Attribute Spaces and Flat Space Scalar Field Gravitation

sgm, 2018/DEC/23

"In mathematics, a metric space is a set together with a metric on the set. The metric is a function that defines a concept of distance between any two members of the set, which are usually called points."
https://en.wikipedia.org/wiki/Metric_space

An attribute is a defining characteristic of something or someone. So here, we define:

In physics, an *attribute space* is a set together with a defining physical characteristic always associated with that set. The attribute is typically a function of useful parameters such as force per unit area/length which can characterize pressure/elasticity.

Examples:

X U E_ρ = Euclidean space plus energy density

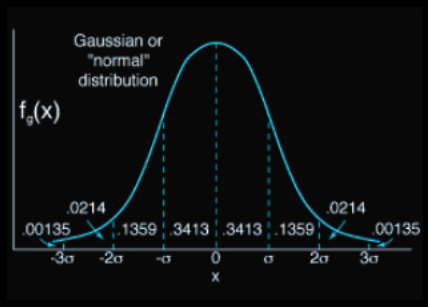
{{**X**, Z_0}, {t, Y_0}} = a model of space-time where Z_0 is the impedance of free space and Y_0 is the elasticity of time

{{x, y}, ε_0, t} = a 2D attribute space that only allows one force with an associated electric field that can evolve over time, t

{x, y, z, t} = {**X**, t} = Euclidean space plus time which is NOT an attribute space and cannot mediate ANY forces

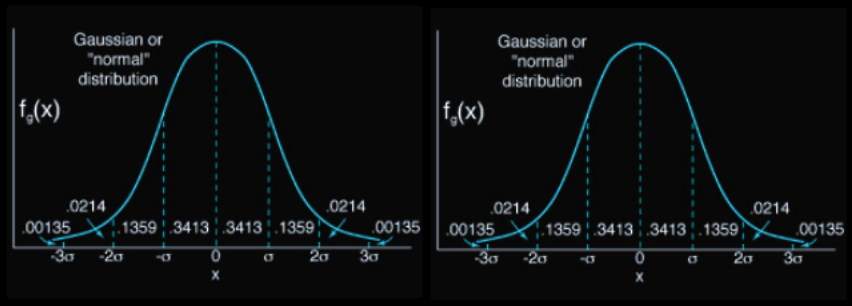
Temporal Elasticity Gravitation and Antimatter
sgm, 2018/DEC/06

2D depiction of a 3D *time-dilation field* of a neutron star:



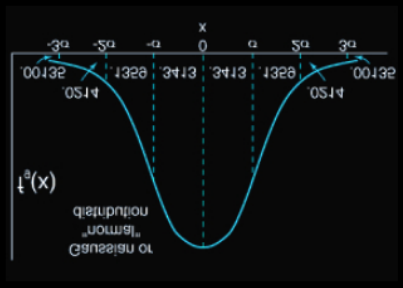
peak magnitude is 1.7, $\sigma=2r_s$, r_s=Schwarzschild-radius

time-dilation view of ‘gravitational’ force:



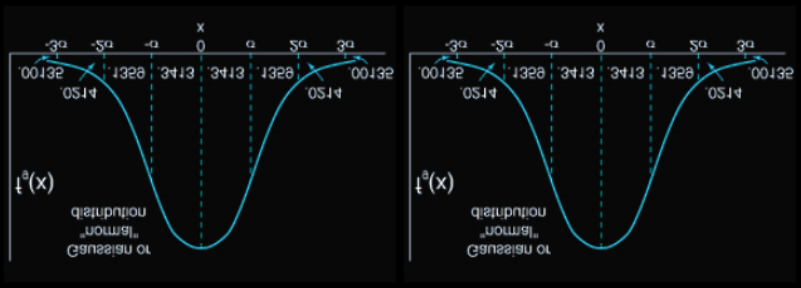
two neutron stars are attracted to each other ‘gravitationally’ because *time is dilated between them*

2D depiction of a 3D time-*compression* field of an *anti*-neutron star:



