

January 2022

The Theory of Nothing – An Alternative Explanation of Gravity

A Discussion Paper

Background

I have lived for many years in search of a more logical explanation of gravity and the creation of ocean tides. At one point in my career I taught coastal engineering at Griffith University, Brisbane. During that time I struggled with the idea that I was teaching my students that ocean tides were caused by the gravitational 'pull' of the moon—an idea that suggests that the Moon's gravity is actually pulling on water particles within our oceans. I knew this explanation wasn't logical, but I had no other explanation that I could give to my students. That mental conflict began my 25 year quest to discover a more logical explanation of gravity and ocean tides.

I am not an astrophysicist. I am just a retired civil engineer that one day stumbled into a darkened room, and then spent the next 25 years searching for the light switch.

1. Introduction

The following discussion is not based on science, mathematical analysis, or experimental outcomes. What I bring to this discussion is not an understanding of astrophysics, but an understanding of fluid mechanics, coastal engineering, and high school physics.

This discussion is based solely on simple logic. The aims of the paper are fourfold:

- (i) to see where simple logic can take our understanding of the universe
- (ii) to explore an alternative explanation of gravity
- (iii) to see if this alternative explanation of gravity can help us develop a theory of gravity that is more consistent with our understanding of quantum mechanics
- (iv) to understand what actually causes ocean tides.

I don't expect to be correct in every aspect of this paper, but I do aim to be interesting enough to promote discussion. Maybe somewhere in this paper is a explanation strong enough to make someone see a new approach to solving an old problem. Remember: the mind is like a parachute, it only works when it is open.

To improve the flow of this paper I will refer to the rate that time passes as the 'time continuum'.

2. Universal laws

The following laws (observations/beliefs) are considered (by me) to apply across the universe.

Law 1

The physics of the universe is based on simple, logical rules. If an explanation is not simple and logical, then it is probably not the best explanation.

It should not be surprising to find common features in the physics of the universe, such as the common features shared between astrophysics and coastal engineering.

Further to this rule is the saying: 'If you don't like the answers you're getting, check your premises' (Jesse Stone: *Lost in Paradise*). If one explanation doesn't answer all your questions, then look for another explanation, but look with a mind that is not shackled to previous explanations.

Law 2

The universe is comprised of just three things: energy, space and time. Everything we see, hear, smell, taste, or feel is just a form of concentrated energy.

Pure energy has no 'matter' or 'mass', and neither does space or time, so the universe consists of nothing. Hence the title of this paper: *The Theory of Nothing*.

Law 3

Physical matter cannot be created. If nothing existed before the Big Bang, then nothing can exist after the Big Bang. What we refer to as 'matter' is simply a form of concentrated energy.

So if you are ever asked the question: *What existed before the Big Bang?* The answer should be: *Nothing*. Which is the same answer to the question: *What existed after the Big Bang?*

Law 4

An infinite amount of nothing is still 'nothing'.

It doesn't matter (excuse the pun) how big the universe is, collectively it is made up of nothing, and therefore it ultimately can be reduced back to nothing.

Law 5

Nothing lasts forever. Meaning that if the universe is made of nothing, then it can have no beginning, and no end.

Law 6

The movement of energy creates both 'space' and 'time'. Time has no purpose unless there is movement, and movement cannot exist unless there is space to move.

I believe Einstein suggested that matter tells space-time how to curve, and space-time tells matter how to move.

So if someone asks: *What exists beyond the furthest galaxy?* The answer should be: *Nothing*.

Law 7

The movement of energy not only creates space and time, but variations in the movement of energy can cause variations in the rate that time passes (the time continuum).

Law 8

Energy can move in three dimensions, so space and time also vary in three dimensions.

Time is not just the fourth dimension of the universe. It is the fourth, fifth and sixth dimensions of the universe.

Law 9

Light travels through space with the characteristics of a three-dimensional wave, which experiences refraction as it passes through gravitational fields. Similar to ocean waves, light waves transport only energy, but no matter.

In the oceans it is not the water that moves with the wave, it is the wave's energy. The speed of a wave is not the speed of the water, but the speed of the energy flow. An ocean wave may interact with physical matter (i.e. water), but no physical matter moves with the wave, the movement of the water is limited to a circular motion that does not travel with the wave. And so is the case for the movement of light. Light may interact with matter, but matter does not move with the passage of light.

Law 10

The speed of light varies according to the 'rate of time' at any given location. Therefore the speed of light varies throughout the universe. As such, a light year has no specific distance, only a set time period.

This means the actual speed of distant galaxies, as measured from Earth, should not be based on the rate that time passes on Earth, but on the rate that time passes at the location of that galaxy. Therefore, some galaxies can appear (to us on Earth) to be moving faster or slower than they are actually moving through space.

Also, the 'size' of space should not be based on the speed of light as measured on Earth, but the speed of light in open space, which may not be uniform for all of space.

Law 11

No two elements of concentrated energy can exist in the same space, at the same time.

If two elements of concentrated energy (say two electrons) approach each other, then there is a force known as molecular repulsion that prevents their direct contact.

If two electrons are moving in approximately the same direction, then they will avoid direct contact by transferring energy from one electron to the other, resulting in one electron increasing its speed, and one electron slowing down (like cars moving along a freeway, hopefully). If two electrons are moving in opposite directions, then molecular repulsion becomes more noticeable (like cars moving along a two-way road, hopefully).

Based solely on simple logic, it would appear to me that molecular repulsion is not an actual 'force', but simply the 'effects' of a localised distortion of space-time. However, it is here that I currently have a problem because such a theory of the localised distortion of time, if caused by the movement of energy, would cause an 'attraction' to exist between two electrons. This suggests that electromagnetic forces may dominate this situation rather than the distortion of space-time, but I am yet to be convinced.

