

Relativity - The Special and General Theory

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In physics books Albert Einstein's theory and Lorentz's hypothesis are often treated as being together parts of one idea. This is odd, as they were each working separately towards differing ends. Einstein worked to modify the apparent speed of light as it was transmitted perpendicular to the direction of travel to make predictions that would come of his principle of the constancy of the speed of light; while Lorentz worked to develop some compensatory idea to the apparently failed Michelson and Morely experiment.

In the classical thought experiment Einstein deals with the vertical; while Lorentz deals with the horizontal. Einstein modifies time; while Lorentz modifies length. This may seem unintegrated. Wouldn't time dilation affect all light transmitted through our frame of reference such as that light transmitted along the line that is the direction of travel? Couldn't there be a modifier of the width of our frame of reference? Might a set of equations including all possible variables yield new solution sets?

The reverse calculation of Einstein's time dilation formula is as follows:

$$t=(1-v^2/c^2)^{1/2}$$

square

$$t^2=1-v^2/c^2$$

multiply by c^2

$$t^2c^2=c^2-v^2$$

add v^2

$$(tc)^2+v^2=c^2$$

It is clear that Einstein started out with a pythagorean triangle where tc is one vector, v is the additive vector perpendicular to that, and that c is our resultant hypotenuse vector.

One might add a vertical modifier to the equation; and then, come up with two more equations that describe light traveling in other directions. I came up with two equations: one describing light transmitted back to front, the other describing light transmitted front to back; much as Lorentz did, only describing the vectors of light on both legs of their journey in the Michelson and Moorely experiment. The equations are as follows:

$$txc+v=c \text{ and } txc-v=c \text{ (or } txc+v \cos \pi =c)$$

It shouldn't take one long to see that these equations are complete nonsense. This becomes clear when you subtract txc from each equation and put them together.

$$+v=c-txc=-v$$

The only conceivable way that $+v=-v$ is that $v=0$. We observe particles in motion all the time. Indeed in the cumulative experience of physical science a particle coming to full stop for any duration is unknown (though

instantaneous stopping is common enough). One might suppose that our frame of reference is going both ways at once. Maybe in diverging alternate universes all moving objects are each going in every possible direction in every possible universe in some eccentric quantum Brownian motion. But, even alternate universes must conform to universal laws. If an object must go both forwards and backwards, it must do both in every possible world.

This bizarre twist can be better explained by exploring a more general geometric description of light. Einstein dealt only with the vectors of light on a line perpendicular to our velocity vector. Lorentz's scope was more unspecific. He sought a hypothesis that allowed light to travel from point A to point B and back in the time expected along the line of our velocity vector; never mind what light did along the way.

Imagine a circle with radius c . This circle represents every possible vector of light in all directions, in a frame of reference that is not moving relative to the space the light is being transmitted through (in reality a sphere would be more appropriate, but it's easy to imagine that this circle is a cross-section of our sphere). The tail of every light vector would be on the origin (the tails of vectors in this thought experiment unless said otherwise are on the origin). Each point of the perimeter of our circle is the head of a possible vector of light.

Imagine a new frame of reference that our first frame of reference has a relative velocity to, described by the velocity vector v . Our circle describing the apparent velocities of light would be modified additively by the velocity vector. (We'll get to modifying the resultant circle in other ways later in the paper, for now sticking to a purely Galilean relativity.) Our new resultant circle from the perspective of the second frame of reference would be centered on the head of the velocity vector.

For Einstein's principle of the constancy of the speed of light to be right there would have to be a way to modify the second circle such that all points on its perimeter would intersect with all points on the perimeter of the first circle. (In this case as it often is in geometry intersection is equivalency.) One could stretch the circle vertically (width) or horizontally (length); one could compress it vertically or horizontally, one could modify the apparent radius (time); but unless there is some unknown physical phenomenon one could not modify it subtractively.

One simply could not do it without entirely ignoring motion, because of the equivalency of commutation. That is, if one function is as $f(x)$ for all values x and another equals that function for all values x , that function must be as $g(x)$ for all values x , therefore these functions are essentially the same function. In less mathematical terms: in order for one to say "the first frame of reference is not moving, and the second frame reference is just the same" the second frame of reference as well must not be moving. This just brings us right back to the problem that $v \neq 0$.

So what would Einstein and Lorentz's transformations have done to modify the resultant circle, if not intersect the whole perimeters altogether?

Modifying the resultant circle with Einstein's formula would, not surprisingly, diminish the circle so that it is smaller and smaller until finally as the velocity vector's head intersects the perimeter of the first circle the resultant circle disappears altogether. (How big is a circle with an imaginary number for a radius?)

Modifying the resultant circle with Lorentz's transformation would compress it to form an ellipse. The ellipse would become thinner and thinner, exactly as the diameter of the circle as modified by Einstein's transformation shrank, until it thins to a line and disappears altogether, just as the head of the velocity vector intersects with the perimeter of the first circle.

It's worth pointing out, that modifying the apparent speed of light in both cases would have light apparently going both faster **and** slower than itself. Indeed by Einstein's transformation one would have exactly half the light going slower than light, and the other half going faster than light. This is because by Einstein's transformation the resultant circle's top and bottom are the two points that always intersect the first circle.

The congruency of the contraction by both transformations is also worth considering. It seems this congruency is due to the mathematical similarity of the formulas themselves. I have no reason to suppose that this isn't any more than a coincidence. Remember, Einstein and Lorentz were working separately towards differing ends. When Einstein learned of Lorentz's work he replied, I would say almost dismissively, that Lorentz's work supported his own. The similarity of formulas, and the end result described by the formulas as one approaches the speed of light, could not have helped any confusion that came as a result.

And yet, it almost seems that it should've been obvious that these two works were unrelated. According to Einstein, Lorentz's formula is just saying what his formula says in a different way. Yet, Einstein's formula modifies time; while Lorentz's formula modifies length. I know that Einstein's other theory of relativity states that time and space are together dimensions of this universe. I'm sure that could not have meant that dimensions could be used interchangeably. I know that when I'm driving down the road I do not sometimes, without warning, find myself driving into the sky!

And, there's still one final point to consider. Note the two points where the resultant circle modified by Einstein's transformation intersects the first circle. We have the velocity vector v . The distance from the origin to that point, as it is for every point on the first circle's perimeter, is the circle's radius, or the light vector c . The distance from the head of the velocity vector is the radius of the first circle modified by Einstein's formula, or the light vector tc . Do you recognize this triangle? Remember that intersection is equivalency. This triangle is the very same triangle that Einstein used for his formula.

It is perhaps an irony that these are the only vectors where the principle of the constancy of the speed of light by Einstein's transformation does hold true. And yet, it is not an irony at all, when one considers that this is the one point where there should be equivalency. Einstein's formula pretty well forced it to be that way.

What about Lorentz? I don't actually have any reason to think he was wrong. Although, if he was right it wouldn't be to his credit; as starting out with one's conclusions already made and writing formulas that would conform to such conclusions, the way faux building fronts fit in westerns; is exactly the wrong way to do science. That is truer when the science itself is in its infancy.

You may be thinking, how could Einstein, one of the, if not **the** smartest man in history, be wrong? How could such a mistake be missed for nearly a century? How could the SRT, and the principle of the constancy of the speed of light be wrong?

Einstein declared that the speed of light is constant. As we shall see he did not just arbitrarily make this declaration. There was an accumulation of errors that made this misdeclaration possible.

As for the validation of this mistake by the physics community... I'd accuse my colleagues of stupidity, but that at least seems improbable. It may just boil down to few having the initiative to review let alone challenge the theory. The last bunch that I know of, that challenged the theory was a bunch of Nazis, who were acting with Hitler's sanction, for a motive that was very clearly not in the interest of science. Remarkably, Einstein's response was that if they could prove him wrong they wouldn't need a committee of a dozen scientists to do it, all it would take is one man. (And, now here's little ol' me.)

I think I've done enough in this paper to show that the SRT is wrong, but the principle deserves some attention. If Einstein hadn't declared that the speed of light is constant, would there be anything in this world to make you think so? Anything at all?

You might wonder, on the other hand, is there anything to make me think otherwise? Actually, there is: Doppler shift. We know if stars are coming or going (and at what relative speed) because their spectrum is a little more red or blue than the spectrum of a star of that type should be. Did it not **ever** occur to you that that defies the principle of the constancy of the speed of light?

