of rock into powder and put it into the stratosphere at 80,000 feet. The energy that the Sun releases in only one second is 4.5 million tons. But the gravitational energy released in only ¾ of one second when one of these iron-core stars collapses is 100 times as much as the Sun will release in 10 billion years. The explosion will blow the outer portions of the collapsed star all over the galaxy. Our bodies are made of that stuff which is blown away by this gravitational collapse. Most of the heavier elements are made in these explosions and scattered far and wide.

Finally, the whole Milky Way (our galaxy) is trying to merge with all the rest of the matter in the observable Universe, but the cosmological expansion prevents it. But what drives the cosmological expansion? It is the energy which the radiation loses to redshift in its long traverse of the vast expanding spaces of the Universe. As every mechanic knows, if the hot gases lose their energy in the expansion of the cylinders in the engine in your car, then they drive that expansion. Similarly, if the radiation from the galaxies and stars loses its energy in the expansion of the Universe, then it drives that expansion.

But if the Universe is expanding, why doesn't its density decrease?

We see a Universe in which all the distant galaxies appear to be running away from us. The further away they appear to be from us, the faster they appear to be running away. Now this cosmological expansion, as it is called, imposes a boundary to the observable Universe at some 15 billion light-years away in every direction. That is because beyond that border things would be receding at speeds in excess of the speed of light and no messages, either electrical or gravitational, could be received by us.

If something is receding from us its radiation will be redshifted to lower energy. And if its speed approaches the speed of light, the energy of its radiation will approach zero. But if the energy of the radiation is seen to approach zero, then the energy of the particles giving rise to that radiation must also be seen to approach zero. And as Einstein pointed out in 1905, mass and energy are the same thing; so if the energy of the particles approaches zero, their mass must also approach zero. Now that raises an interesting question: can the particles cross the border? And the answer is no. Why? Because if the mass of the particles approaches zero, their momentum must also approach zero and with it our uncertainty in that zero momentum. But we know from Heisenberg's Uncertainty Principle that if our uncertainty in their momentum approaches zero, our uncertainty in where they are must approach totality. As such, the particles simply "tunnel" back into the observable Universe. That is why the density of the observable Universe does not decrease in spite of the fact that all the distant galaxies appear to be running away.

To the extent that the hydrogen (which has been recycled from the borders of the observable Universe through Heisenberg's Uncertainty Principle) succeeds in condensing into stars, to that extent it radiates. And so the final frustration is this: that the radiation arising from the success of gravitational collapse, losing its energy through redshifting in its long traverse of the vast expanding spaces of the Universe, drives that cosmological expansion.

As Walt Whitman said, "From every fruition of success shall come forth something to make a greater struggle necessary."

So cheer up! Even gravity can't win it in the end.

1997

JOHN DOBSON
1801 GOLDEN GATE AVENUE
SAN FRANCISCO CA 94115
(415) 567-2063

F R U S T R A T I O N

When I was in Los Angeles last winter I was walking downhill through Griffith Park following a tiny stream running down the edge of the road. And I was thinking about what the poets say, that it will be happy when it reaches the sea. But the poets are wrong, you know. It won't be happy when it reaches the sea. The sea is trying desperately to fall to the center of the Earth, but the rocks are in the way. And the rocks are trying to fall to the center, but the iron of the Earth's core is in the way. And with thousands of miles of rock piled on top of it the iron itself is trying to collapse, but the size of the atoms themselves prevents it. Now why must the atoms be so big? Why can't the electrons just sit down on the nucleus? And why are the electrons spaced out in shells?

Enter Heisenberg's uncertainty principle and Pauli's Verbot. Heisenberg's uncertainty principle keeps the electrons from sitting on the nucleus, and Pauli's exclusion principle keeps them spaced out in shells, because no two spin-one-half particles can occupy the same energy state. These are the two reasons why the atoms are so big. This is why they can't collapse. But why Heisenberg and Pauli? Because we live in a world in which we see an electromagnetic duality against a gravitational totality. And since the duality and the totality exist by contrast to each other, neither can allow the other to collapse.

It was pointed out by Albert Einstein in 1905 that what we call matter is just potential energy. Gravitational rest energy, electrical rest energy, nuclear rest energy, and inertia or mass are all the same thing. It is energy itself which is hard to shake.

Now if we push two electrons toward each other, we do work on them, and that makes them heavier. Similarly, if we squeeze the charge of one electron down to the size of one electron, we are pushing negative charge toward negative charge and we are doing work on it. Now the energy required to squeeze the charge of one electron down to the size of one electron is itself the mass of that electron. There is no material particle in there. There is just the electrical charge and the smallness of the electrical charge. There is nothing else in there.