Law 12

In my opinion, there are no such force (outside the molecular world) as 'suction' or 'attraction'. A suction cap does not use suction to hold itself onto a surface; the ground effects of a race car does not 'suck' the car onto a race track; a vacuum cleaner does not 'suck' air into the hose attachment; and the Moon's gravity does not 'pull' on water molecules in order to produce ocean tides. All of these examples can be explained by either:

- (i) the effects of the localised distortion of time; or
- (ii) molecular repulsion.

This means that in the distant future, the only way that a 'tractor beam' could work on a starship is for the starship to be able to alter the time continuum that exists between the two objects (patent pending).

Law 13

An object passing through a distorted time continuum will experience a force, and therefore an acceleration, along the line of the minimum time continuum (i.e. the trajectory of the minimum rate of time).

In the case of the Moon rotating around the Earth, the net gravitational force exerted on the Moon is generated by:

- (i) the Moon's ability to distort the time continuum that exists around the Moon; and
- (ii) the fact that the Moon exists within the distorted time continuum generated by the Earth, which further distorts the time continuum around the Moon into an asymmetric pattern (refer to figures 1 and 3).

An expanded discussion of the lateral forces exerted on an object that exists within a distorted time continuum is presented in Section 3 of this paper.

Law 14

A force is required to resist, or otherwise alter, the lateral acceleration that results from an object passing through, or existing within, a distorted time continuum.

This means an upwards force is required if an object comes to rest on the Earth's surface (which is the force we associate with 'weight'). This force is proportional to the mass of the object. Hence weight (W) equals mass (m) times the acceleration (g) due to gravity ($W = m.g$), or simply force equals mass times acceleration ($F = m.a$).

Law 15

Electromagnetic radiation does not produce 'light'. Light is only produced within the minds of some living creatures, all of which (those being the living creatures) are made up of concentrated energy, in other words, 'nothing'.

Electromagnetic radiation only becomes visible to humans because its photons are capable of causing electronic excitation within all molecules, which leads to changes in the bonding or chemistry within the visual molecule retinal of the eye, which in turn triggers the sensation of vision.

In other words, light, which is made up solely of energy, can interact with matter, which is also made up solely of energy, which is made up of 'nothing'.

This means that stars, or suns, do not produce light (only the brain can do that), and therefore the whole universe actually exists in permanent darkness. Also, there is no dark side of the Moon, just one side that receives direct radiation from the Sun, and one side that doesn't.

Law 16

The universe exists in total silence. Noise is only produced within the minds of some living creatures.

A tree does not create a noise when it falls in a forest, even if people are there to hear the noise. In fact no tree has ever created any noise. A falling tree produces only waves of air pressure, which are caused by molecular repulsion. These air pressure fluctuations are detected by our ears, which send an electrical signal to our brain, and only then is a noise created.

Law 17

The universe exists without smell. The sensation of smell is produced only within the minds of some living creatures.

Your father does not create a smell while watching TV. Your father simply releases gases with a chemical composition that can be registered by receptors within the nasal cavity, which then sends electrical messages to the brain, which creates the sensation of either a good or bad odour. Which means the smell is actually created by the people doing the smelling, not by the person releasing pockets of gas (i.e. the smell is created by the 'smellee', not the 'smeller').

Law 18

The universe exists without taste. The sensation of taste is produced only within the minds of some living creatures.

Taste is the perception produced or stimulated when a substance in the mouth reacts chemically with taste receptor cells located on taste buds in the oral cavity, mostly on the tongue, which can detect five taste modalities: sweetness, sourness, saltiness, bitterness, and savouriness.

This means every human will experience a different taste based on the functioning of their brain. Which means my cooking is actually very good, it is just that I am the only person that can register the fine-dining experience that I have created.

Law 19

Objects that we have traditionally referred to as 'matter' cannot physically touch each other. Molecular repulsion prevents any direct contact from occurring; however, electrons can interchange between atoms of different objects.

The fact is, when we stand on a floor, we don't actually touch the floor. The sensation of touch, which includes the sensation of heat, is registered by sensory neurones, which in turn send messages to the brain, which then creates the sensation of touch, even though no physical contact actually occurs.

This could mean that my big sister never actually hit me during my childhood years. A claim she supports, but I strongly refute. It is a bit like hitting a person while the person is wearing clothes, and then claiming that you did not physically come into direct contact with that person. Even though no physical contact occurs, there is a force involved, which can result in mental pain and physical injuries—take note big sister.

Law 20

The existence of heat is an action that is not solely created within the mind of living creatures. It involves a transfer of energy, and sometimes a transfer of matter. But ultimately, heat is also made up solely of energy, which is made up of 'nothing'.

In summary

This means the universe exists in total darkness and has no light, colour, noise, or smell, but the universe has energy in different forms, including heat and matter. It also means that our Sun produces only heat and electromagnetic radiation, and that all suns (stars) exist in total darkness. It is only our brain that gives them brightness and colour.

When God said let there be 'light' (which by the way nobody would have heard), God must have meant, let there be living creatures, and let these living creatures have eyes and a brain.

Since every person has a unique brain, every person will see a slightly different picture, hear a slightly different sound, smell a slightly different odour, and feel a slightly different touch.

Everyone is beautiful, it is just that we are beautiful to a select, but special, number of people.

3. Lateral forces generated on an object located within a distorted time continuum

The following discussion is independent of whether the space-time continuum is distorted by 'mass' or by the 'movement of energy' (refer to Section 7 for further explanation).

For simplicity I will focus this discussion on the gravitational interaction between the Earth and the Moon.