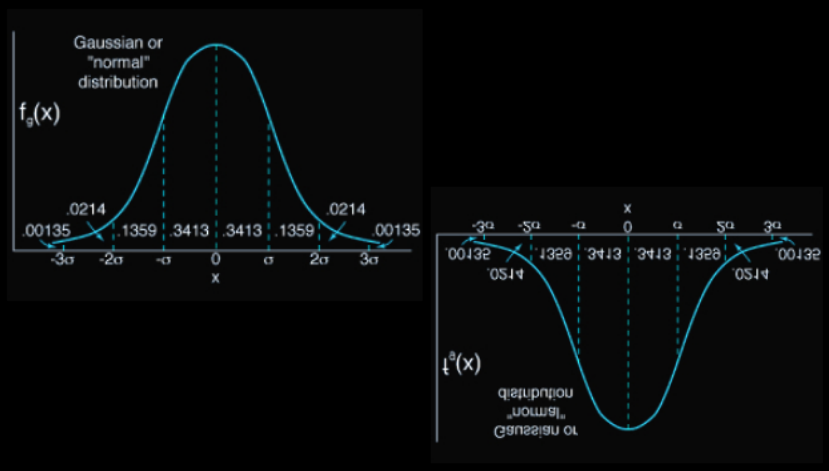
peak magnitude is -1.7, $\sigma=2r_s$, r_s=Schwarzschild-radius

time-compression view of ‘gravitational’ force:



two antineutron stars are *attracted* to each other ‘gravitationally’ because *time is compressed between them*

No ‘gravitational’ interaction between a neutron star and antineutron star because *time is flat between them*:



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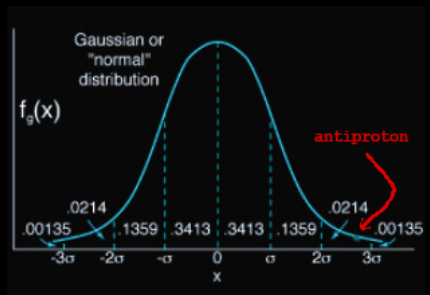
flat time

An antiproton near a neutron star:



appears as a ‘dip’ in the time-dilation field of a neutron star; effectively, *gravitational repulsion*

A proton near an antineutron star would experience a similar phenomenon.

Causality and Antigravity:

Science is not an individual “thing” or person but if it was, and if it was capable of emotion, most certainly it would ***loathe*** two things for *many* good reasons:
1. backward time travel
2. antigravity

1 would violate ***causality***, which can be summarized by:
a. there are events, before and after a specific time, t_1
b. *no event* ***after*** t_1 *can cause an event* ***before*** t_1
c. in order for an event to ***cause*** another, they ***must*** *be physically* or *logically* ***coupled***

Let’s say you’re an executioner who when you push the button, a guillotine blade slices off a criminal’s head. But it’s not as simple as that, let’s say the signal to “go ahead”, no pun intended, comes to you via quantum communications from a distant star system, so there is essentially no delay in that signal even though separated by vast distance. Your supervisor happens to live on the surface of a neutron star where time passes around twice as slow for him as it does for you. It takes about five seconds for you to verify the criminal’s identity and another five, in your automated prison system, to have the guillotine blade positioned behind the neck of the criminal for execution. Your supervisor knows about the time dilation for his office relative to yours and about the time delay for carrying out executions. He knows that once he signals you for an execution, it takes about 20 seconds of *his time* for you to be ready to perform that particular execution. So, for safety reasons, he adds another 20 seconds of his time, which equates to 10 of yours, before he issues the “go ahead [and behead]” signal. So, the least amount of time you need to perform an *authorized* execution is 20 seconds. He’s monitoring everything on video, which of course looks twice as slow to him, again for safety.

Your latest execution assignment is THX1138, for criminal drug evasion, but by mistake, because you spent all night partying with LUH, you sent the execution blade to SAM1109. Your supervisor notices this mistake and issues a "NO GO!" directive immediately, in his time frame, for you to stop your execution procedure. Bleary eyed and hung-over, you misread "NO GO!" as "go ahead" ***AND*** *you forget* that normally you don't get that message until *10 seconds later* .. Dear reader, *knowing* we live in a *causal* universe, is there *any* chance you will *not* push that button?