But the proton is wound up against gravity as well as against electricity. That is why it is 1836 times as heavy as the electron. Just as we must do work to space things together in the electrical field, we must do work to space things apart in the gravitational field. And the work required to space a proton away from all the rest of the matter in the observable Universe is five hundred atom bombs per pound. That is why all this stuff is so heavy. The proton is 1836 times heavier than the electron because of its gravitational windup. But it is wound up against electricity as well because electricity and gravity are two sides of the same coin. That is why the proton is so small. We see things spaced out by seeing them as small. The electron is purely electrical, the proton is not. The proton is smaller and heavier than its electrical outrigger. The proton is the canoe, the electron is the outrigger.

It is not forbidden that the electron and the positron (an electron with a positive charge) should merge and disappear in radiation. They are not gravitationally dissimilar. Although they have opposite charges, their masses are equal. But the proton is much heavier than the electron because of its gravitational windup, and in the presence of their gravitational dissimilarity in the hydrogen atom the proton and the electron cannot merge and disappear in radiation.

Now back to Heisenberg. If an electron were to sit on the nucleus, our uncertainty in its position would be very small. Then Heisenberg's uncertainty principle would require that our uncertainty in its momentum should be so large that the momentum associated with that uncertainty would probably jump the electron off. That is why the electrons, in the atom, stay out of the nucleus. But why are they spaced out in shells? This is because of Pauli's exclusion principle. Only two electrons, with opposite spin, can occupy the same position in an atom. This is the other reason why the atoms are so big. If the nuclei were the size of garden peas, the electron shells would fill football stadiums around them.

And that is why the water, the rocks and the iron can't collapse.

This world is made out of frustration. Maybe you didn't notice. But if we see what we see in space and time, it will necessarily be made out of frustration because we do not see things as they are. That which is beyond space and time must necessarily be changeless (beyond time), infinite and undivided (beyond space). That which is changeless is itself infinite and undivided. It can only be one; not three. But seen in space and time, it's a three-way frustration. Gravity wants everything to fall to one place, to be undivided. Electricity wants the size of the particles to be infinite. And inertia wants everything to stay just as it is.

But even if the atoms of the oceans, the rocks and the core of the Earth could collapse, they'd still be unhappy because the Earth is failing, though constantly trying, to fall into the Sun. It fails because its inertia is in the way. But the gravitational rest energy of the Earth, which wants the Earth to fall in, is itself its inertia which prevents it.

Meanwhile the Sun is trying to collapse by fusing hydrogen to helium in its core, but the energy released by this fusion has kept the Sun bloated for nearly five billion years, and will continue to keep it bloated for another five billion years. Then, when the core finally collapses to the density of some hundred thousand pounds per pint, the rapid fusion rate around the core will bloat the outer regions of the Sun to the size of the Earth's present orbit, and the outer regions will puff away, as we see it in the Ring Nebula. As the center condenses and the outside is blown away, the Sun will lose mass and relax its gravitational hold on the Earth, frustrating our effort to fall to it. The Earth will probably drift away to about the present orbit of Mars, as a molten ball of iron and rock.

The Sun is too small for gravity to overcome the electrical repulsion of nuclei larger than carbon and oxygen; so the Sun, after puffing the outside away, will end up as a dwarf star made of carbon and oxygen. In its early days it will radiate in the ultraviolet, and then slowly cool to black.

But the gravity of a larger star fuses its center to iron which, in three quarters of one second, collapses by gravity to the density of a hundred thousand battleships in a one-pint jar. And the energy released is unbrelievable. The energy of the explosion that blew Crater Lake was only forty-two pounds, and it blew thirty-five cubic miles of rock to powder and put it in the stratosphere at eighty thousand feet. The energy that the Sun releases in only one second is four and one half million tons. But the gravitational energy released in only three quarters of one second when one of these iron-core stars collapses is a hundred times as much as the Sun will release in ten billion years. And it blows the outer portions of the star all over the galaxy. Now our bodies are made of that stuff which is blown away by this gravitational collapse. Most of the heavier elements are made in these explosions and scattered far and wide.

And finally, the whole Milky Way is trying to merge with all the rest of the matter in the observable Universe, but the cosmological expansion prevents it. But what drives the cosmological expansion? It is the energy which the radiation loses to redshift in its long traverse of the vast expanding spaces of the Universe. As every mechanic knows, if the hot gases lose their energy in the expansion of the cylinders of your car, then they drive that expansion. Similarly, if the radiation from the galaxies and stars loses its energy in the expansion of the Universe, then it drives that expansion.

But if the Universe is expanding, why doesn't its density decrease?