Figure 1 shows a graphical representation of the distorted time continuum around the Earth and Moon. Obviously, Figure 1 is not to scale.

So the question is: Is the lateral acceleration of the Moon caused by a 'force', or is it simply a physical consequence (an 'action') of an object passing through, or existing within, a distorted time continuum?

To answer this question we have three options:

- (i) we can simply accept that an object existing within a distorted time continuum will experience an acceleration along the line of the minimum time continuum
- (ii) we can develop a mathematical explanation for the above phenomenon
- (iii) we can consider the forces generated on the Moon based on our understanding of the forces we know act on an object resting on the surface of the Earth.

The first option is similar to our general acceptance that a charged particle moving through a magnetic field will experience a lateral force.

The second option is beyond my mathematical ability. I suspect that this mathematics will result in the development of a theory linked to the 'conservation of time'. Please could someone do the mathematics.

The third option is my chosen path because it relies on our understanding of 'weight', which is something I have experienced in increasing amounts as I age (for me, moving through time definitely causes an increase in this vertical force).

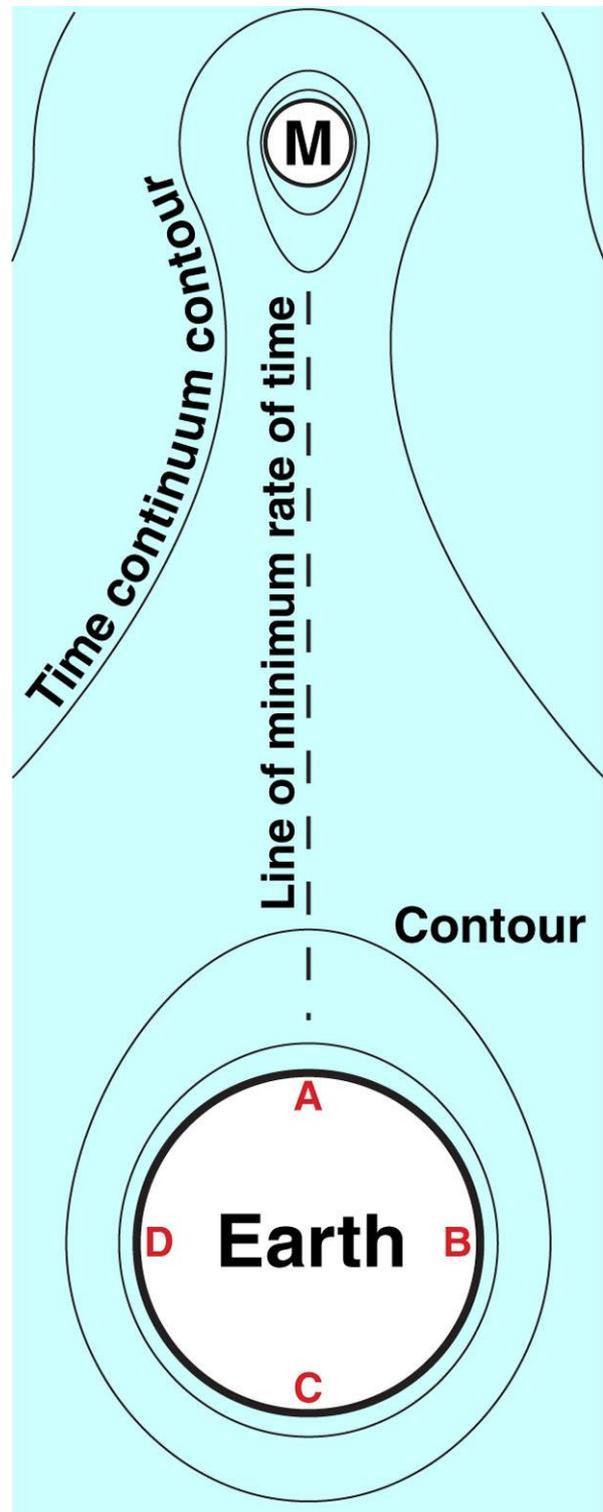


Figure 1 – Time continuum (rate of time) contours around Earth and Moon

The weight of an object resting on the Earth's surface is caused by the object resisting the effects of gravity (i.e. resisting the continued acceleration towards the centre of the Earth).

If we accept Albert Einstein's explanation that gravity, and therefore the rotation of the Moon around the Earth, is caused by the distortion of the space-time continuum, which in turn is caused by the presence of a mass in space, then Figure 2 shows how this explanation would apply to a person standing on Earth.

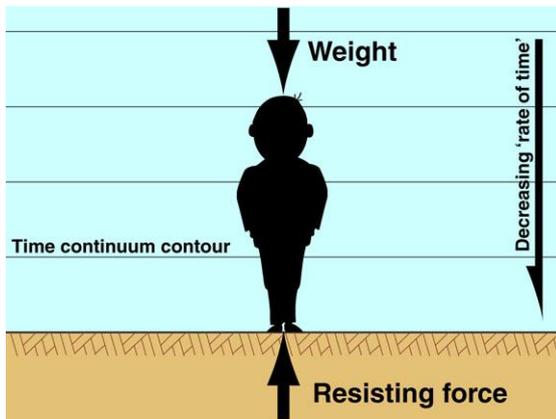


Figure 2 – Forces acting on a stationary person resting on the surface of Earth

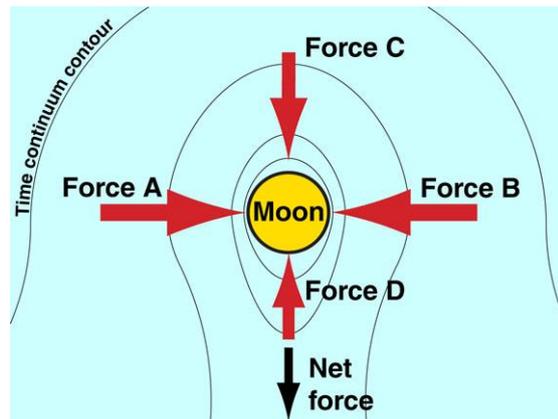


Figure 3 – Forces acting on the Moon as a result of the distortion of the local time continuum