2 would violate ***conservation****, which can be summarized by:
a. ***no*** *mass* can move ***up*** a gravitational potential ***without*** *force application* in that direction
*conservation of momentum, $\mathbf{p}=m\mathbf{v}$ where **p** and **v** are vectors pointing in the same direction, differing only by magnitude m, mass; $\mathbf{F}=m\mathbf{a}$ is similar but about force and acceleration; since $x'=v$ and $x''=a$, $\Delta x=|\mathbf{v}|$ *which* ***requires*** a corresponding **a** and **F** in **v**-s direction

We are simply stating the *definition* of momentum above; similarly, recognize Newton's second 'law' is merely the *vector definition* of force. When we use the phrase 'gravitational potential', we're assuming Newton's universal law of gravitation, $F=Gm_1m_2/r^2$ which in *100s of years*, has *never* seen violation.

Antimatter and Time:

In ***every*** particle accelerator in the *history of physics*, ***every*** *time* we simulate 'the creation event' by smashing beams of nuclei/anti-nuclei against each other, ***equal*** amounts of matter and antimatter are produced. The immediate automatic question that should be in your mind is: *what happened to all the antimatter?*

There's *only two* reasonable answers:
1. some natural process *destroyed* it *and/or*
2. some natural process *has hidden* it
Key obvious phrase: 'natural process'; we'll come back to this question later.

As the humorous fictional example above has illustrated, the passage of time for observers scattered throughout the universe, near neutron stars or out in flat space-time, ***always*** *progresses at different rates* depending on nearness to strong gravity sources. But it is ***fundamentally*** *important* to note that ***never***, *absolutely* ***nowhere*** in the universe, is *causality* ***violated***. This applies to antimatter as well. *No natural process associated with antimatter can violate causality.*

But what about gravitational conservation detailed above? Could antimatter have properties that ***seem*** to violate conservation but ***not really?***

Let's propose a *real physical object* called an antineutron star. What would its *properties* be? Well, the first attribute would be mass; its *mass range could not be* ***any different*** than that of matter neutron stars: 1.4 – 2.2 solar-masses. The next attribute should be about *time dilation*: would an antineutron star dilate time *exactly the same* as neutron stars or could it, ***without violating*** *causality or conservation*, somehow 'dilate' time *differently?*

A rubber band can *linearly only* be stretched or relaxed. Make even markings along its length; observe how those markings separate and merge while you stretch and relax the band. Time dilation corresponds to stretch; time compression corresponds to relax. Another analogy: a metal spring; observe how it takes pressure to compress the spring and tension to extend it. Force/energy is required either way. So it's conceivable that *antimatter could compress time*, speed time up, most importantly ***without violating causality nor conservation***.

Why temporal compression does not violate causality: causality is about the impossibility of future events causing past events; speeding time up has nothing to do with future events causing past events; temporal compression has nothing to do with violating causality.