We see a Universe in which all the distant galaxies appear to be running away from us, and the farther away they appear to be from us, the faster they appear to be running away. Now this cosmological expansion, as it is called, imposes a boundary to the observable Universe at some fifteen billion light years away in every direction. Because beyond that border things would be receding at speeds in excess of the speed of light so that no messages, either electrical or gravitational, could be received by us. But if something is receding from us, its radiation will be redshifted to lower energy. And if its speed approaches the speed of light, the energy of its radiation will approach zero. But if the energy of the radiation is seen to approach zero, then the energy of the particles giving rise to that radiation must also be seen to approach zero. Now as Einstein pointed out in 1905, mass and energy are the same thing; so if the energy of the particles approaches zero, their mass must also approach zero. Now that raises the interesting question: can the particles cross the border? And the answer is no. Why? Because if the mass of the particles approaches zero, their momentum must also approach zero, and with it our uncertainty in that zero momentum. But we know from Heisenberg's uncertainty principle that if our uncertainty in their momentum approaches zero, our uncertainty in where they are must approach totality. The particles simply "tunnel" back into the observable Universe. That is why the density of the observable Universe does not decrease in spite of the fact that all the distant galaxies appear to be running away.

To the extent that the hydrogen (recycled from the borders of the observable Universe through Heisenberg's uncertainty principle) succeeds in condensing into stars, to that extent it radiates. And the final frustration is this: that the radiation arising from the success of gravitational collapse, losing its energy through redshifting in its long traverse of the vast expanding spaces of the Universe, drives that cosmological expansion.

As Walt Whitman says, "From every fruition of success shall come forth something to make a greater struggle necessary."

So cheer up! Even gravity can't win it in the end.

GEOMETRY

In order that we could see a Universe spread out before us, *without* a real separation between us and what we see, the "Exterior Decorator" invented a four-dimensional geometry. In that geometry space and time come in as a pair of opposites so that we can see things as if away from us in space by seeing them back in time. If we see an event as a light year away, we see it a year ago, and the away comes in squared with a plus sign and the ago comes in squared with a minus sign. So the total separation stands at zero.

We see a Universe spread out before us with zero separation between us and what affects us by gravity, and with zero separation between us and what we see.

In that geometry what is known in the trade as the speed of light is simply the ratio of space to time. One light year is equal to one year. And the total separation between the emission and absorption events for what are known in the trade as 'photons' and 'gravitons' is zero.

In the famous double-slit experiment the emission and absorption events of the 'photons' are adjacent in space-time. But this adjacency has two components, a space component and a time component. And if both slits are open for the space component, we see an interference pattern if we let a great many 'photons' go through. The wave aspect of light is in the space component.

If the double-slit experiment is done with electrons, where the emission and absorption events are *not* adjacent, we still get the interference pattern with both slits open because, once again, the space component of the assumed trajectory has both slits open.

In this geometry it is impossible to predict, in the double-slit experiment with both slits open, where, in the interference pattern, the absorption event will be found.

Is it possible that Heisenberg's Uncertainty Principle is simply a necessary consequence of the geometry? And, if so, is it possible that Pauli's Verbot is also a consequence of that four-dimensional geometry?

In that geometry we see a gravitational plurality against an electromagnetic duality, and they keep each other up. Heisenberg's Uncertainty Principle prevents the demise of the electrical duality in the hydrogen atom in the presence of the gravitational dispersion of the protons through space. And Pauli's Verbot prevents the gravitational collapse of the neutron stars in the presence of the spin duality of the neutrons.

Is it possible that the gravitational plurality and the electromagnetic duality are simply consequences of the geometry, and that as a further consequence, they keep each other up?

GEOMETRY 1905

Unlike Euclid's geometry, which was a theoretical geometry about a theoretical space which does not in fact exist, this is the geometry of what is known in the trade as the real world. This is the geometry that allows us to see, in space and time, that which is not in space and time and must therefore be Changeless (not in time), Infinite, and Undivided (not in space). This is the geometry that allows us to see that underlying existence *as if* in space and time.

In this four dimensional geometry the space separation between two events comes into Pythagoras' equation squared with a plus sign, but the time separation between those two events comes in squared with a minus sign; so that if the two are equal, the total separation between those two events stands at zero. In this geometry the space separation between two events is not objective, nor is the time separation, but the space-time separation between any two events is still objective. Four-dimensional addresses (here-now or there-then) are objective, and the space-time separation between them is also objective.

In this geometry we see the underlying existence spaced out as a gravitational plurality, and spaced in as an electromagnetic duality, and they keep each other up.