A person's 'weight' is the result of the Earth's surface resisting the forces exerted on the person by the gradual change in the time continuum, which varies with the square of its distance from the centre of the Earth. Independent of what causes the distortion of the time continuum, the forces exerted on an object that resists these gravitational forces (in this case a person standing on the surface of Earth) will be proportional to the 'mass' of the object.

Note 1 – My assumptions

I have made two assumptions here: (i) gravitational forces are related to the mass of an object, and not the movement of energy associated with the object, and (ii) the time continuum is decreased (not increased) by the presence of an object in space, such as a moon, planet or sun.

If you don't think that the forces associated with a very minor change in the time continuum could be significant, then try jumping into the air. If you return back to the surface of the Earth promptly, then you have just experienced the power of gravity.

Now because these forces are assumed to be acting on the mass of an object, the gravitational forces acting on our atmosphere (i.e. air) would be significantly less than those forces acting on our oceans. This means the impact of the Moon's gravity on our atmosphere is significantly less (in relative terms) to its effects on our oceans. The amplitude of these gravity-based distortions of our atmosphere is also affected by the fact that air is compressible.

The gravitational forces that act on a person also act on the surface of the Earth, because the earth (i.e. the dirt) is resisting the further compaction of this earth, which gravity is trying to achieve.

These same forces act on the surface of the Moon (Figure 3); however, because of the asymmetric distortion of the time continuum around the Moon, which is 'primarily' caused by the presence of the Earth, there is a net force that causes an acceleration of the Moon towards the Earth. This acceleration will cause the Moon to travel in a circular path around the centre of mass of the combined Earth and Moon because the centrifugal force generated by the orbiting Moon (which acts outwards) is in balance with the net gravitational force acting on the Moon, which acts inwards towards the Earth.

The distortion of the time continuum on the far side of the Moon, as shown in Figure 3, is the result of the Earth's gravitational field extending through the Moon and beyond. This means forces A and B are greater than Force C, which is greater than Force D. A similar effect occurs on the Earth,

which in part, accounts for the lower high tides experienced on the side of Earth that faces away from the Moon.

We refer to this net force as a 'gravitational force', and therefore we must accept gravity as being a 'force', and not just an 'action'.

This means that ocean tides on Earth are not caused by the gravitational 'pull' of the Moon, but by the Moon's distortion of the time continuum contours that exist around the Earth.

4. The physics associated with a three-dimensional time continuum

If we accept that the space-time continuum can somehow be distorted by the presence of objects in space, then we must also accept that 'time' must have three dimensions. This means we should be able to develop a three-dimensional contour model of 'time'.

Now these time continuum contours will move freely with the objects (moons, planets and suns) that generate them. And when two objects come in close proximity to each other, their time continuum contours will begin to interact.

For me, the best way to think about the three-dimensional variation of the time continuum is to think of ocean waves. In the ocean, long, medium and short waves can coexist in the same location, and different waves can pass through the same location, travelling in different directions, without losing their energy or structure (as shown in figures 4 to 6).