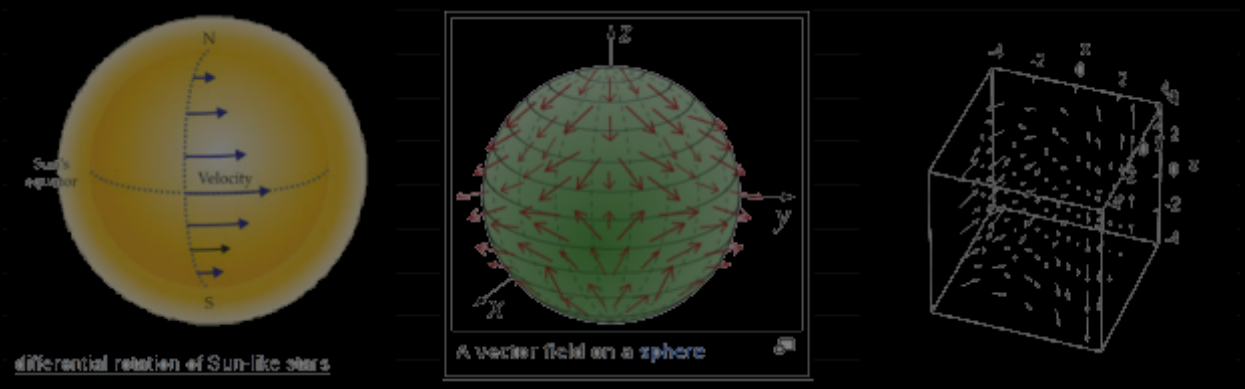
Why temporal compression does not violate conservation:
1. if we simplify gravitation as mediated by time dilation, there is a superposition of dilations between two masses *causing* mutual attraction
2. between neutron stars and antineutron stars, there is a *surface where time is* ***flat***, and when there is *mass inequity* (as in most cases), *gravitational repulsion* until that surface is a plane bisecting a line through both stars
3. obviously, point 2 also applies to matter and antineutron stars – and – antimatter and neutron stars
4. not so obvious is *gravitational attraction between antineutron stars*; antimatter attracts and *can burn in thermonuclear reactions* although ***THREE TIMES FASTER*** than matter stellar fusion
5. *antimatter black holes self-destruct* because the event horizon is a surface where time goes to infinity which implies that Hawking evaporation is the rapid demise of *anything* more massive than the maximum neutron star, 2.2 solar-masses

Any extant antimatter galaxies would be *devoid of black holes* and *gravitational wave signatures* of antineutron star mergers should be *distinct* from signatures of neutron star mergers – especially when they end in black hole formation.

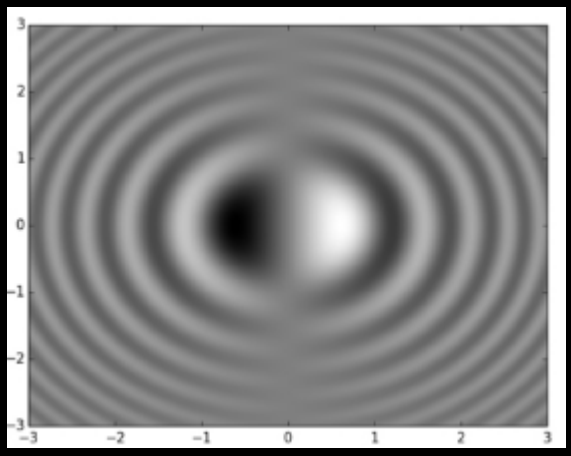
So where is all the antimatter? It’s all there: either as dead antineutron stars or galaxies devoid of black holes. AEgIS and LISA should both provide evidence for/against temporal compression as a property of antimatter. We only have *time* to tell .. This essay is dedicated to Hope Micheal, my daughter, who turns 2 in one month of time .. There it is again, that word..

Flat Space Scalar Field Gravitation
sgm, 2018/DEC/17

Engineers and physicists who can visualize (some sadly cannot), do. But *our visualizations may not always reflect reality*. They are similar to intuition but of course – are of a visual nature. There are *very few* things I am proud of but one thing I'm both ashamed and proud of is (ashamed that I am proud of a god-given gift): visualizing gravitational effects.