Gravity, Electricity, and Inertia as Cosmological Fossils

The Big Bang model compares the Universe to a raisin pudding in the oven. As the pudding gets bigger and bigger, the raisins get lonelier and lonelier; so if you come too late for dinner, you'll get only one raisin to a spoon. The Steady State people thought it might be more like a barber-pole that keeps on going up but never reaches the eaves. In their model, as the raisins get lonelier and lonelier, new raisins spring up in between; so no matter how late you come for dinner, you'll get three raisins to a spoon. But the Big Bang people complained, "Where did you get those new raisins?" And the Steady State people replied, "Where did you get *your* raisins?" This is indeed a problem if the Universe is "actual."

Both Quantum Mechanics and Relativity allow the suggestion that world which we see may possibly be "apparitional" rather than "actual"; as when a rope is mistaken for a snake. The snake may be said to be "apparitional" and not "actual".

At the risk of following Alice in Wonderland down the rabbit hole, let us speculate that energy, and therefore the observable Universe, may not be "actual" (that is, arising from a process in physics.) If the raisins are "apparitional" and not "actual" our problem becomes very much simplified.

In the four-dimensional geometry of Einstein's Special Theory of Relativity, space and time come in as a pair of opposites, so that the separation between the Perceiver and the Perceived goes to zero. That immediately suggests that seeing the Universe in space and time may be suspect. Further, Heisenberg's Uncertainty Principle imposes a necessary uncertainty in what we see *in space and time*, just as there is a necessary uncertainty in Alice's rabbit, or in the snake for which a rope has actually been mistaken.

Although it may seem outlandish to suggest that the Universe might be "apparitional" rather than "actual", it is only the consequences of this speculation to our physics that are of interest here. Could this idea help to explain anything that needs to be explained, and could it predict any measurements which we could make? If we posit an existence not seen in space and time then what would be the characteristics of such an existence. It what way could these characteristics be expected to show up in our physics?

If we are willing to accept negative statements, the characteristics of such an existence can immediately be stated. Since dividedness and smallness can be seen **only in space**, that which is not in space would have to be *undivided and infinite (unbounded)*. And since change can be seen **only in time**, that which is not in time must be *changeless*. If then, we follow Alice down the hole and speculate that we may have mistaken the undivided, the infinite, the changeless for something else, then that else would have to be divided, finite, and changing. That might help explain why what we see as matter is widely dispersed through space, divided into atoms, is made of minute particles and is continually changing.

Why should the dispersed particles fall together by gravity? Could gravity be the Undivided seen in the (apparitional) appearance of division?

Why should the minute particles be electrical? Could the electrical charge on the particles be the Infinite seen in the (apparitional) appearance of smallness?

Why should the changing resist every change in its state of motion? Could inertia be the Changeless seen in the (apparitional) appearance of change?

Could it be that the characteristics of what we have mistaken for the Universe must show up in our physics, just as the length and diameter of a rope show up as the length and diameter of the snake for which it has been mistaken?

Could this be why matter shows gravity, electricity, and inertia?

Within the framework of the cosmological models which have taken the Universe to be "actual", the origin of gravity, electricity, and inertia has never seen a clear solution. But if energy, and therefore the Universe, is "apparitional", and if, as we have speculated, we have mistaken the *undivided*, the *infinite*, the *changeless* for something else, then the problem of origins becomes very much simplified. For then gravity, electricity, and inertia would be like cosmological fossils. They would simply be the characteristics of what, through apparition, we see in space and time as the Universe. They would appear as fossils of those characteristics seen in our physics.

If the *undivided* is seen (misperceived) as dispersed through space then the *undivided* could show up in that space appearing as gravity, just as the length of our rope shows up as the length of our apparitional snake. And if the *infinite* is seen as minute particles, then the *infinite* could very well show up as the electrical charge of those particles, just at the diameter of the rope shows up as the diameter of the snake. And if the *changeless* is seen as changing, then the *changeless* could show up in our physics appearing as inertia.

The universe appears to be a perpetual motion machine. But perpetual motion machines are forbidden by our physics unless, that is, we allow that the first cause of our physics might be apparitional. Then that problem disappears, and the universe is seen to be wound up by apparition to $9x10^{17}$ joules/kilogram. It is wound up to $9x10^{17}$ joules/kilogram ($9x10^{23}$ ergs/kilogram) against its tendency toward undividedness, which we see as gravity. It is similarly wound up to $9x10^{17}$ joules/kilogram against its tendency toward infinitude, which we see as electricity, and against the Heisenberg Uncertainty Principle because we can know where things are in space and time. These would be like the two sides and the edge of the same coin. They are all related to seeing things in space and time. Only if our uncertainty in their space-time positions went to infinity could their momenta and their energies go to zero.