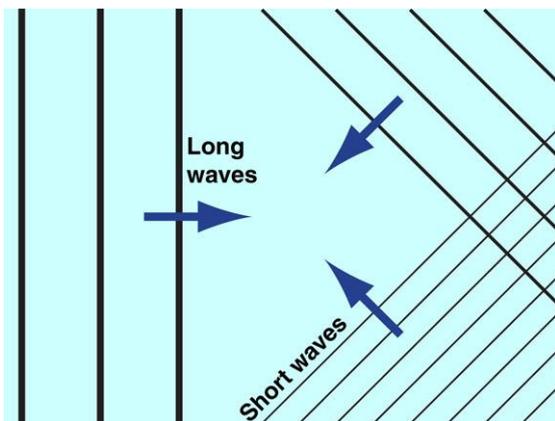


Figure 4 – Three sets of waves approaching a central location

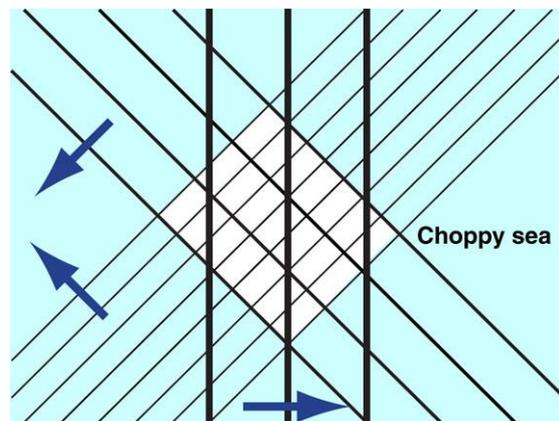


Figure 5 – The coexistence of three sets of waves at a central location

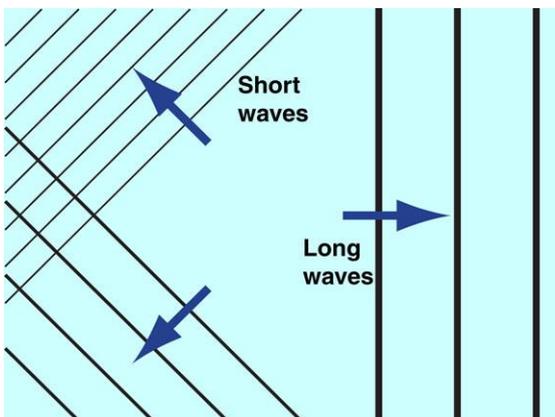


Figure 6 – Three sets of waves after passing the central location

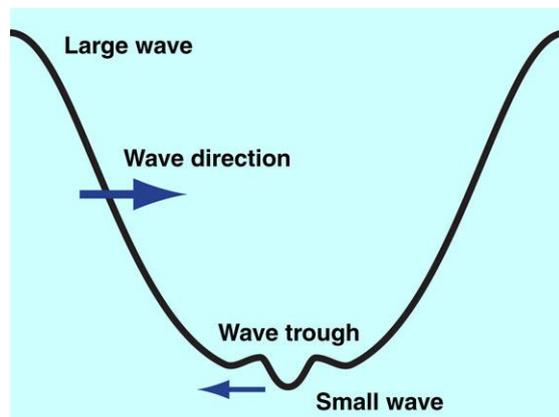


Figure 7 – Small wave superimposed on the trough of a larger wave

But the ocean's surface exists in just two dimensions (if we ignore the curvature of the Earth, and the height of the waves). Whereas variations of the time continuum exist in three dimensions.

Another important property of time continuum contours is that just like ocean waves, when they interact with each other, their amplitude (or their strength) is superimposed on the amplitude of the other time contour. This means:

- (i) if a time continuum generated by the Earth, that has a time value of 101% of Earth time, overlaps a time continuum generated by the Moon, that has a time value of 102% of Earth time, then the resulting time continuum will be 103% of Earth time; and
- (ii) the fact that the full surface of the Earth exists with a time continuum equal to 100% of Earth time does not prevent molecular variations in the time continuum from existing within an individual atom—in other words, variations of the time continuum can exist within an atom totally independent of the time continuum generated by the Earth as a whole.

To explain this further, imagine you are in a boat and a large wave passes under the boat. As the boat reaches the crest of the wave, you throw a rock into the water. The rock makes a splash and generates a series of small waves on the surface of the large wave. Now imagine that the boat falls to the bottom (trough) of the same large wave, and you throw another rock into the water. The rock will make the same splash, and generate the same small waves, but now these small waves will exist on the surface of the trough of the large wave as shown in Figure 7.

This means that it is likely that the time continuum experienced by the nucleus of an atom would be different from the time continuum experienced by an electron of the same atom, which can be different from the time continuum experienced by the greater object (e.g. the Earth) that contains that atom. However, beyond a single atom it may be difficult to recognise secondary influences on the time continuum caused by the surrounding atoms due to the rapid decline in the distortion of the time continuum (i.e. the effects decline with the square of the distance).

Note 2 – An alternative explanation of wave interaction

The above wave-based explanation makes logical sense to me because I have studied coastal engineering, but I appreciate that some people may have found that explanation a little confusing. So below I have presented an alternative explanation.

Imagine you are in the middle of a large choir. Now you can clearly distinguish the voice of the person next to you from the collective sound of all the voices in the choir, even though the voice next to you is one of the members of the greater choir.

If the person next to you were to give a solo performance, then people at the back of the hall may not be able to hear that single voice, but the effects of that person's voice will technically travel an almost limitless distance so long as there are air particles that can be vibrated.

However, when everyone is singing, the collective strength of these individual voices will appear to travel further than that of a single voice. In real terms, the distance of travel has not changed, only the amplitude of the sound waves has changed.

So each member of the choir should be able to distinguish their own voice, and possibly the voices of the people next to them, while also hearing the collective sound of the whole choir. Similarly, an electron can experience the individual effects of the nucleus on the time continuum, while also experiencing the collective effects generated by the Earth as a whole.

This means that if electrons wore digital watches, each electron that makes up the planet Earth would show a different time on their watch. However, such a property would not apply to humans on the surface of the Earth. On the surface of the Earth it would be almost impossible to identify anything but the collective time distortion. In other words Earth time is effectively a constant all around the surface of the Earth (but just a little, little, little bit slower directly under the Moon).

Studies have shown that variations in the time continuum caused by the presence of an object in space vary with the square of the distance from the centre of the object. The extent (i.e. the reach into space) of these variations in the time continuum is technically limitless. This means variations in the time continuum generated by our Sun will reach far beyond Pluto.

It has also been demonstrated through visual observations that the light from distant stars can be bent as this light passes around our Sun (Figure 8). It has been suggested that the 'pull' of the Sun's gravity causes this light to bend, but I think not!

'Light' is said to have no mass, and it is my belief that the lateral force exerted on an object passing through a distorted time continuum is proportional to the 'mass' of the object, which in the case of 'light' would be zero.

However, if the lateral force exerted on an object passing through a distorted time continuum is proportional to the 'movement of energy' associated with that object, then it could be concluded that the travel path of light could be bent by gravitational forces.

What I believe these observations actually show is that light travels with the properties of a wave. I believe that light is actually being refracted around the Sun because the speed of light is governed by the local rate of time, and the rate of time varies in circular contours around the Sun. This causes the light wave closest to the Sun to travel slower than the light wave further away from the Sun (similar to ocean waves bending around an island that is encircled by a sloping beach).