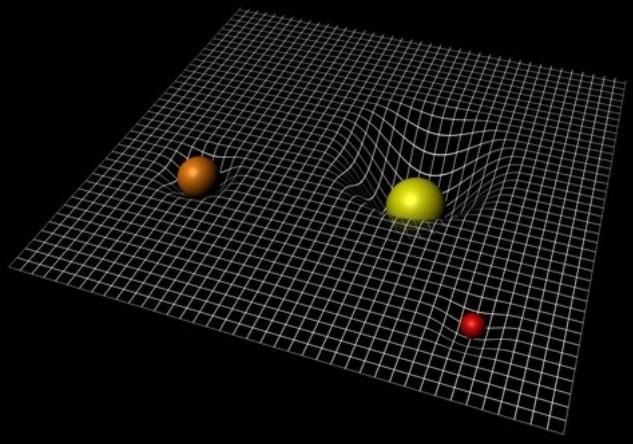
three images of 3D vector fields



an image of a 2D scalar field

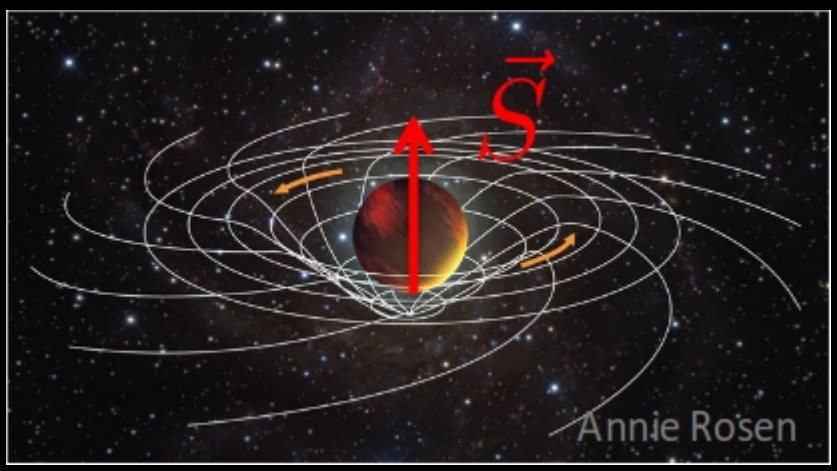
Please note the *striking differences* between vector fields and scalar fields. *Vector* fields contain *magnitude and direction* data – while – *scalar* fields hold at most [complex] *magnitude* data.

There are 3 gravitational effects we need to know if ‘scalar is enough’: gravitational field, time-dilation, and Lense-Thirring.