This speculation suggests that energy is apparitional, that only its changes could be actual. They arise by transformations of that energy from one form to another without any change in the amount. It further suggests that the Conservation laws might be apparitional. In order that the observable universe should represent zero change in the changeless, it should appear as pairs of opposites – time against space, gravity against electricity, plus against minus, momentum to the right against momentum to the left, and spin-up against spin-down.

In addition to suggesting an origin for gravity, electricity, inertia and the Conservation laws, this speculation also makes several predictions regarding physics and cosmology.

First, the Universe cannot have arisen "through random fluctuations in nothingness", as has been recently suggested, or the physics of the Universe would be different. The particles would not be electrical. It must instead have arisen from the Infinite, but not as an event in time. Since time is part of the Universe, the Universe cannot have arisen as an event in time.

Secondly, the cosmological expansion rate cannot exceed escape velocity. Otherwise there would be a dispersional energy unbalanced by its opposite. A dispersional energy unbalanced by the condensational energy of gravity would represent a "real" change in the changeless.

Thirdly, the protons should not decay. If hydrogen is the primordial apparition, then neither the electrons nor the protons should decay.

There is another consideration which might be worth mentioning. It concerns the conditions near the border of the observable Universe. Although we speculate that the "existence" underlying the Universe must be Infinite, the Universe itself must be finite, even though the border may be unreachable. Such a border is implied by the cosmological redshift. But this redshift also implies a low energy and therefore, low mass for the particles seen near the border. This low mass, through the Uncertainty Principle, should allow the particles seen near the border to tunnel back in. If the mass of a particle near the border is seen to approach zero both its momentum and our uncertainty in that momentum will be seen to approach zero. As a result our uncertainty in its position must approach infinity. This might account for the hydrogen needed in the Steady State model to balance the cosmological expansion.

This low mass also implies a 3°K background radiation even for the Steady State cosmology, since radiation moving through the low mass particles near the border will be so often picked up and reradiated that it will become thermalized to 3°K.[1] The amount of radiation thus predicted is much less than that predicted by the Big Bang model, and it is much closer to the actual measured amount.[2]

John L. Dobson
September 23rd 1986

---

[1] Sir Fred Hoyle, ***"The Origins of the Universe"***, a lecture, 1975.
[2] Sir Fred Hoyle, ***The Intelligent Universe***, Holt, Rinehart and Winston, 1983, p. 181.

GRAVITY, ELECTRICITY and INERTIA as COSMOLOGICAL FOSSILS

The big bang model compares the universe to a raisin pudding in the oven. As the pudding gets bigger and bigger, the raisins get lonelier and lonelier; so if you come too late for dinner, you'll get only one raisin to a spoon. The steady state people thought it might be more like a barber-pole that keeps on going up but never reaches the eaves. In their model, as the raisins get lonelier and lonelier, new raisins spring up in between; so no matter how late you come for dinner, you'll get three raisins to a spoon. But the big bang people complained, "Where did you get those new raisins?" And the steady state people complained, "Where did you get *your* raisins?" That is indeed a problem if the universe is actual.

But both quantum mechanics and relativity allow the suggestion that the world which we see may possibly be apparitional rather than actual, as when a rope is mistaken for a snake, the snake may be said to be apparitional. At the risk of following Alice in Wonderland down the rabbit hole, let us speculate that energy, and therefore the universe, may not be actual. If the raisins are apparitional, our problem becomes very much simplified.

In the four dimensional geometry of Einstein's special theory, space and time come in as a pair of opposites, so that the separation between the perceiver and the perceived goes to zero, and that immediately suggests that seeing the universe in space and time may be suspect. And Heisenberg's uncertainty principle imposes a necessary uncertainty on what we see *in space and time*, just as there is a necessary uncertainty in Alice's rabbit, or in the snake for which a rope has been mistaken.

Although it may seem outlandish to suggest that the universe might be apparitional rather than actual, it is only the consequences of this speculation to our physics that are of interest here. Could it help to explain anything that needs to be explained, and could it predict any measurements which we could make? If we posit an existence not seen in space and time, then what would be the characteristics of such an existence, and in what way could they be expected to show up in our physics?

If we are willing to accept negative statements, the characteristics of such an existence can immediately be stated. Since dividedness and smallness can be seen only in space, that which is not in space would have to be *undivided and infinite (unbounded)*. And since change can be seen only in time, that which is not in time would have to be *changeless*. If then, we follow Alice down the hole and speculate that we may have mistaken the *undivided*, the *infinite*, the *changeless* for something else, then that else would have to be divided, finite and changing. That might help to explain why what we see as matter is widely dispersed through space, divided into atoms, made of minute particles and continually changing. But why should the dispersed particles fall together by gravity? Could gravity be the *undivided* seen in the appearance of division? And why should the minute particles be electrical? Could the electrical charge on the particles be the *infinite* seen in the appearance of smallness? And why should the changing resist every change in its state of motion? Could inertia be the *changeless* seen in the appearance of change? Could it be that the characteristics of what we have mistaken for the universe must show up in our physics, just as the length and diameter of a rope show up as the length and diameter of the snake for which it is mistaken? Could it be that that is why matter shows gravity, electricity and inertia?