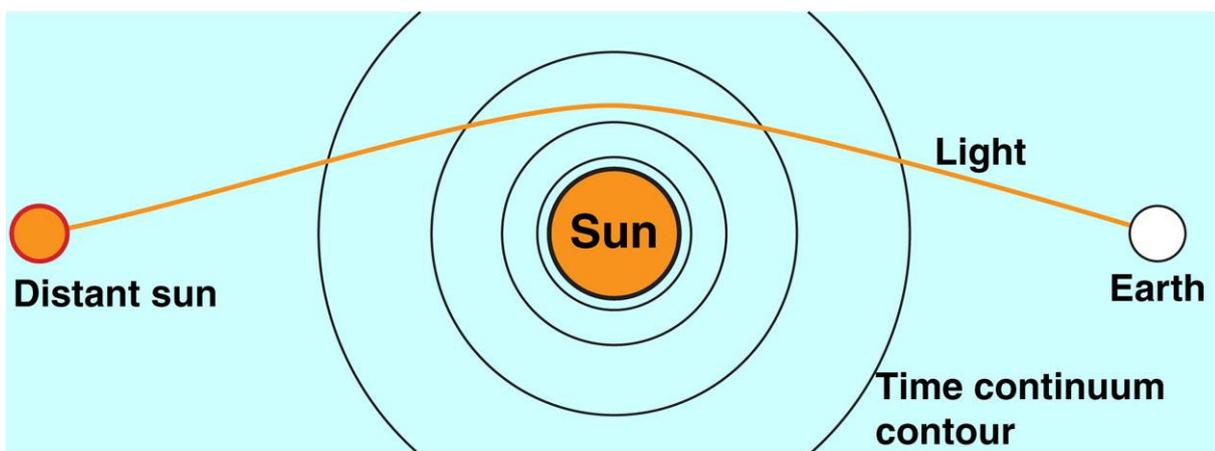


Figure 8 – Refraction of light around the Sun (not to scale)

This refraction of light would make the visual observation of black holes very difficult because the light from distant stars (i.e. stars positioned behind the black hole) would bend around the black hole, effectively hiding the black hole's existence.

This also means that a Star Trek cloaking device would require the starship to generate significant internal energy movement in order to distort the time continuum to such an extent that a scanning beam from another spacecraft would first split, and then be refracted around the cloaked starship (patent pending).

So this discussion raises a few questions:

- (i) Is the distortion of the time continuum generated by the 'mass' of an object in space, or by the total 'movement of energy' associated with that object?
- (ii) Why is the gravitational force so noticeable if the distortion of time is so minor that it is virtually undetectable?
- (iii) Could a cloaking device be designed to work on my VW Polo?

The answer to the first question would need us to investigate how well these two relationships match observations made outside our solar system (because inside our solar system the relationship between mass and the movement of energy is almost constant). However, there is also the possibility that this question could also be answered through quantum mechanics.

The answer to the second question is that the gravitational force produced by an object existing within a time continuum gradient is dependent on:

- (i) the mass of the object
- (ii) the absolute velocity of the object (which is very, very large)
- (iii) the gradient of the time continuum (which is very, very small).

In the case of a person standing on the surface of the Earth, the absolute velocity of the person is given by the velocity of the Earth travelling through space, which is significant.

Finally, the answer to the third question is hidden deep inside my patent application. All I can say is that very few people have seen my car on the road over the past year—truth.

5. An explanation of gravity based on the current mass-based model

If it is accepted that gravity is related to the 'mass' of objects, and that it is the mass of objects in space that distorts the space-time continuum around these objects, then:

- (i) a line of the minimum time continuum would exist between two distant objects in space, while also extending through and beyond these objects
- (ii) if an object (the Moon) is located within, or passes through the gravitation field of another object (the Earth), then the first object will experience a net gravitational force acting along this line of the minimum time continuum
- (iii) the net gravitational force is generated by the existence of an asymmetric time continuum gradient, which is generated around the Moon as a result of the combined gravitational fields of the Earth and Moon (Figure 3)
- (iv) the gravitational force exerted on an object (the Moon) is proportional to the object's mass
- (v) the gravitational force exerted on the Moon, plus the Moon's existing momentum, will cause the Moon to rotate around the Earth (or more correctly to rotate around the centre of mass of the combined Earth and Moon), but only because the Moon's centrifugal force is in balance with the net gravitational force acting on the Moon.

6. The consequences of accepting a mass-based gravity model

If it is accepted that gravity is related to the mass of objects, and that the mass of objects distorts the space-time continuum around such objects, then:

- (i) any distortion of the time continuum generated around the Big Bang would depend on the rate of conversion of energy to mass during, and immediately after, the Big Bang
- (ii) the gravitational forces exerted on matter produced by the Big Bang would be massive during the initial stages after the Big Bang, due to the large amount of central mass
- (iii) in the initial period after the Big Bang, time would progress relatively slowly (relative to current Earth time) due to the large amount of central mass
- (iv) the gravitational forces exerted on matter produced by the Big Bang would decrease with time as the universe expanded, which means the universe would expand at a decreasing rate that itself would decrease with time
- (v) this could mean that the universe would never stop expanding, but more likely it would mean that at some stage the universe would stop expanding, and then begin to collapse
- (vi) as the universe expands, time near the outer edges of space would accelerate (relative to Earth time)
- (vii) this would mean that galaxies on the edge of space would appear to a person on earth to be travelling faster than they actually are (depending on how the speed of these galaxies is measured)
- (viii) the gravitational effects of a black hole would be proportional to the mass of the black hole, and would vary with the square of the distance from the centre of the black hole
- (ix) back on Earth during 2022, the gravitational forces acting at a molecular level within an atom would also be governed by the mass of the electrons and nucleus.

In the gravity-based model there is the theory that the gravitational effects of a black hole are so strong that not even light can escape, but light has no mass, and therefore should not be affected by the 'pull' of gravity. The reason for light being trapped in a black hole would more likely be related to the expectation that time stops within a black hole, therefore light cannot move.