How can one's relative velocity manifest itself in a Doppler shift if the speed of light is never slower or faster than the constant? Shouldn't blue always be blue, and red always be red then? One explanation is that the speed of light itself doesn't change; that it is merely the wavelength modulated by the motion of the emitting body. But, in order for that to be so emitting bodies, at least, must not have constant relative speeds to light.

It's worth mentioning that more than once in this paper we will see the importance of color. You must understand that if you are moving towards an object it is more blue, and that if you are moving away an object it is more red; it is just as fair to say that the blue light is faster than the red light. Or, one can even say that color is light speed. Feel free to take the time to look around you while thinking about that. (This notion was originally dismissed because of observations of eclipses. Something I'll address later in the paper.)

Has it already been suggested that the spectroscopy of elements is due to the Doppler shift of sub-atomic particles

as the light is being emitted?

This leads right into the measurement of the speed of light. Over the years such measurements have gotten very precise. There have been some odd discrepancies in these measurements as methods have become more advanced. But these were easily dismissed as imprecision due to things like imperfect instruments and other things. Perhaps, they were too easily dismissed.

To my knowledge these measurements were of the speed of visible light only. This is very important, as visible light is a very limited band of the electromagnetic spectrum. Since the measurements would have been of the speed of light, which as I've written is the same as measuring the color, they were simply measuring the speed of white light (or a composite of light in that band). Later measurements used lasers to produce the light. Such light would have been even more limited in its band, so the precision of measuring the speed of light of that color would have been likewise greater. As should be plain, attributing the precision of these measurements to the refinement of instrumentation, though correct, misses something.

Now, to list the errors that led Einstein to believe the speed of light is constant. Though one could go as far back as letters written by Rev. James Bradley (or farther), it would be best to start with the minimum of emission. Unfortunately, I must address this matter as Albert Einstein mentioned it in his own work, however in the work of his that I used for this paper he neglected to reference it to a previous paper. And, I've had little success finding any other information on it. I know what it is at least.

It has been supposed that if the speed of light is not constant for all colors then when one object eclipses another there should be on the edge of the eclipsing object a rainbow of colors spectrometric of the eclipsed body. This would be because the tail end of the light rays emitted from the now obscured object would race each other to the observer, with light of the bluer colors *winning* the race.

It has been written that experiments to detect such a rainbow shade have "with great exactness" proved that the speed of light is the same for all colors. I couldn't agree less. The observations for the experiment were, to the best of my knowledge, never performed with any but eclipses by our own moon of our own sun. The speed of visible light is about 300,000 km/s. The distance from the moon to the earth is four light seconds, or 1.2 million km (which is important as it is a very short distance for light to travel, and a very long distance to make an arc as the moon travels in the sky). Compared to that, the speed of the moon in orbit relative to earth is a mere 36,000 mph. Even not counting the imposed limitation of the band of visible light, why would anyone think that these experiments would even work?

I really wish I had more research material on this experiment. I'm fairly certain supporters of the concept of the ether who were trying to discredit the Maxwellian model of light conducted the experiment. Naturally, such experimenters would be all too eager to count inconclusive results as being negative results. That taken into consideration it is something of an irony that Einstein would rely on this experiment for work on his own interpretation of the Maxwellian model.

(Although, one might presume that Einstein in support of Maxwell was perhaps attempting to compensate for this experiment, much as Lorentz attempted to compensate for the Michelson & Moorely experiment. Likewise, one might suppose that with Einstein and Lorentz being disciples of the opposing camps, Einstein would have found it very easy to dismiss Lorentz's work. Personally, I find the drama of this controversy, and the historical continuity of it up to this paper to be fascinating. It is perhaps an irony that the ether was finally discredited by Einstein's theory, which may in turn be wrong. Although I doubt that we'll see new interest in the ether concept since, as this paper will consider, the Michelson & Moorely experiment discredited the ether far better than Einstein could.)

The next error was made by Willem de Sitter. De Sitter predicted that if the speed of light was not constant, when observing cosmic bodies in motion, one would observe "whimsical apparitions" as these cosmic bodies would appear to be in more than one place at a time. He was part right.

The critical detail here is the speed of light of any one color is constant, but the speed of light varies from the light of one color to another. So visible light in general may take 4.1 years to travel from Alpha Centauri to here; but ultraviolet light might take 3.09 years, and infrared light might take 4.11 years to travel the same distance.

De Sitter himself would have largely been unaware of this effect manifesting itself in any way, because he used an optical telescope limiting him to observation of the visible spectrum only. Although, I must be careful here, as de

Sitter was a pioneer of photographic recording of astronomical observations. And, I can't help but wonder if his film might have exposed for light of a non-visible spectrum (as early films sometimes did).

In any event, the effect itself would've manifested itself not as a double (or quadruple?) image, but instead as the objects seeming to be out of focus. Although, since this effect is due to a spectroscopic parallax upon examination one might have noticed that the rainbow blurring occurred along the line of the stars motion only. If de Sitter noticed it at all, he could have easily dismissed this anomaly in his own observation and in the developed films as imperfections of instrumentation, atmospheric interference, some deterioration of the coherency of the image as the light itself was traveling across the void, or that being what the binary stars actually looked like.

It would be worthwhile to consider the Michelson & Moorely experiment, though that experiment didn't actually contribute to Einstein's own error as he rejected the idea of the ether. I could say that the limited band of visible light, and Doppler shifting of the light might have contributed to the negative result of the experiment. But, why bother? The light source, the mirrors, the illuminated screen, the medium the light was being transmitted through, and the observers were all stationary relative to each other, in that experiment. All it succeeded in doing was proving the concept of the ether wrong (still a worthwhile experiment for that). Although, if it was right, wouldn't we determine the cardinal directions simply by observing the Doppler shifting of light coming off of objects around us?

One final error is Einstein's own. A founding principle of Einstein's relativity, indeed the stated reason for the constancy of the speed of light, is that there is a transformative relativistic relationship between electric and magnetic fields. It was Maxwell who hypothesized that light is a curious self-sustaining ripple between electric and magnetic fields. Einstein believed that for these fields to maintain themselves exactly in the fashion such that they could be described as light their speed relative to the observer must be constant. Taking this and what I've written so far into consideration, I ask you is it good science to make such an assumption and bend the nature of time and space to conform to such a belief? What really then is the difference between Einstein and Lorentz?

Such rhetorical questions aside, the actual nature of electromagnetism must be addressed. Since the Special Theory of Relativity, electric and magnetic force have been lumped together as electromagnetic force, one of the four basic forces. Is this incorrect? No, actually.

Einstein was mostly right. The distinction between an electric field and a magnetic field is motion. But, it is not a valid description that electric fields in motion become magnetic fields, or that magnetic fields stilled become electric fields. The fault of Einstein's reasoning is thinking that electric and magnetic fields are different things that may transform one into the other. In actuality magnetism is an effect of an electric field in motion, or electrodynamicism. That is, if a computer simulation modeled the electric fields of charged particles in motion and their effects on other charged particles also in motion, an effect should be observed in the model exactly congruent with magnetism, as we know it.

But, such computer models have been rendered. Why then, have these models not doubled the magnetic force?

To understand what's missing here, one must first consider the vector mechanics of magnetic force versus other forces. Other force vectors are determined by their respective field lines. Their only interaction with the velocity vector is to modify it additively. Magnetic force vectors on the other hand are the products of the multiplication of the velocity vectors with magnetic force field vectors. While other forces are a straightforward cause and effect relationship from field to force to velocity, magnetism draws the affected particle's velocity and fields together in partnership. The implication of this is that magnetism is not just an electric field effect, but an electric field **feedback** effect.

More than that, magnetic fields are an effect of charged particles in motion. The basic model of these fields is field lines wrapped in circles around a charged particle and its velocity vector. The usual form of this in practice is charged particles moving in a circuit, either electrons rotating in their valence shells or an electric current being conducted through an electroconductive material, producing the typical toroidal magnetic fields.

This model and its results miss something. That something is relativity. Although the model is useful, it is not strictly correct to say the velocity of a charged particle produces magnetic force fields while the velocity of another interacts with these force fields to produce force, when the charged particles do not have separate absolute motions. (Notice that there being no absolute motion is one thing about which Einstein and I do not disagree.) Instead, these charged particles are **directly** interacting to produce magnetic force. That is, it is their relative velocity that is producing magnetic force.

To make it more clear why this is so important consider the basic model as we trade velocity between the two charged particles without changing their net relative velocity. If we diminish the velocity of the charged particle producing the magnetic field, the magnetic field will dwindle to nothing as the particle's velocity approaches zero. Though the affected particle's velocity will change as the velocity of the affecting particle's has decreased, its velocity multiplied by nothing will produce no force. Likewise, when the velocity of the affected particle decreases to nothing as the velocity of the affecting particle changes, the resultant change in the magnetic field multiplied by no velocity also produces no force.