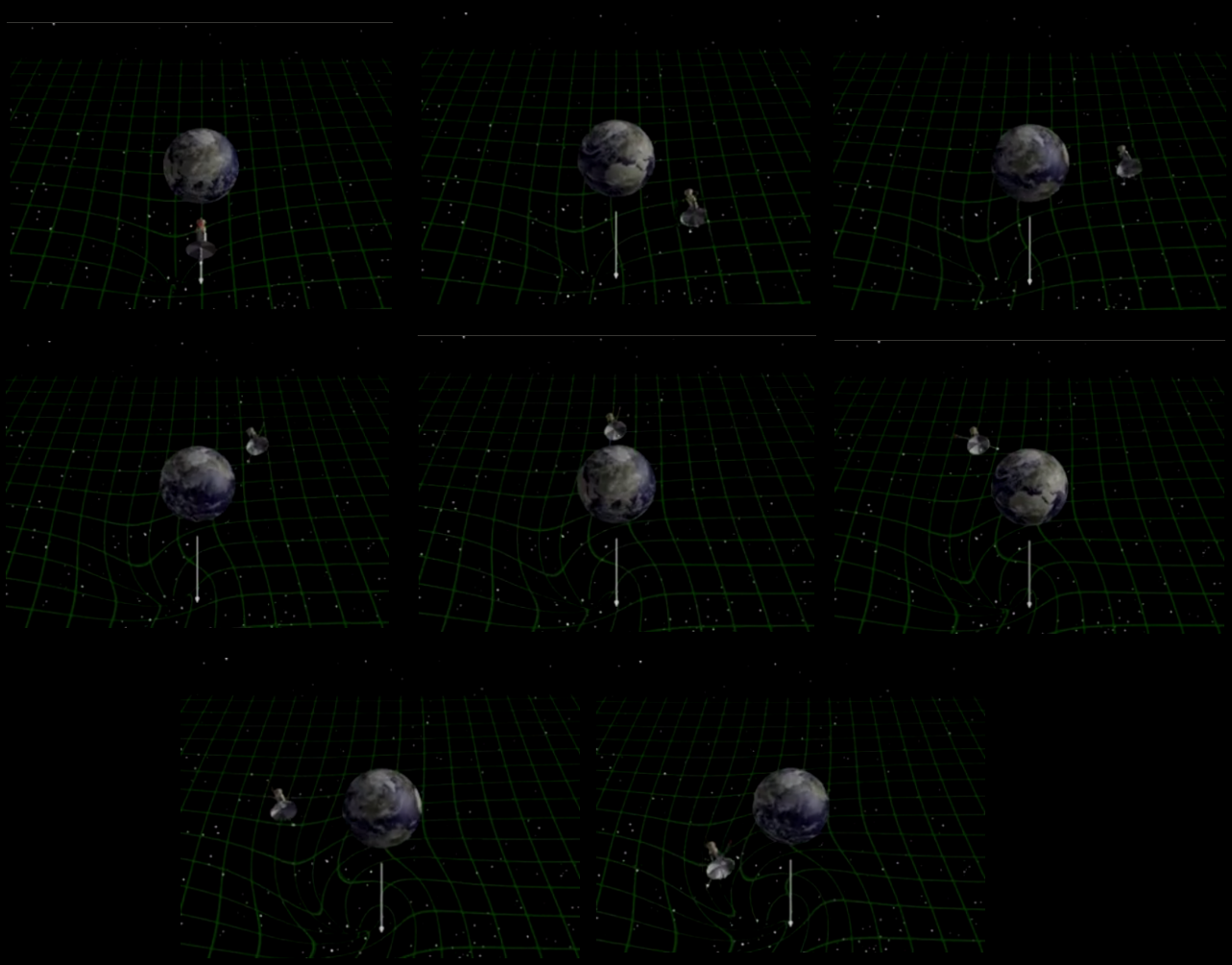
As we can inspect above, gravitational field is clearly representable by a scalar field. What may not be so obvious is time-dilation is as well. Every gravitational field has associated with it a time-dilation field that is typically ignored by physicists. It is not a vector quantity. So above also signifies the fact time-dilation is also representable by a scalar field.

That leaves Lense-Thirring:



This is a problem if we ignore the fact we’re allowed complex numbers in a scalar field. This effect *clearly* is a manifestation of a *vector-field phenomenon* – IF we understand it properly. If so, *it appears to be a differential rotation of space-time* similar to the differential rotation of Sun-like stars depicted above on page one.

There have been several attempts to provide a scalar field flat space theory for gravitation over the last century. As far as I know, they have been successful in terms of reproducing / reconstituting General Relativity. However, I’m not sure how well they address Lense-Thirring. I have had trouble visualizing that phenomenon within my TET, temporal elasticity theory, framework since inception. I believe I may have a solution.



An illustration of how Lense-Thirring twists space-time, in conventional GR, but here within TET, *differential temporal dragging*.

	Conv'l GR	**TET**
gravitation	S-T-C	T-D
time-dilation	S-T-C	T-D
Lense-Thirring	S-T-D'g	T-D'g

S-T-C = space-time-curvature

S-T-D'g = space-time-dragging

T-D = time-dilation

T-D'g = temporal-dragging

One should note that 1.7 time-dilation on the surface of a neutron star in conventional GR should also imply 1.7 *space-dilation* which no one seems to recognize. Since space is ***flat*** in TET, we don't have to worry about that.

Upon first hearing about Lense-Thirring several years ago, I had trouble understanding it .. Of course later, I wasn't sure if I could accommodate it in TET, a scalar field theory. But just as it took time for me to accurately visualize gravitation in terms of TET, intervening time-dilation, it also took time for me to accurately visualize temporal-dragging to explain Lense-Thirring.

It's reassuring to know that TET is a robust framework which can handle the subtle nuances of GR explored theoretically and experimentally over the last century. Visualization can be a powerful and accurate mental simulation tool when employed carefully and conscientiously. Intuition, in this form, can be quite a gift.

"The intuitive mind is a sacred gift..", A. Einstein.