7. An explanation of gravity based on an energy-based model

As discussed above, the current explanation of gravity links this force to the mass of objects. The thought being that the mass of an object causes a distortion in the space-time continuum, which causes the Moon to travel in a curved path around the Earth, and the Earth to travel in a curved path around the Sun.

But why was 'mass' chosen as the key variable when it does not seem to have a logical association with the time continuum. Surely, if we could find another variable that had a more logical connection with time, and was proportional to mass, then such a variable must also be considered as a possible key variable that controls the movement of objects in space.

At the beginning of this paper I suggested that the universe is comprised of just three things: energy, space and time. I also suggested that the movement of energy creates both space and time, and that variations in the movement of energy cause variations in the rate that time passes (i.e. the time continuum).

Note 3 – The effect of multiple parameters that hold direct relationships with each other

If a relationship can be demonstrated to exist between two variables (X & Y), and an independent relationship exists between the second variable and a third variable (Y & Z), then a relationship must also exist between the first and third variables i.e. if $X = A(Y)$, and $Y = B(Z)$, then $X = A.B(Z)$.

If Gravity = A(Mass), and Mass = B(Energy Movement), then Gravity = A.B(Energy Movement).

If it is accepted that gravity is related to the 'movement of energy' associated with an object, and that it is this movement that distorts the space-time continuum around these objects, then:

- (i) a line of the minimum time continuum would be created between two distant objects in space, while also extending through and beyond these objects—however, my problem is, on one hand I say that the movement of energy creates time, but then this energy-based model relies on the concentrated movement of energy (i.e. a moon, planet or sun) causing a localised reduction in the time continuum, which seems counter intuitive
- (ii) if one object (the Moon) is caught in the orbit of another object, then the orbiting object will experience a net gravitational force acting along the line of the minimum time continuum
- (iii) a net gravitational force is exerted on the Moon because of its existence within an asymmetric time continuum gradient that exists around the Moon (Figure 3).

In other words, the forces and actions developed within our solar system remain the same for an energy-based gravity model as it does for a mass-based gravity model.

In order to test which of these two relationships is the most appropriate we would need to investigate how well these relationships match observations made outside our solar system. This is because inside our solar system, the total movement of energy associated with moons, planets and our Sun is directly proportional to the mass of each object, and so the two relationships would produce the same outcomes.

Outside our solar system the relationship between mass and the movement of energy would be different to that observed within our solar system because each solar system is potentially travelling through space at a different velocity.

Alternatively, these two potential relationships could be tested based on our knowledge of molecular physics. Unfortunately I have very little knowledge of molecular physics.

However, before any of this analysis can take place it will be necessary to determine what 'movement' we are referring to when we discuss the movement of energy. It is my suggestion that the movement of energy refers to the collective movement of all energy units, including:

- (i) the rotation of electrons
- (ii) the spinning of the Earth
- (iii) the rotation of the Earth around the Sun
- (iv) the movement of our solar system and galaxy through space.

8. The consequences of accepting an energy-based gravity model

It is important to note that all of the calculations previously performed on the various Moon landings, and every Explorer satellite mission, would largely remain unchanged if we adopted an energy-based model. Adopting an energy-based system over a mass-based system changes only the variables, not the answers. The answers only change once you leave our solar system.

Now, if it is accepted that gravity is related to the total movement of energy associated with an object, and that this movement distorts the space-time continuum around such objects, then:

- (i) 'time' would have started at the very commencement of the Big Bang (if a single big bang is assumed to have occurred)
- (ii) during the early stages of the Big Bang the gradient of time would have been extreme, which means the gravitation force acting against the expansion of the universe could also have been extreme, except, if the Big Bang wasn't moving through space, then maybe these gravitational forces may have been insignificant (this depends on the mathematics)
- (iii) the gravitational forces exerted on galaxies would decrease with time as the universe expanded, which would mean that the velocity of all galaxies would decrease with time
- (iv) as the universe expanded, the rate of time would always be a maximum at the outer edges of space; therefore the velocity of light would be fastest at these outer edges of the universe
- (v) collectively this would likely mean that at some stage the universe would stop expanding, and then would begin to collapse
- (vi) at the edge of space, gravitational forces would disappear due to the lack of energy movement, which would mean planets, suns and galaxy clusters would lose their binding force, and all objects would begin to move freely, and therefore drift apart
- (vii) however, objects associated with a galaxy would still exist in relatively close proximity and would likely collapse into themselves, potentially forming a black hole, or at least a centre of mass
- (viii) these 'centres of mass' would then start moving towards the centre of the universe at an accelerating velocity
- (ix) this means these 'centres of mass' would be travelling with velocity through space, which means a significant time continuum would exist around these centres of mass (due to the collective movement of energy)
- (x) as the velocity of these centres of mass increased, the rate of time within these centres of mass would slow, even though its velocity towards the centre of the universe would increase
- (xi) as matter collects at the centre of the universe, the compression of this matter would be such that electrons, protons and neutrons would not be able to move freely, and as a result, both the movement of energy, and the rate of time, would slow, if not completely stop
- (xii) with the formation of this ultimate black hole, light would not be able to leave the black hole, not because of the extreme gravity, but because time had stopped
- (xiii) unlike the mass-based black hole theory, in the energy-based system, the creation of a black hole would be very slow, and objects would become compressed as they entered a black hole due to the severe time gradient (i.e. the reverse of current thinking).