The crux of this is that the event itself isn't changing, but the force produced varies according to the interpretation. This can not be taken as interpretations trading force exerted by one particle on the other for force exerted by the other particle on the one, as the two interpretations can also be treated as role reversals of the charged particles. Nor can it be supposed that magnetic force can be traded for electric force, since according to the conventional model the electric force exerted should be the same regardless.

(I would not take this as a vindication of the Special Theory of Relativity, or evidence of any kind of relativistic compensation formula. In order for that to be so the compensation would probably have to be the same for each interpretation as the unmodified force product is the same in both cases.)

Still this doesn't give a lot to go on on how to model magnetism correctly, or why we haven't simply stumbled onto the correct model. It is my belief that a true model of magnetism must take into account not just electric force and the relative motion of charged particles, but also the other three basic forces. What is needed here is a unified field theory. I guess a unified field hypothesis will have to do.

Let us imagine that charge is relative. That is, that neutrons are not strictly neutral as we know it, but are, just like the other sub-atomic particles, mutually repellant of each other, and at the same time mutually attractive with protons and electrons. One might expect that once this is done the basic forces as we know them would neatly fall into categories congruent with the charge relationships of sub-atomic particles (except for weak force).

But, this is not the case. Yes, electric force still repels protons and electrons from particles alike, and also attracts each to the other. Strong force can now be accounted for by the mutual attraction between protons and neutrons. And, gravity can account for the unaccounted extra margin of attractive force in general. But, what about the mutual repulsion between neutrons? And, how then could strong force possibly overcome the repulsion between protons **and** the previously unaccounted for repulsion between neutrons (that is why is it so **strong**)?

The answer is that the incremental charge difference between protons and neutrons is not the same as the charge difference between neutrons and electrons, it is different. Different enough to make the attractive force between protons and neutrons that much greater. Making strong force great enough to tightly bind protons and neutrons together in atomic nuclei. Moreover this would mean that the mutual attraction between neutrons and electrons would be that much less, which would help to explain why it has so far been overlooked.

One might even suppose that neutrons ironically are more negatively charged than electrons, as it seems that neutrons are more attracted to protons than electrons such that the stable atomic model is protons and neutrons in the atomic nucleus, rather than protons and electrons. This is not as straightforward as one might suppose. Firstly, there's the relationship between attractive and repulsive forces. It would be too much of a presumption to suppose that the net repulsive force is equal the net attractive force. In fact, gravity seems to make it plain that the net attractive force is just greater than the net repulsive force. And, I suspect, for reasons that I'll put forth later in this paper, that neutrons are not as repellant of each other as protons are of each other.

I feel it is funny that this would mean that we could now know all forces to be just one force. And, that rather than this force taking on some new exotic and strange form, the force that all forces really are is electric force.

Maybe now your thinking, *fine, first he writes the Special Theory is wrong and now he's just ignoring the General Theory*. Oh no, I'm getting to that right now. And no, I'm not about to write that it too, is wrong.

Let us imagine a horizontal plane, the kind used to describe the curvature of space-time. The horizontal axes of this plane may be treated as a representation of space, or if one might prefer space-time. The vertical axis represents the force field. This is the one mistake made of the interpretation of the General Theory. A gravity well warps time and space in only one direction. A force well may warp time and space either way, towards positive or negative charge.

As a particle is approached the strength of its electric field, or the depth of its force well increases inversely proportional to the square of the distance. The implication of this is that the depth of the force well plunges asymptotically as the distance to the particle approaches zero. The startling conclusion that one can draw from this is that all particles are singularities (or collections of singularities). It of course defies modern thought on black hole physics that this can be. And yet, I'm not too distressed with this, as for modern black hole physics to apply the Special Theory of Relativity would have to apply.

The description of charged particles as singularities in a bipolar charge scale implies to me the existence of two, and only two, elementary charged particles. It should be clear that if this is true then subatomic particles and quarks as well are heterogeneous conglomerations of these elementary charged particles. One consequence of this is that a sub-atomic particle's mutual repulsion with like particles depends on its composition of elementary charged particles. There is plenty more to consider about the nature of particles as singularities, but before that we must understand the nature of space-time and the force field.

Light is affected by gravity. As it is clear that amounts to a deformity in space-time affecting a ripple in space-time, space-time must be self-affecting. Space-time seems to have a curious elasticity. A disingenuous way of saying this would be to say space-time doesn't like to be curved.

The results of this are as follows. The default of undisturbed space-time is a flat plane. Disturbances in space are propagated as longitudinal waves. Singularities achieve their stability from somewhat imperfectly forming infinitely stretched cylinders. (These would of course actually be hyper-cylinders. And, I'm not at all certain about they're being stable forms. Wormholes, which will be discussed later, may be much more stable, and therefore the true stuff of matter.)

This is a little unsettling as this model fits for space, but time just doesn't seem to want to play by these rules. A disturbance in time doesn't propagate itself; it's just a feature of time. A singularity in time is less like a well, and more like a rift.

I think it's always been clear that there is something that distinguishes time from the other three dimensions, even if one didn't suppose that defied the General Theory. (Or is it just the Theory of Relativity now?) Although, I expect there will be considerable debate on the subject in any event, I think I have an explanation that is somewhat placating.

It may just be that time is more, I guess you could say, flexible than space. This paints a picture of time being the more accommodating dimension. That is, there is a certain amount of buckling and wrinkling in space-time, and these blemishes are displaced from space into time.

The model of space as a film has certain implications about the workings of the universe. First, this explains the attraction of unlike particles and the repulsion of like particles. When particles of unlike charge approach each other the space between flattens out, vertically yes, but it stills flattens. When particles of like charge approach each other space is curved between them. This curve becomes rather like a wound spring.

(One possibility that may come of this is that one way singularities may be formed endothermically from the bulge between the collision of multiple singularities of the opposite charge. Alternatively, singularities of like charge may collapse exothermically into fewer singularities. Which is more likely may depend upon the amount of slack there is in the space-time plane. That is, what amount of energy is there. This may be a kind of matter energy transformation. However, how common this transformation is and under what circumstances is less clear.)

Second, it is not matter that moves matter around. Indeed, matter is just there, a passive feature in the fabric of space-time. All motion is done in space-time, by space-time. For instance, gravity as we know it may be the universe's way of putting the clutter of matter aside to leave plain unwarped empty space.

Third, I'm sure you know the anecdote that we are mostly empty space. The reality is empty space is more something than matter is. That is, we are not empty space speckled with particles. What we are is the universe wrapped around bits of nothing.

Fourth, mass may in the strictest of terms be a meaningless concept. That is, a pharmacist can still measure out dosages on his scales with confidence that these measurements will be the same if measured here on Earth or on

Pluto. But, presuming that all singularities are the same, then there would be no quantifiable distinguishing characteristic, no additional value, between singularities as particles other than charge. That is, force is not the product of mass and acceleration, it just is.

It's the question *are all singularities the same of geometry?* that makes this difficult. I can't imagine that singularities can just vary in any fashion; otherwise I would expect our universe would not be organized according to any pattern. All would be chaos.

Singularities may vary according to circumstances. That is, they likely may conform to a standard geometry, but respond to the warping of space around them. One might expect such a happening to be only a momentary thing. However, a singularity could fall into a role, a role that between it and the singularity is mutually defining.

A model for space-time that I'm certain has already been considered is the space-time plane curving to form a sphere. This would seem to defy the universe's own rules on curvature, yet I would not suppose it to be beyond the realm of possibility. Why this is important to this paper is that would mean that singularities of one charge would be on the "inside track", while the opposite charge would be on the "outside track". This would mean there is **some** difference in geometry of singularities, although given the relative scale of the universe versus singularities it would be absurd to think this wouldn't be a negligible difference.

There's also the bottom-of-the-well problem. The easy out would be to say singularities stretch into infinity. (Of course, since singularities like the rest of space-time have a certain flexibility, that begs the question what happens when the lengths of wells cross and possibly get entangled?)

One might expect a singularity to collapse onto a line (a hyper-line?), which may immediately discontinue, making it a point actually. Alternatively, a singularity could continue a ways begin widening again and then open up on another space-time plane.

(In either case, this would mean force does not **exactly** equal the square of the inverse of the distance. I believe I heard somewhere that it has already been suggested that gravity is proportional to the inverse of **just** more than the square of the distance. There will be more on this later in the paper.)