Within the framework of the cosmological models which have taken the universe to be actual, the origin of gravity, electricity and inertia has never seen a clear solution. But if energy, and therefore the universe, is apparitional, and if, as we have speculated, we have mistaken the *undivided*, the *infinite*, the *changeless* for something else, then the problem of origins becomes very much simplified. Then gravity, electricity and inertia would be like cosmological fossils. They would simply be the characteristics of what, through apparition, we see in space and time as the universe. They would be like fossils of those characteristics seen in our physics. If the *undivided* is seen as dispersed through space, then the *undivided* could show in that space as gravity, just as the length of our rope shows up as the length of our apparitional snake. And if the *infinite* is seen as minute particles, then the *infinite* could very well show as the electrical charge of those particles, just as the diameter of the rope shows as the diameter of the snake. And if the *changeless* is seen as changing, then the *changeless* could show in our physics as inertia.

The universe appears to be a perpetual motion machine, but perpetual motion machines are forbidden by our physics, unless we allow that the first cause of our physics might be apparitional. Then that problem disappears, and the universe is seen to be wound up by apparition to $9x10^{17}$ joules/kilogram against its tendency toward undividedness, which we see as gravity, against its tendency toward infinitude, which we see as electricity, and against the uncertainty principle, because we can know where things are in space and time. These would be like the two sides and the edge of the same coin. They are all related to seeing things in space and time. Only if our uncertainty in their space-time positions went to infinity, could their momenta and their energies go to zero.

This speculation suggests that energy is apparitional, that only its changes could be actual. They arise by transformations of that energy from one form to another without any change in the amount. It further suggests that the conservation laws might be apparitional. In order that the observable universe should represent zero change in the changeless, it should appear as pairs of opposites, time against space, gravity against electricity, plus against minus, momentum to the right against momentum to the left, and spin-up against spin-down.

In addition to suggesting an origin for gravity, electricity, inertia and the conservation laws, this speculation makes several predictions regarding physics and cosmology.

First, that the universe cannot have arisen through random fluctuations in nothingness, as has recently been suggested, or the physics would be different. The particles wouldn't be electrical. It must instead, have arisen from the infinite, but not as an event in time. Since time is part of the universe, the universe cannot have arisen as an event in time.

Secondly, that the cosmological expansion rate cannot exceed the escape velocity. Otherwise there would be a dispersional energy unbalanced by its opposite. A dispersional energy unbalanced by the condensational energy of gravity would represent a real change in the changeless.

Thirdly, that the protons should not decay. If the hydrogen is the primordial apparition, then neither the electrons nor the protons should decay.

There is another consideration which might be worth mentioning. It concerns the conditions seen near the border of the observable universe. Although we speculate that the existence underlying the universe might be infinite, the universe itself must be finite, even though the border may be unreachable. Such a border is implied by the cosmological redshift. But this redshift also implies a low energy, and therefore a low mass, for the particles seen near the border. This low mass, through the uncertainty principle, should allow the particles seen near the border to tunnel back in. If the mass of a particle near the border is seen to approach zero, both its momentum and our uncertainty in that momentum will be seen to approach zero. Then our uncertainty in its position must approach infinity. This might account for the hydrogen needed in the steady state model to balance the cosmological expansion.

This low mass also implies a 3K background radiation even for the steady state cosmology, since radiation moving through the low mass particles near the border will be so often picked up and re-radiated that it will come in thermalized to 3K. The amount of radiation thus predicted is much less than that predicted by the big bang model, but it is much closer to the measured amount.

John L. Dobson
September 23rd 1986

1600 Baker Street
San Francisco CA,
94115 415/567-2063

HISTORY 1803

By John Dobson
Published 2004-10-22 13:37:29
From 2004
Read comments on this article

A few thousand years back, in India, we had the old five element theory in Sanskrit. Those elements were five forms of energy perceivable by our five senses. But when that notion on to Greece around 600 BC, the Sanskrit was very badly translated and it was thought that the five elements were five "things" like earth and water, fire and air. But the Sanskrit cannot be translated that way. Vayu means wind, not air, and Tejas means that which shines, not fire. Agni means fire.