- (xiv) if you managed to stand next to a black hole, you would probably die of old age long before you were drawn into the black hole (ignoring the fact that time would have slowed to the point that your life span would be several thousands or millions of years)
- (xv) once the whole universe had collapsed into a central black hole, it is likely that at some point matter begins to be converted back into energy, and this sudden release of large amounts of energy initiates a new 'big bang'; and the cycle begins all over again
- (xvi) under this model, our current universe may in fact be just one of an endless cycle of big bangs, followed by universal expansion, followed by universal contraction, followed by another big bang, and so on, but the same could also be said for the mass-based model
- (xvii) each time a big bang occurs it is likely that new elements are added to the Periodic Table
- (xviii) back on Earth in 2022, the gravitational forces acting at a molecular level within an atom would also be governed by the movement of energy within the atom
- (xix) this means the gravitational force acting on each ring of electrons would be different, and would relate in part to the velocity of each electron, but also to the velocity of the atom moving through space.

It is noted that the distortion of the time continuum created by the movement of an individual electron could coexist on the surface of the distortion of the time continuum created by the collective effects of the trillions of energy units that make up the Earth. In effect, the small wave shown in Figure 7 is representative of the gravitational issues within an individual atom, while the large wave represents the gravitational issues associated with the Earth as a whole.

The effects of an individual electron may not be detected on the surface of the Earth, but the effects of this individual electron on the time continuum will:

- (i) be felt by the atom's nucleus, but possibly not to a measurable degree by adjacent atoms (because these effects vary with the square of the distance from the electron), and
- (ii) the gravitational effects of an individual electron will extend all the way to the surface of the Earth and beyond.

Movements of large quantities of energy (say the Earth) can generate relatively large changes in the time continuum, but these large changes in the time continuum are actually the result of trillions of small changes overlapping each other, each generated by just one unit of energy.

Further still, at a molecular scale, the movement of each electron produces its own distortion of the time continuum virtually independent of what is happening around it.

9. Conclusions

If we accept that gravity is related to the movement of energy associated with an object in space, and not the mass of the object, then this will change our understanding of:

- (i) the initial expansion of the universe after the Big Bang
- (ii) the size and rate of expansion of the universe
- (iii) the ultimate expansion, then collapse of the universe
- (iv) the existence and operation of black holes (maybe black holes are not as scary and destructive as we once thought)
- (v) the potential effects of gravity acting at the molecular level, and the possible development of a universal equation that accounts for both astrophysics and molecular physics.

I believe today in 2022 what I have believed for the past 25 years, that is, ocean tides on Earth are not caused by the Moon's gravity 'pulling' on the water. This is because, outside the molecular world (and possibly inside the molecular world), there is no such thing as an 'attracting' force. Similarly, the Moon is not pulled towards the Earth, it is pushed towards the Earth.

I believe that it is now my responsibility to issue a notice to my past engineering students that I was wrong when I told them that ocean tides were caused by the gravitational pull of the Moon. For any of these students that still have their lecture notes of 1995–96 (and why would you not keep such important information), please correct your notes by inserting the following statements.

The rotation of the Moon around the Earth is caused by:

- (i) the Moon existing within a time continuum gradient (i.e. variations in the rate that time passes) that is generated by either the Earth's mass, or the movement of energy associated with the movement of Earth through space (the latter being my preference)
- (ii) the superposition of the time continuum gradients that exist around the Earth and Moon cause a distortion of these time continuum gradients, and the formation of a line of a minimum time continuum to exist between the Earth and Moon (Figure 1)
- (iii) the resulting asymmetric time continuum gradient around the Moon causes a net force to act on the Moon, which acts in the direction of the line of the minimum time continuum (a similar force is also generated on the Earth)
- (iv) the net gravitational force acting on the Moon is proportional to either the mass of the Moon (my preference), or the total movement of energy associated with the Moon, and this force causes the Moon to experience an acceleration along the line of the minimum time continuum (i.e. towards the Earth)
- (v) this acceleration will cause the Moon to travel in a circular path around the centre of mass of the combined Earth and Moon, but only because the Moon's centrifugal force is in balance with the net gravitational force acting on the Moon.

Ocean tides are caused by:

- (i) the Moon existing within a time continuum gradient generated by either the Earth's mass, or the collective movement of the energy associated with the Earth
- (ii) the superposition of the Moon's time continuum gradient on the Earth's time continuum gradient causes a distortion of the Earth's time continuum gradient, which in turn causes the formation of a line of the minimum time continuum to exist between the Earth and Moon, and which extends through the Earth and Moon, and beyond
- (iii) the resulting asymmetric time continuum gradient that exists around the Earth causes an asymmetric pressure to be exerted on the water, which causes the ocean's water furthest from the line of the minimum time continuum (points B and D in Figure 1) to be pushed towards this line on both the side of the Earth facing towards the Moon (Point A, higher high water), and the side of the Earth facing away from the Moon (Point C, lower high water)
So the Moon's gravitation field forces ocean water on the far side of the Earth to effectively move away from the Moon—welcome to the complexity of gravitational fields.
- (iv) further to this, the rotation of the earth around the centre of mass of the combined Earth and Moon generates a centrifugal force on the Earth's oceans (including Point C), which further contributes to the existence of the lower high water
- (v) the spinning of the Earth (one rotation every 24 hours) does not directly contribute to the existence of tides because this is a static effect that simply alters the height of mean sea level around world (however, this action does indirectly affect the timing of tides by altering the mean depth of water around the world).

Technically there is no such thing as the gravitational 'pull' of the Moon; however, ocean tides are a direct consequence of the interaction between the gravitational forces generated by the Earth and Moon.

I can now retire as an engineer with a clear mind, even though I still carry a bit of guilt for initially teaching my coastal engineering students an 'untruth'.