A linked space-time plane may have other singularities on it of opposite charge. In practice, this other plane would not be an alternate universe or any such thing, to our perception. It would just mean that certain particles wouldn't interact with each other. This isn't such a difficult model of our world to imagine, with matter being an exotic heterogeneous substance. Plus, these interactions, although being very sophisticated in reality, would to appearances conform to bi-polar relationships.

The possibility that space-time planes may be stacked one over the other to no end, is another thing altogether. (What do you think? Would calling it the Baklava model of existence be too corny?) This would mean the particles that we know would be linked by association to near identical arrangements of particles on plane after plane, which would start looking like alternate universes the farther one roams from our plane. And yet, these universes wouldn't be very alternative. Everything you do would be mimicked by your alternates. Or not mimicked, the causality would be the same, and any divergence would through physics be brutishly forced to conform to its place.

Some or all singularities may instead of linking to another space-time plane loop back to our own space-time plane. (I guess that strictly speaking these would not be **singularities**.) Although, these would as described be the classical "wormholes", I'm not sure if they would be the long-as-the-universe-is-wide objects of suggestion.

I'm really not well prepared to consider this subject, as I know very little about hyper-dimensional geometry. (Though, up until this part of the paper the hyper-dimensional geometry has been simple enough that anyone with any understanding of geometry could understand it.) But, imagining the more conventional geometric representations (with an emphasis on **representations**, I know) of our wormholes, there are certain conflicting geometric interests.

The inside of the wormhole arch would seem to want to form as large a circle as possible. The outside of the wormhole arch would seem to want to form a flat plane. While the tube sections would seem to likewise want to form as wide cylinders a possible. And, all without disturbing the universal plane overly much. These "interests" (I can quote myself as a literary device, can't I?) may very probably balance out, for some optimal stable form.

It's this "balancing out" that may limit wormhole size. Also, the warping of space between openings and the overall warping of space proportional to their size makes it seem doubtful that large wormholes could exist without our noticing their effect on reality.

If wormholes exist, they would be most attracted end-to-end to wormholes of similar geometry and unlike charge. They would be most repelled by wormholes or true singularities with minimal openings of like charge approaching not end-to-end.

There you have it. That's my unified field hypothesis.

So, what are the consequences of all this, other than a sudden need to rewrite a lot of physics literature?

A very good start would be the matter energy transformation formula: $E=mc^2$. Before I get into this, it should be mentioned that Einstein's formula didn't make atomic energy. Radioactivity was an observed phenomenon before Einstein published in the *Annalen der Physik*. Einstein's formula was simply applied as an eagerly received explanation for radioactivity, and the energy produced by our own sun.

Some of you may be thinking, didn't you already explain this? The warping of space to trade between the existence of particles and energy may be matter energy transformation. But, I honestly don't think what we know is matter energy transformation.

I think a more likely explanation is simple enthalpy. That is, just as with chemical bonds, when atomic bonds are modified there is a certain energy differential.

And, why not? When it comes right down to it, the atoms that make up chemicals are made of the same stuff as the sub-atomic particles that make up those atoms. If an amino acid liberated from a protein shouldn't spontaneously transform into energy, why should a proton liberated from an atom? To say otherwise defies the principle of the conservation of matter. That is to say that matter is conserved, except when it's not.

There are certain implications of this. Like, for example, there can be both exothermic **and** endothermic atomic reactions. Any of you thinking about building a cold atomic bomb? (Then perhaps you'd nuke hell.)

With a clearer understanding of the relationship between the liberation of atomic energy and its byproducts one could refine the processes that produce atomic energy. One could use this working knowledge to make real the promise of safe atomic energy in our time. On the other hand, the woman of my dreams could spontaneously manifest herself out of a random convergence of quantum particles. In addition, one can imagine nuclear weapons further optimized to either maximize or minimize the area of leftover dangerous residual radioactive contamination.

Oh, but it doesn't end there. According to our astrophysics community our universe is between ten and 100 billion years old, with the most favored age being about 16 billion years of age. These estimates were figured by observing the most distant known bodies. It seems to me that this is a way of saying to the creationists *see the universe can't be only 6000 years old as these objects are such a distance away. And, it would take light at least this much time to travel this distance. So, the universe must be at least this old.*

Fine. We know the *least* how old the universe is. I'm afraid, if anything, that we've succeeded at grossly understating the age of the universe.

So, how much might we have understated the age of the universe? This is just conjecture, of course. But, if one supposes that cosmic bodies that are in general moving at about the same speed would take an amount of time to be organized into systems that is proportional to the size and complexity of the systems one might guess at a range for the age of these celestial systems. Our world is 4.5 billion years old. Our solar system may be about 12 billion years old. That age is already most of the time previously thought to be the age of the universe (the low end of the previous estimates even). One might increase the magnitude of that guess a notch and suppose the age of the Milky Way is 100 billion years, the upper end of the estimates mentioned earlier. Personally, for reasons I'll put forth later in this paper, I'd put the age of our galaxy at closer to 25 billion years. In any event, you can bet that the universe itself is older still.

When Stephen Hawking heard of the red shift of most observed galaxies he drew a natural series of conclusions.

First, the universe must be expanding. Second, the universe must be expanding from one point. With your pardon Dr. Hawking, but it seems to me that may be a bit of an assumption. (You may yourself be thinking *it's not like you haven't made your share in this paper*, and I don't deny that.) Still, you may not be that far off on the big bang.

So, some of you may be somewhat concerned by now. You may think *he was writing about atomic energy and then with no real segue or any warning he goes on a tangent about the beginning of the universe. What's all this got to do with atomic energy?*

Here's what. Roger Penrose wrote that once a star's fusion fuel was consumed it would continue to collapse into a singularity, or a "black hole". Maybe I'm missing something, but, by the same logic, shouldn't the moon crash into the earth, as the forces attracting the moon to the earth far surpass the forces repelling the moon from the earth? Ah well, that's less important than the fact that the assumption that the fuel would at some point be consumed is wrong. (Dr. Penrose, please, don't beat me up with a baseball bat. You're the only one I've so far written is wrong who can. And, I'm not sure that if the others could they wouldn't be lining up to do so.)

Consider that it has already been hypothesized that there may be an "island of stability" beyond the heavy elements. It may even be that there are what might be described as archipelagos or even continents of stability in the very high atomic numbered elements, making the periodic table of the elements a much more complicated and exotic table than previously supposed (as if it wasn't enough of either to begin with.)

What would happen to a star then, is once the fusion fuels we're familiar with have been consumed, the star would simply continue fusing into ever heavier and heavier elements. What would result would depend upon whether the continuing fusion would be endothermic or exothermic. The smart money is on the star collapsing into a super-hot exothermically fusing bright white star. The other possibility is the star collapsing into an endothermically fusing super-condensed frosty black dwarf, which would resemble a black hole; though it would not be a singularity, as described by Hawking and Penrose. For the rest of this paper I will call these stars monsters.

It is not clear to me what rule the state of monsters would follow. An unlikely possibility is monsters of one kind may be the rule, but they may co-exist with a minority of the other kind. Even if monsters of one kind are the rule, they may very probably occasionally flip states in a Jekyll and Hyde fashion for relatively brief periods of perhaps around a hundred million years, or so; as the fusion fuels within progress through the series of super-heavy elements. They may even maintain both endothermic and exothermic fusion simultaneously.

Stability of monsters would vary from one time to another with survivability bottlenecks in the course of their life were they may or may not survive, due to runaway fissioning, which I can not correctly call radioactivity, at least in the case of bright white monsters as that would be endothermic fission. Either a surplus of matter in the case of bright white monsters or a surplus of energy in the case of black dwarf monsters would catalyze this instability. This could result in a chain reaction, as the explosion of one monster would set off the explosion of another. Incidentally, monsters changing their state would very probably be at their most vulnerable then.

You may be wondering how can a bright white monster explode if the fissioning process for it is endothermic? The answer is Boyle's law. Nitroglycerin is not known for a high heat differential. Instead it is known for rapidly producing many moles for each one of its own. Fissioning monsters would make TNT going off look like an ant's breath by comparison. Although, the high pressures and the frigidty of the explosion making the bright white's plasma almost at war with itself would make the explosion violently dynamic like nothing in human experience.

All this suggests a cycle that paints a very different picture of the life of our universe. One can imagine starting with cosmic wind and dust condensing into stars. These stars slowly burn down to monsters, which occasionally collide with each other to form still more massive monsters (although bright whites probably wouldn't survive that). Eventually these monsters blow into cosmic wind and dust starting the cycle all over again.