In 1803 and English chemist, John Dalton, borrowed the word elements from the older theory because "The alchemists couldn't show their ware," and used it as we use it now for the chemical elements of the atomic table.

In 1805 another chemist, Prout, noticing that the atomic weights went up stepwise, suggested that all the chemical elements were made of hydrogen. That was some sixty years before we had the atomic table, and it was more than a hundred years before we knew that one chemical element could be made into another.

When I was kid in the 1920s it was still taken for granted that the chemical mix of the Universe had been given at the time of creation, if there was a creation, or had been around forever, if there was a forever. No one thought then that the other chemical elements could have been made from hydrogen.

By 1930 we knew that the chemical mix of the Universe was changeable, and the Big Bang cosmologists thought they could get the mix from the Big Bang. But they couldn't. Then, in the 1950s, M. Burbidge, G. Burbidge, Fowler and Hoyle wrote a paper on the "Synthesis of Elements in Stars." They pointed out that in smaller stars like our Sun the hydrogen is fused first to helium, then to carbon and oxygen. But in larger stars, where the temperature is higher, the fusion continues through silicon, sulfur, etc. to iron which collapses to a neutron star with such a release of energy that the outer portions of the star are blown away. The heavier elements are made in the supernova explosion itself, and are also scattered far and wide.

By then the European physicists knew that the physical Universe is made out of hydrogen. But no one knew where the hydrogen came from. The Big Bang people wanted to get hydrogen from the Big Bang, but they had no source for that. The Steady State people wanted to get the hydrogen from the "C field," but they had no source for that.

If we want to understand the origin of the hydrogen we'll have to go back again to those old physicists in India. They said there has to be, underlying what we see, and existence not in time and space, changeless, infinite and undivided. If, my mistake, we see that as in time and space, the changeless, the infinite, the undivided must show through in what we see. You can't mistake your friend for a ghost without seeing your friend. As I see it, the changeless shows through in physics as inertia, and the infinite and undivided show through as the electrical and gravitational energies.

Those old physicists said the Universe is made of energy. I think that that energy shows through in the physical world as hydrogen and what it does. It's not as though the physical world is made of something else.

Those old physicists spoke of three spaces, the Consciousness Space, the Mind Space, and the Great Space. As I see it Shiva-Shakti represents the perceived in the Consciousness Space where there is on a duality, the perceiver and the perceived. The Mind Space I take to be the genetic space where we are involved in a plurality of interpersonal relationships. The Great Space I take to be the space of our physics where we see an electrical duality against a gravitational plurality, without being involved in either one.

It's only the physical world in the Great Space that's made of hydrogen. And there, in the Great Space, only the hydrogen arises by Vivarta, by the mistake. Everything else in the physical world arises from that hydrogen by Parinama, by transformational causation. Chevies don't arise by Vivarta, they come from Detroit.

John Dobson

Hollywood, 2004

For Swami Swahananda

HISTORY 1803

A few thousand years back, in India, we had the old five element theory in Sanskrit. Those elements were the five forms of energy perceivable by our five senses. But when that notion went on to Greece around 600 BC, the Sanskrit was very badly translated and it was thought that the five elements were five "things" like earth and water, fire and air. But the Sanskrit cannot be translated that way. Vayu means wind, not air, and Tejas means that which shines, not fire. Agni means fire.

In 1803 an English chemist, John Dalton, borrowed the word elements from the older theory because "The alchemists couldn't show their ware," and used it as we use it now for the chemical elements of the atomic table.

In 1805 another chemist, Prout, noticing that the atomic weights went up stepwise, suggested that all the chemical elements were made of hydrogen. That was some sixty years before we had the atomic table, and it was more than a hundred years before we knew that one chemical element could be made into another.

When I was kid in the 1920s it was still taken for granted that the chemical mix of the Universe had been given at the time of creation, if there was a creation, or had been around forever, if there was a forever. No one thought then that the other chemical elements could have been made from hydrogen.

By 1930 we knew that the chemical mix of the Universe was changeable, and the Big Bang cosmologists thought they could get the mix from the Big Bang. But they couldn't. Then, in the 1950s, M. Burbidge, G. Burbidge, Fowler, and F. Hoyle wrote a paper on the "Synthesis of Elements in Stars." They pointed out that in smaller stars like our Sun the hydrogen is fused first to helium, then to carbon and oxygen. But in larger stars, where the temperature is higher, the fusion continues through silicon, sulfur, etc. to iron which collapses to a neutron star with such a release of energy that the outer portions of the star are blown away. The heavier elements are made in the supernova explosion itself, and are also scattered far and wide.

By then the European physicists knew that the physical Universe is made out of hydrogen. But no one knew where the hydrogen came from. The Big Bang people wanted to get hydrogen from the Big Bang, but they had no source for that. The Steady State people wanted to get the hydrogen from the "C field," but they had no source for that.

If we want to understand the origin of the hydrogen we'll have to go back again to those old physicists in India. They said there has to be, underlying what we see, and existence not in time and space, changeless, infinite, and undivided. If, by mistake, we see that as in time and space, the Changeless, the Infinite, the Undivided must show through in what we see. You can't mistake your friend for a ghost without seeing your friend. As I see it, the Changeless shows through in physics as inertia, and the Infinite and Undivided show through as the electrical and gravitational energies.

Those old physicists said the Universe is made of energy. I think that that energy shows through in the physical world as hydrogen and what it does. It's not as though the physical world is made of something else.

Those old physicists spoke of three spaces, the "Consciousness Space", the "Mind Space", and the "Great Space". As I see it Shiva-Shakti represents the perceived in the Consciousness Space where there is on a duality, the perceiver and the perceived. The Mind Space I take to be the genetic space where we are involved in a plurality of interpersonal relationships. The Great Space I take to be the space of our physics where we see an electrical duality against a gravitational plurality, without being involved in either one.

It's only the physical world in the Great Space that's made of hydrogen. And there, in the Great Space, only the hydrogen arises by Vivarta, by the mistake. Everything else in the physical world arises from that hydrogen by Parinama, by transformational causation. Chevy's don't arise by Vivarta, they come from Detroit.

John Dobson, Hollywood, 2004

For Swami Swahananda

HOW MUCH ARE WE WILLING TO TAKE FOR GRANTED?

Newton's laws of motion take inertia for granted. Quantum Electrodynamics takes the electrical charge for granted. Gravitational theory takes gravity for granted. And the currently "orthodox" cosmology takes the Big Bang for granted.

But how much are we willing to take for granted? Why should matter show inertia? What is it that it should resist every change in its state of motion? And why should the miniscule particles be electrical and fall together by gravity? On what grounds can we take all this for granted?

The currently popular Big Bang cosmology seems to take for granted that in the absence of the Universe, and in the absence of space and time, there would be nothing. But is it a warranted assumption? That is the question which I asked Allen Sandage at Pomona in the summer of 1987. I suggested that it seems warranted to assume that in the absence of time there would be an absence of change. And the in the absence of space there would be an absence of smallness and dividedness. But that leaves the possibility that underlying what we see there might be the changeless, the infinite, the undivided – which seems a long way from nothing,

Sandage was unwilling to discuss the problem; so we let the matter drop. But several months later, when Stephen Hawking was in Berkeley, I had the opportunity to him whether he thought there was any observational evidence on one side or the other. He replied that he wasn't sure that it was a meaningful question. However I do think it is a meaningful question, and that the evidences are there in our physics. I further think that the only reason we don't see these things as evidence is because they are the very things we have taken for granted.

I see inertia as evidence that the changeless underlies what we see. I see electricity and gravity as evidence that it is also infinite and undivided.

Please note that I have made no supposition as to what it might be; only what it might not be if not in space and time.

John L. Dobson
May 5th 1988

HOW MUCH ARE WE WILLING TO TAKE FOR GRANTED?

Newton's laws of motion take inertia for granted. Quantum electrodynamics takes the electrical charge for granted. Gravitational theory takes gravity for granted. And the currently "orthodox" cosmology takes the Big Bang for granted. But how much are we willing to take for granted? Why should matter show inertia? What is it that it should resist every change in its state of motion? And why should the minuscule particles be electrical and fall together by gravity? On what grounds can we take all this for granted? And the currently popular Big Bang cosmology seems to take for granted that in the absence of the Universe, and in the absence of space and time, there would be nothing. But is it a warrented assumption? That is the question which I asked Allen Sandage at Pomona in the summer of 1987. I suggested that it seems warrented to assume that in the absence of time, there would be the absence of change, and that in the absence of space, there would be the absence of smallness and dividedness. But that leaves the possibility that underlying what we see there might be the changeless, the infinite, the undivided, which seems a long way from nothing. Sandage was unwilling to discuss the problem; so we let the matter drop. But several months later, when Stephen Hawking was in Berkeley, I had the opportunity to ask him whether he thought there was any observational evidence on one side or the other. He replied that he wasn't sure that it was a meaningful question. However I think it is a meaningful question, and that the evidences are there in our physics. I further think that the only reason we don't see these things as evidence is because they are the very things we have taken for granted. I see inertia as evidence that the changeless underlies what we see, and I see electricity and gravity as evidence that it is also infinite and undivided. Please note that I have made no supposition as to what it might be; only what it might not be if not in space and time.

John G. Dobson
May 5th 1988