Where can we see this cycle in action? A galaxy, from rim to core, is this process laid out before our eyes.

This may be a fair explanation for the horizon problem, why the universe has no end, no boundaries, nor periphery within the sight of our best telescopes. There may simply not be any such thing. I would compare the universe to an endless sea rolling with waves, with near empty void for troughs, and galactic cores for crests. And, the universe could be an endless sea in more than that sense. Without a beginning, as we know it, the universe is potentially ageless.

So, no big bang? Not quite. I don't know that there would be any reason for an upper limit on the size of monsters. The odds of a monster surviving to a certain advanced age and mass are as far as I know simply asymptotically diminished. So, it's not unreasonable to suppose that these galaxies expanding apart from each other are the debris of some rare monster of monsters.

As these galaxies expand they are each collapsing in on themselves. This may explain the ratio of the rotational velocities of the outer and inner parts of galaxies defying past expectations. Instead of the star systems and nebulae that make up galaxies orbiting in the circular or elliptical fashion as expected, they are actually trapped in a slow death spiral. Of course, I imagine it has already been hypothesized that the differences in rotational velocity may have something to do with the spiral of the galactic arms themselves. (And, let me make it abundantly clear that I do **not** suppose that the death spiral and the spiral arms are the same things.)

It should be clear why I think the galaxies are collapsing in on themselves; but that leaves alone how they are doing this. That is, how are the stars and nebulae losing the energy in their orbits? The short answer is condensation. Water vapor may condense into water droplets without a differential in the net energy because the condensing water is displacing its energy to the rest of the water vapor. This is the explanation for how cosmic dust condenses into accretion disks, and then planets. It is also the explanation for how cosmic wind and dust condenses into nebulae, and then stars. The gradual fall of stars into the core is simply a continuation of this process.

One might in turn wonder how it is the transfer of energy is possible in nebulaic plasma that are highly thermo-insulative materials, let alone between cosmic wind and dust and proto-planets that seem not to directly interact? One answer would be that all forces even those we think of as being direct interaction only forces act at distances.

But, the best answer would rely on gravity, the extra margin of force that acts at a distance. Consider the gravity slingshot concept. Also, consider that the same phenomenon in reverse can act as a brake. Gravity braked materials can transfer energy into a proto-planet. This energy can in turn be transferred to gravity slingshot materials. Some materials lose energy and condense, while others gain energy and disperse.

I wonder if this may in part be a contributing factor to the shape of galaxies as disks. For the condensation process to ideally progress, one might expect it would be best for the nebulae and stars of a galaxy to be adjacent to void. On the other hand, this would seem to be reversing the causality, wouldn't it?

Also, it would seem that this process of condensation would not be entirely constant. One might expect the motion of condensing stars to be uncontrolled, almost Brownian. This will be important later in the paper.

And, my figuring the age of our galaxy being about 25 billion years? If our galaxy progressively collapsing in on itself is really a fair description of its mechanics, one might expect our galaxy to be progressively older as one moves inward, somewhat like tree rings (only trees expand rather than shrink). The youngest parts of the galaxy only just recently condensed would be found in the peripheral regions. The age of the parts about halfway in would represent the average age of the galaxy. And, the oldest parts near death would be in the core. Our solar system, I understand is about halfway between the galactic core and rim. If our solar system's age of 12 billion years represents the average of the galaxy, which I suppose it does, then the age of the oldest parts of our galaxy would be perhaps about twice that, or 25 billion years. Additionally, 25 billion years is an age that I feel meshes well with the age that I expect monsters would have when they go to the core to die.

Aside from listing suggested methods to verify what I've written, that's all I have to write on atomic energy and the life of the universe.

Now, imagine a horizontal plane. This plane is the surface of a transparent medium, of a uniform density. As light approaches this medium from above its velocity is modified by the gravitational attraction of the medium. This attraction affects light's velocity relative to the surface only. Also, the cumulative force is dependent on the density and the Δ time. The latter being dependent on the inverse of the velocity relative to the surface.

Imagine that before the velocity of light is modified another medium of a different uniform density is moved so its perfectly flat surface is placed against the perfectly flat surface of the first medium. I'm sure those of you who count yourselves as students of the optical sciences know where I'm going with this. Doesn't all this suggest to you the formula $n \sin(A_i) = n' \sin(A_r)$? No? You don't think that perhaps this may be a good explanation for why Snell's law

describes refraction so?

Consider that the indices of refraction vary with the density and to a lesser extent crystal lattice structure of a medium. Density is likewise a factor in the refraction of sound. But, the explanation for that is differences in the speed that sound is conducted through different media. A medium of light isn't a literal medium that light is conducted through as a wave. So, how could density factor in here other than with gravity?

What could be a better explanation for internal reflection? If light internally encounters the surface of a dense transparent medium with an obtuse angle of incidence one might expect it to not have escape velocity relative to the surface. (I know its mind boggling to use the words "escape velocity" with regards to light, outside of Black Hole physics. Aside from what I've already written on matter essentially being little Black Holes, just remember $1/r^2$. Even tiny wells can be deep ones up close.) The light would then make a parabolic orbit symmetrical to a line normal to the medium's surface. In short the angle of incidence would equal the angle of reflection.

But, it doesn't always quite work that way. Consider Snell's Law is a rule the refraction of light conforms to. If Snell's law were a perfect description of refraction, all light would refract the same always according to the Law. That is, what about prismatic effect?

Imagine a beam of white light approaching glass. The beam is composed of the spectrum of light from red to violet. The red light is slower so though its angle of incidence is the same as the blue light its component velocity relative to the glass is also slower. This difference means that how the two colors are refracted is likewise different.

With respects to Euclid, if the glass is a pane, with parallel surfaces, the light refracted on the other side should be refracted to lines of radiation parallel to the line of radiation the light had when it met the glass. There would be a slight perhaps even imperceptible parallax because the colors were refracted at different points on the far side, but otherwise there would be no difference.

If however the glass was a prism things would be different. The portion of the light's velocity, that as the component relative the surface of glass, would be different being refracted on the one side than the other. This would mean the light of the different colors would be refracted to lines of radiation not parallel to each other. Also, (though this last effect would be very slight) since the modification of the light's velocity would not be an exact reciprocation of before, there would be a slight Doppler shift from before! (But, Aristotle's still wrong. And, Newton's still right.)

The principle of the constancy of the speed of light being wrong would seem to have implications for communications, though the layperson might not expect this to matter for some while. I don't know about that. In fiber-optic communications the amount of data that can be squeezed through a line depends on how many different bands of light one can use to transmit data without bands overlapping and corrupting the data of neighboring bands.

I could see this going one of two ways. If the inconstancy of the speed of light is not now a constraint in determining bandwidth nothing remarkable will happen. If on the other hand it is a constraint then that ad' that appeared a few years back were Avery Brooks asks "How many Libraries of Congress per second can **your** server handle?" may soon come to seem very quaint. And, the internet broadband that is now an essential feature in American homes may in turn be superceded by ultra-broadband, at about the same price.

There is the speed of light speed limit. There would of course be nothing along those lines to keep a spacecraft from going faster than a certain speed. There would however be the cosmic wind. Although it is very insubstantial, any fluid can exert significant force, drag if you will, against a moving object if it is moving fast enough; as I expect interstellar spacecraft would. This would mean there would be a kind of maximum velocity that any rocket could achieve no more than.

(There is one propulsion system that I read about that would seem to get around this. This system was a big magnet that would induce the ions of the cosmic wind to form a sympathetic magnet, a magnetosphere if you will. Since this propulsion displaces the ions around the spacecraft, it would seem to have evaded this difficulty altogether.

Unfortunately, there's just no such thing as a free lunch. The stronger the magnetosphere around the spacecraft, that is, the faster the spacecraft is going, the more resistance the current in the electromagnet would have. On the

plus side, this seems to be a good workable idea for a propulsion system with a *regenerative* braking system.)

In a few years advanced interferometry telescopes are due to begin the expanded search for extra-solar planets. The success of these telescopes will be much less than anticipated.

Recall de Sitter and his overlooking the out-of-focus effect? Well, as the profile of planets occupy such small arcs in the sky, and move over such large arcs in relatively short periods of time; this effect would be for these planets so much greater. In fact, it may be so great that it may be very difficult to detect even the blur of a planet's orbit.

I would suggest completely integrating the methods of searching for extra-solar planets. The wobble of one body may suggest the presence of a smaller body. Looking along the suggested track of such a body's orbit may confirm if there is or is not something there. In such a way we may re-construct other planetary systems one planet at a time.

This process may be especially useful in detecting satellites. Since the orbits of such planets would be hyperactive compared to the leisurely pace of the orbits of solitary planets, indirectly detecting such planets might otherwise be challenging.

Once planets are detected, their motion may be re-constructed, offering an animated glimpse at the life of these alien planets. This may be done because each band of the spectrum radiated from a planet will represent a different snapshot of that planet in time, like frames in motion picture film.

So, what does this mean for SETI? Before we consider what the inconstancy of the speed of light means for the search for extraterrestrial life, I think the probability of such life should be re-examined.

You may have heard the Fermi Paradox, the idea that if life arose on a world not long after the galaxy formed, and if this life evolved into a space-faring civilization it should have proliferated across the entire galaxy by now. I believe the response from Peter Ward and Donald Brownlee would be that such civilizations would be rare, and the distance between worlds suitable for colonization great enough to be prohibitive to expansion across the galactic plane.

This galaxy seems to be older than previously supposed. And, a space-faring civilization could be potentially older still, if its world of origin long ago fell into the core. So, would that mean the rare earthers are right? Are we alone?

One of the factors considered by the rare earthers is the Giant Impact. Long ago a rogue planet or as I've heard it called the Orpheus planet struck the proto-Earth. The Orpheus planet's core made a short orbit and fell into the proto-Earth, which is why this world stands out today as diverging from the standard of planetary densities. The remains or ejecta either achieved escape velocity, or it coalesced to form our Moon.

The Moon as it turns out is critical to life on earth. The Moon regulates variation in the Earth's axial tilt. Such a slight variation was responsible for the geologically recent formation of the Sahara desert. A world with the typical arrangement of moons, that is small moons, in distant orbits may expect such extremes as arctic summers and winters in the **mid**-latitudes. Since our world collided with the Orpheus planet so long ago our human civilization was made possible.

I do suspect the turn of events of the Orpheus planet collision may be somewhat more likely than supposed; simply because I believe the Orpheus planet alternatively may have been torn apart by tidal effects; and was slowed somewhat by the interaction of planetary ionospheres. However, this would still be an astronomically improbable event.

But, there's still something else. For a planet to be hospitable it must be in close proximity to a large body, so its axis is regulated. This leaves alone the possibility of which planet is orbiting which. One possibility that the rare earthers seem to have failed to consider is that gas-giant satellites may be overwhelmingly advantaged to be suitable for complex macro-organic life.

We have detected gas-giants in relatively close orbit of their suns. Granted these examples are biased by the detection methods that found them. But, we at least know that gas-giants may orbit in the hospitable zones of their respective stars.

One of the factors that determines the probability of a world forming is system density. Plainly in order for a world of suitable size to form there must be an adequate amount of material available. This applies to gas-giants as it does other worlds. However, one may expect there to be a relationship between star formation and accretion disk density, so it may seem improbable to suppose that if anything as large as a star can form there should not also be additional material available for the formation of such relatively small objects as gas-giants. Since gas-giants may form their own accretion disks further condensing system accretion disks; one may in turn expect miniature planetary systems to form.

(It is unfortunate that most of what is orbiting our solar system's gas-giants can not be characterized as true stable planetary satellite systems. It is said the beautiful rings of Jupiter will not last more than a mere 2 million more years. Making us very fortunate to see them at all. It really is a pity.)

One of the other suggested requirements was the presence of one or more gas-giants to act as meteor sinks, as without such sinks a small world could see an increase in orders of magnitude of encounters with meteors. In order for a suitable satellite world to form it must do so in tandem with a gas-giant. So, the probability of such a world forming at all is no more than the probability of a gas-giant forming in the hospitable zone. Past that the odds are not just any odds, but the odds of a suitable satellite world forming dependent on the density of the accretion disk.

One may wonder wouldn't a satellite world be endangered by its gas-giant's effectiveness as a meteor sink? Moderately so, yes. This problem would be mitigated somewhat by the distance of a world's orbit, and the probability that the gas-giant wouldn't be handling the burden as a meteor sink alone. On the other hand, there is the general conformation of orbital planes to the ecliptic and that being the most probable direction from which meteors approach.

One may also wonder if gas-giants are such great meteor sinks, shouldn't stars be even better? Yes, actually. Because of this it may be worthwhile to include the capacity of stars as meteor sinks in formulas. One might counter that the role of stars as meteor sinks would be negligible as all parts of a star system, including asteroids and comets, are in orbit of a star. So, no meteor that would fall into a star would exist in a star system. As we shall see there is still more to consider on this.

This author has to wonder if a world that is very infrequently bombarded with meteors would really be safer. Ask people on the streets and they'll likely tell you the impact in the Yucatan killed the dinosaurs. Some may tell you that catastrophic eruptions of the Deccan Traps killed them off.

It has been suggested that the Chicxulub impact may have had some hand in provoking the greatest eruption of the Deccan Traps. I find this remarkable as in human history the events that were of the greatest global climatological harm were volcanic events such as the eruption of Krakatau of the 19th century and the 535 AD catastrophe rather than impact events. This can be explained by the fact that volcanoes eject dusts and gases into the atmosphere disproportionate to their ferocity.

It may seem inappropriate to make such a comparison to relatively minor events of the past thousand years to events 65 million years ago. However, just as the Chicxulub impact was a once in tens of millions of years event, the Deccan Traps was a once in hundreds of millions of years event. That is exactly what is so remarkable here. It is quite a coincidence that in 150 million years it was this time that both these events occurred.

The suggestion that I'm making is; that, if meteors may incite volcanic eruption, which I suppose they may, a certain frequency of meteor strikes is almost essential; as without them the capacity for a world killing volcanic eruption could just continue to build. If this were so, hospitable worlds would be balanced between another pair of Goldilocks extremes in addition to density, and radiant heat. It may be that hospitable worlds must be balanced between death by meteor swarm and death by cataclysmic eruption.

To understand this better we must understand the mechanisms at work that make volcanoes. Now, one may expect any world with a fluid mantle to have volcanoes, regardless of internal planetary heat energy. This is because fluids circulate. When fluids circulate you get down-currents and you get up-currents.

The more energetic up-currents in a planet's fluid mantle fight gravity to seep through the planet's crust in the form of volcanoes. Remarkably, these super-hot molten magmas actually lost heat on their ascent due to Bernoullian conservation of energy and expansive decompression.

One might suppose that the mantle would be as hot as magma was before its ascent. However, volcanic materials represent only the most energetic portions of the mantle, and not the mantle as a whole. If this weren't the case, planets would burst at the seams. (Although in fairness, that is about what is happening with the mid-oceanic ridges.)

Still, internal heat energy is a factor in volcanic activity. The classical contributor to this heat energy, is heat leftover from the compression of the accretion disk into a planet. An already discussed contributor is the considerable leftover kinetic energy of the Great Impact itself. (I read of a potential third contributor to core heat. That being fission piles in planetary cores. I think this idea should be re-examined.)

In the case of our world, the heat from the formation of our planet would originally have been much greater than the heat leftover from the Great Impact. But, the heat of planet formation would have had more time to dissipate, and would be reduced because planetary formation was a process of condensation. So, the heat leftover from the Great Impact would still be very significant by comparison.

Plainly a world without a Great Impact would be much less active volcanically. It would also very probably not feature tectonic plates. The reason for this is that our crust reformed after the Great Impact, rather like a gigantic Humpty Dumpty poorly put back together again.

The fissures between the tectonic plates act somewhat like pressure release valves, relieving the mantle of its internal pressure. However, I expect it remains to be seen what difference molten magma having to take the path of most resistance versus the path of least resistance makes to eruption ferocity. Additionally, the gap in fault lines can act as tremendous pressure chambers as well, making truly catastrophic eruptions possible that might not otherwise be possible.

The proportional relationship between the formation of gas-giants and system density would seem to be pretty linear. The effectiveness of gas-giants as meteor sinks is a little trickier. The mundane notion that gravity wells suck objects in is wrong. If an object, not previously captured by a gravity well, approaches the gravity well at all, generally it will have and maintain escape velocity. The reason meteors fall into gas-giants is very simply because they slam headlong into them. That is, if you have something as big as a gas-giant, the movements of meteors are going to intersect with its sphere by virtue of the fact that it is there.

However, I may have thrown some of you off, as you may recall that gravity does play a role in this. This role is as a focus. Imagine the unmodified course of an object as a straight line. This straight line will at its closest come a certain distance to a point. If that point is a gravity well the object will swing around it in a parabolic orbit dependent on the object's velocity and the depth of the gravity well. The closest the orbit comes to the gravity well, the perigee, will be closer to the point than the closest it would have come if there was no gravity well. If the gravity well is a planetary body with a radius greater than the height of the objects perigee, but less than the closest distance it would have come without gravitational influence; it should be clear that with gravitational influence the object would crash into the planet, but without it the object would have continued on unobstructed.

It is this collaboration between gas-giant profile and gas-giant gravity well depth that makes gas-giants such very good meteor sinks. The easy presumption would be these multiply, and that there is an exponential relationship between gas-giant meteor sink effectiveness and accretion disk density. But, a gas-giant's profile is proportional to the square of the cube root of its volume, which is not even proportional to the amount of material that makes up a gas-giant as gas-giants are compressed by their own weight. Likewise a deep gravity well will divert the motion of a meteor, but it will also make it move that much faster. That is, the height of a meteor's perigee will be compound modified by the meteor's increase in kinetic energy at that height due to the conservation of energy.

The relationship between accretion disk density and meteor impact frequency is also non-linear, and trickier still than the meteor sink relationship. The number of comets in the Oort cloud would plainly seem to be dependent on the density of the accretion disk. But, why some comets move in steep elliptical orbits that plunge past the orbits of the inner planets is less clear.

Asteroids are thought by some in the physics community to be the debris of demolished planetary bodies. Clearly the availability of potential asteroids in this case would also depend on accretion disk density.

But, there is a non-linear relationship between available material for potential asteroids and asteroids produced due to disturbing events. The more sophisticated a planetary system is the more delicate and vulnerable it is to

unbalancing events with cascading effects. One planet in a wild orbit may interact with others, either to radicalize an orbit or in a collision. The more planets there are in a system the greater the odds of any one planet having such an interaction with another.

But, how are planets made asteroids? And, what makes comets go rogue? Consider it has been thought by some that the eccentricity of Neptune's orbit may be due to a close encounter with another star. It also should be clear by the demolition of the gas-giant satellite systems, the wrecking of the planet (or planets?) that once composed the asteroid belt, and our own Great Impact that some interesting things have happened and may still be happening to our solar system.

But, what was the disturbing event? The conclusion already put forth, is some star, Nemesis perhaps, exerted some influence on our solar system. This star need not have been a Nemesis star as one such encounter could have lasting cascading effects on our solar system. On the other hand, there's no reason to suppose it isn't a Nemesis star.

Many have supposed the Nemesis star idea to be somewhat unlikely because if such a star existed astronomical surveys should have revealed it by now. After all, with the scale of cosmic space, even with the speed of cosmic bodies and geologic time to travel, such a periodic visitor couldn't have gotten very far, could it?

One response to this is that our astronomical surveys are incomplete. It has even been suggested that a star not unlike our own may remain undetected, under our noses if you will, within the radius equal to the distance to Alpha Centauri.

Another response might be that some candidate stars **have** been detected that are at least approaching our solar system. However, astronomers have yet to model the path of any these candidates to show that they either have been or will be periodic visitors to our solar system.

It has been observed that even in collisions between galaxies, collisions between stars would be uncommon. Obviously, our solar system has suffered nothing approaching the drama of a collision between our sun and another star. That is, all that would be necessary for the effects we're familiar with to manifest would be for another star to exert tidal influence on our solar system at a distance, perhaps a light-day.

Recall our solar system is along with other stars trapped in a Brownian death spiral around the galactic center. There is no reason to suppose these spiral paths couldn't come as close to crossing as a light-day, or less. Also, with some stars being on the inside track relative to other stars, a certain amount of what could be termed friction would be only natural. So, one might expect stars to have close encounters like this with each other.

But, how often? If this is common enough the ravaging of our system may be re-enacted across the galaxy. However, if it is not the vast majority of star systems may be, for good or bad, tranquil and undisturbed.

On the other hand, maybe our solar system has never had such a close encounter. It has been suggested that the disturbing event that makes our solar system what it is may be nothing more dramatic than tidal effects due to the oscillation of our solar system's orbit around the galaxy. This likewise may not be a unique feature of our solar system. And yet, it also may not be an unavoidable feature either, as one would expect the orbital oscillation of various star-systems to vary from negligible to extremely vibrant.

On the other hand, maybe the oscillation idea is off. It does seem unlikely that anything like that could throw off the orbit of Neptune as far as it has.

Then again, maybe it could. Perhaps Neptune has been subjected to a resonant harmonic effect; a resonant harmonic that if Neptune had received the full influence of it, could have thrown Neptune completely out system. (This makes me wonder if there might be many such planets and comets wandering alone in the void.)

And, as usual, it could very well be that both possibilities have together contributed to the solar system we know. One compelling variation is a near miss star could have unbalanced our system, and since then the orbital oscillation has continued to agitate an already agitated system.

Getting back to stars as meteor sinks. I think it should be clear that after asteroids and comets had been thrown

into their orbits, a relatively large portion of them would sink into their star. However, the vast majority would continue to orbit, and would most probably from then on be safe from falling into their star.

Where gas-giants have an advantage as meteor sinks, is that any asteroid or comet whose orbit could potentially intersect with the sphere of a gas-giant would very possibly eventually do so. This would have a regulating effect on a system, as it would tend to delete the most eccentric and most dangerous meteors. That is, a world would most be endangered by meteors, whose orbits are most likely to intersect with the orbit of a planet like that world; but these meteors' orbits are also most likely to intersect with the orbit of a planet like a gas-giant.

Gas-giants would also have an important role in modifying the orbits of asteroids and comets during close calls. Each time asteroids and comets are thrown into new orbits it gives their stars a new chance to gobble them up. These new orbits would also have a different probability that they may intersect with the orbit of a planet.

Some of you may earnestly be wondering if discussion of the meteor sinks may be pointless. Our world doesn't seem to be terribly menaced by meteors, but look at the devastation wrought upon our solar system. Perhaps half the small planets of this system have been annihilated. This is a fate that our world too seems to have only just escaped. The Great Impact brought our world very close to not escaping. To think that if the Orpheus planet's course had been closer to or farther from the proto-Earth's center, what might have been.

The chaos this suggests makes me think that the probability of another Great Impact very much like our own in another star system in this galaxy may be significant. (A possibility that it may surprise you to find I do not feel reassured by.)

The greatest danger presented by this chaos may not be the demolition of worlds by collision or tidal interactions. The greatest danger may instead be the radicalization of orbits. An isolated world that might otherwise be hospitable to life may be thrown into a moderately elliptical orbit, which though stable would take it unacceptably far out of the hospitable zone during a season out of the year.

Satellite worlds may seem safer as they would seem anchored in the hospitable zone by their gas-giants. But, an eccentric orbit would make an interaction between satellites very likely. Such satellite interactions may take the form of mutual annihilation. Or, they may take the form of one world expelled from the satellite system, and the other consumed by the gas-giant acting this time as a planet sink.

(This begs the question if meteors are more likely to fall into gas-giants, wouldn't the same be true for wild planets? This makes me wonder, just how many of our world's siblings were swallowed up by Jupiter, Saturn, and Uranus?)

This may not be quite as impossible a situation for satellite worlds as one might suppose. Yes, there would be a deletive process. But, any satellite that would escape that process would then be relatively safe. We can expect satellite worlds to be very possibly only-children.

So, if the hazard to worlds due to the unbalancing of orbits is so much greater than the hazard presented by asteroids and comets why even bother considering meteor impacts? The answer is that though planet interactions are high impact, low probability events; meteor impacts are low impact, high probability events.

I would liken it to the difference between standing under a rain of boulders and standing under a cold rain. Though the boulders may be large and numerous, there would at least be a chance that none will fall on your head. But, if the rain is cold enough you **will** die of pneumonia. (So, don't forget your umbrella.)

I think that if one were to make a graph with disturbed system density as the variable, and the probability of a hospitable world existing in system being the dependant quantity; the range of probability for denser systems would dwindle to astronomically low numbers. (Which would be negligible if this weren't astronomy.) But, then the saturation of asteroids would kick in, and the function would make a hard turn into the x-axis. Hospitable worlds, in disturbed systems any denser than that, would be an impossibility.

Now that I've examined all the factors I can think of that would define the probability of the existence of any number of hospitable worlds it should be possible to make a formula that should give us a better understanding of life in our galaxy. That formula will have to be written by someone else as at this point I would have no idea were even to begin. Some of the things I've written should make us doubt even our own existence. And then, there are the on-

the-other-hands.

If I had to guess I'd suppose that satellite worlds are significantly more likely than an isolated world such as our own. If then our world was the only such Great Impact world in the galaxy I'd suppose there should at the least be tens of satellite worlds across the galaxy.

However, this is not strictly correct figuring. Besides the obvious problem that I'm not sure of the difference in probability between formations of world types, there is that it's all a presumption anyways. A satellite world forming in our galaxy may be a long shot, while our world forming may have been an even longer shot; and somehow, against all expectations ours was the one that formed.

Doctors Ward and Brownlee may still be right about our world being unique amongst worlds. In fact, they may be so right that when the hypothetical space-faring civilization conducts their surveys looking for hospitable worlds; they may make a cursory check of our solar system; note that all our gas-giants are far outside the hospitable zone; and dismiss it as being a system totally unsuitable for intelligent life. It may be the reason E.T. hasn't called is E.T. has no idea we could even exist!

But, even if this were the case shouldn't we have overheard alien radio traffic? Actually, no. An inconstant speed of light means different bands of a transmission would arrive at their destination at different times. What's more, slight modifying of the velocity of light by refraction implies that bands could even leak into other bands. This leakage would be less than negligible within a star-system but across cosmic distances it could have a large compounded effect.

Of course in any event, interstellar communicators would favor X and Gamma rays simply because they would get to the receiver faster than the rest of the spectrum. But, also the reduced time in transit and the high energy of the radiation would mitigate the garbling of transmissions.

Another solution would be to isolate the transmission of bits in their band and in the time between transmissions, while confining the transmissions of these bits both to micro-band and microburst transmission. This wouldn't be much of an issue if one were trying to make relatively low data transmissions over relatively short distances. But if one wanted to make high data compressed transmissions over great distances, these difficulties would be impossible.

All this would mean that not just orientation, but also range as well would be critical for signals. This might make relays between communicators very helpful. Interstellar starships might be of great assistance in this way, especially since their added speed would enable them to communicate in the extreme Gamma portion of the spectrum. (Which would likely be X-rays to the star-farers themselves.) This may even make the value of such voyages much less the passage of travelers or the transport of physical goods, but their role as telecommunications relay couriers instead.

But, especially for us, it would mean that any transmission that SETI detects could only be meant for this Solar system. This would possibly mean that an alien civilization is trying to introduce themselves to us. But, I think the more likely possibility would be that this would mean that an actual alien outpost would exist somewhere in system. Since SETI has yet to detect any such transmissions, it may be that there really isn't any alien presence in our Solar system at all.

So, it's a matter of time before we receive a transmission from an alien civilization introducing themselves to us, because we've been transmitting into space for decades, right? Well, no actually. Aside from most of our transmissions being made in portions of the electromagnetic spectrum that are sub-optimal for inter-stellar communications, there are other issues.

Most of our transmissions have been very weak, too weak to be received in adequate strength in neighboring star-systems. The same difficulties that make communications within interstellar civilizations challenging, would apply to us as well. Our transmissions have not been optimized for interstellar communications so would likely be indistinguishable from background radiation to any receiving civilization.

One of the ways that our transmissions have not been optimized is that instead of being digital most transmissions have been analog. One might suppose that analog transmissions might be preferable, because such transmissions

are interpretable as being fideliſous of the nature of the meſſengers and ſurely in common. Although that may be true, as digital communications are very abstract and ſubjective in interpretation, digital transmissions are at leaſt clearly artificial.

And, on top of all this it may be that alien civilizations are not even liſtening. Maintaining observations of all or even a portion of the ſtars in the galaxy, in addition to the near continuous analysis of the requisite depth and ſophiſtication of the ſtreaming data, would be prohibitively reſource intensive. This when as I've written, alien ſurveys have almoſt certainly already been made, and the likely conclusion would be that this is a ſyſtem that it would be pointless to maintain a watch on.

(As ſome of you may have already gueſſed, this author is not entirely enthused with the idea of ruſhing to make contact with other galactic civilizations. It has been ſuppoſed that any race capable of interſtellar travel and communications muſt be enlightened and therefore benevolent. Although there may be ſomething to that line of thought, I can't help but think that this thinking is ſimilar to the logic that led the Mexican peoples to pre-conclude that viſitors from across the Atlantic muſt be enlightened and good-willed.

Granted human paranoia is more likely to get humanity into trouble than human naivete'. I juſt don't want **either** to be our undoing. A wiſe courſe of action may be to firſt eavesdrop on the galactic converſation before making ourſelves a part of it. Of courſe, that courſe of action has its drawbacks as it is much eaſier to ſend relay ſhips transmitting data to another civilization than it is to ſend relay ſhips to transmit data from another civilization.

One could alſo ſay we have a reſponſibility to ourſelves and to other galactic civilizations to firſt deal with our own iſſues before bringing our values and our faults to ſomeone elſe's door.)

This concludes the portion of the paper detailing its conſequences. Now to liſt the methods to verify or reject theſe ideas, in more or leſs the order that they were put forth in the paper.

Fiſt is the meaſure of the ſpeed of light. It would be worthwhile to meaſure the ſpeed of light in bands outside the viſible portion of the ſpectrum. Perhaps ſtaring with the gamma and microwave extremes. Obviously if the reſults of ſuch meaſurements come back uniformly regardless of the meaſured bands then pretty much this entire paper is a waſte of paper. It is my hope that ſuch meaſurements will nail down the formula for the function of the relationship between light ſpeed and color.

Other related methods would work to reproduce the experiments that led Einstein to his error, with greater precision and modern instrumentation, ſo modern ſcience may ſucceed where the likes of de Sitter failed. In all caſes meaſurements ſhould uſe as great precision as poſſible; and ſhould uſe the whole ſpectrum without being confined to viſible light.

For the minimum of emission experiment I would ſuggeſt uſing a body other than our moon. A body that is faſt moving across its background deſcribing a large arc from our point of view would be ideal. Either the planet Neptune at perigee or ſimilarly a comet on flyby would work. For the eclipse any background ſuch as a well-defined and well-ſtudied patch of ſky would do. (Keep in mind that the eclipsing object may very eaſily be brighter than its background. So, what observers will be looking for is where the ſpectroscopy of the object begins and where the ſpectroscopy of the background ends according to each band of the ſpectrum.)

Reproducing de Sitter's binary ſtar experiment may be the moſt telling. It is this experiment that I conſider moſt likely to ſucceed. It would not be enough to look for phase ſhifts in the periodicity deſcribing the ſtars' orbit throughout the ſpectrum. That could too eaſily be diſmiſſed as a quirk of Doppler Shift. Real parallax muſt be detected to verify this paper. In ſhort ſtar poſition as obſerved in that band muſt match band phase.

I don't know that there is any point at all to reproducing the Michelson and Moorely experiment with modern equipment.

I understand experiments have already been done with ſtreams of ſub-atomic particles interacting with each other. More needs to be done with this; and the data need to be re-examined in the context of my unified field hypotheſis.

In any event we deſperately need a real working model of magnetiſm.

The proportionality of force to the inverse of the distance to *what* power needs to be nailed down. One can now bet with some assurance that it isn't exactly two.

Various experiments can be conducted with regards to refraction and gravitational deflection of light. One experiment that would be helpful would be to see if there is or is not a parallax between red and violet after being refracted through a pane. Likewise another such daunting experiment would be the attempt to find a post-refraction Doppler Shift. (I understand cryogenic materials would be very useful here.)

The products of atomic reactions must be fully accounted for. No proton must remain undetected.

Three sectors of the universe need sophisticated computer models. The life and death of stars needs to be modeled. Planetary systems and their suitability to hospitable worlds were parts of our universe in need of modeling well before this paper. And, more needs to be done with sub-atomic modeling.

The re-modeling of stars is an important yet seemingly insurmountable problem. Star modeling has always been difficult. Stars are defined by belittling age, and crucial rapid watershed events. They are defined by their giant size, and their composition of elementary particles whose interactions at the finest level make the very nature of the whole system. And, this paper if right isn't making things any easier.

Of course, there is the spectroscopy of stars. If there were stars out there composed of exotic elements, shouldn't we have detected them? The simplest explanation for why we haven't may be that the lightest elements of any star will remain suspended on its surface concealing its true nature.

I would even go so far as to suggest that for all we know our own sun might be one of these monsters as described in this paper. Something I find a little troubling as our sun may then change its state to a Black Dwarf with little or no warning. (Exit Mundi here's one for your collection.)

Thus concludes this paper.