HOW LIGHT BENDS & CURVES
by Christina Munns

ABSTRACT
The aim of this paper is to explain the mechanism of how light both bends and curves and to discuss these findings in the light of current understanding of the properties of a gravitational field. This paper explains how gravity does not commute with the phenomenon of light since the gravitational force is a conserved vector field and is path independent. Also gravity is irrotational and thus has zero curl and so could not cause light to curve. The essential argument of this paper is that the bending of light arises as a result of a difference in the refractive index between two identical reference frames travelling at different velocities and that the curvature of light arises as a direct result of the rotational symmetry of time which is intrinsic to the phenomenon of acceleration. Therefore the deviation of light from its path is not due to the presence of the gravitational field as expressed in Einstein’s Theory of General Relativity but is instead due to the CP violating and distorting effect of the phenomenon of time which is intrinsic to all material states.

INTRODUCTION
I will now explain the reason why the beam of light in Diagrams 2 bends and curves in Diagram 3:

Figure 1 - Direction of a beam of light between two rockets in deep space.
Figure 1 = rockets travelling at same speed = same inertial frame of reference
Figure 2 = 2nd rocket faster velocity = difference in refractive index = refraction of light
Figure 3 = 2nd rocket accelerating relative to 1st rocket = curvature of light due to rotational symmetry of time inherent in the phenomenon of acceleration in 2nd rocket
FIGURE 1
In this diagram the two rockets are travelling in the same speed and so they both exist within the same inertial reference frame. Their motions are both equal to each other and therefore the light can continue in a straight line, unimpeded by any change.

FIGURE 2
In this diagram the two rockets are travelling at different velocities, with the second rocket travelling faster than the first. This means that they are travelling in different inertial frames of reference. The light beam travelling from Rocket 1 to Rocket 2 is bent. It is generally believed that this event arises due to the upward thrust of Rocket 2 compared to Rocket 1. I do not believe this to be the case. Instead, I propose that it is the difference in velocity between the two rockets that causes the light to refract. Sir Isaac Newton understood correctly that gravity has no impact on light, for the reasons that are outlined in the exposition of Figure 3 of this article. Einstein decided to disregard Newton’s perception of gravity in relation to light (much to my dismay!) in order to derive his framework for the Theory of General Relativity. He did so in order to provide a framework in which gravity is consistent for all observers.

FIGURE 3
In this diagram Rocket 2 is accelerating relative to Rocket 1. Since acceleration measures the rate of change of velocity over a period of time and since time itself exhibits rotational symmetry and is CP violating, I propose that the curvature of the beam of light in Figure 3 is due to the decaying and rotational effect of time itself. Since time rotates in a clockwise direction, then the beam of light similarly experiences a change in direction in a clockwise rotation due to the rotational symmetry of time.

Albert Einstein believed that light bent in the presence of a gravitational field. He believed that this event took place both in space in an accelerating g force and also on Earth under the influence of a gravitational field. This paper serves to prove the point that this theory that a gravitational field causes light to bend and curve is in fact, incorrect. Instead, this article serves to elucidate the matter by presenting the arguments that light bends in Figure 2 between the two rockets because of the velocity differential which in turn impacts on the refractive index and thus phase velocity of the beam of light in both the rockets and that light curves in Figure 3 because Rocket 2 is accelerating and since acceleration is derived from the phenomenon of velocity divided by time, it is the rotational symmetry of time itself that causes the curvature. I will explain.
EXPOSITION
I will now give the explanation of how light remains unchanged, bends and curves according to Figures 1, 2 and 3 above.

FIGURE 1

The two rockets in this diagram have the same inertial reference frame because they are travelling at the same velocity. Therefore the beam of light is able to travel in a straight line, since there is only one inertial frame of reference between the two rockets.

FIGURE 2

In this diagram Rocket 2 (containing the blue person) is travelling at a faster velocity than Rocket 1 (containing the green person). I propose that it is the difference in velocity that causes the beam of light to bend because there is a difference in the refractive index between the two rockets due to the different velocities of the two rockets. Thus the light travelling in Rocket 1 experiences one refractive index but the light in Rocket 2 experiences a lower refractive index due to its higher velocity.

It is because the refractive index measures the phase velocity of light that causes the light to bend or refract in Rocket 2. Due to the fact that there is a difference in velocity between the two rockets, the light travelling to the second rocket is bent. This bending of the light beam is due to the principle of refraction and Snell’s Law. Therefore, it can be stated that due to the fact that Rocket 2 has a lower refractive index relative to Rocket 1, that the light in Rocket 2 experiences a faster phase velocity. Since the phase velocity of the light in Rocket 2 is faster, (due to its faster velocity) compared to the phase velocity of the light in Rocket 1, then the difference in phase velocity creates a boundary condition which causes the beam of light to refract. Here is a diagram demonstrating this:
It is because Snell’s Law applies to light passing through two different isotropic media that this law is of relevance to Figure 2. It is implicit in this instance that the light is travelling between the same isotropic medium of the medium of the rockets. From the perspective of the beam of light, it perceives that it is passing through the same isotropic medium (i.e. that of a rocket) in both rockets. However, the velocity differential between the two rockets creates a boundary condition between the two rockets through which the light must pass. It is the different refractive index between the two rockets that arises due to the velocity differential that causes the refraction of light. Here is a diagram showing the refraction of light at the boundary between two media with a different refractive index:\(^2\)

Therefore, it can be proven that it is not because of the upward motion \textit{per se} or gravitational field of Rocket 2 that causes the light to bend, but rather that the higher velocity of Rocket 2 causes a different index of refraction and hence the light is bent or refracted.
In this diagram Rocket 2 is accelerating relative to Rocket 1. The definition of acceleration is: is the rate of change of velocity. Since the phenomenon of acceleration is the rate of change of velocity over time, the phenomenon of acceleration has an intrinsic factor of time. Since the phenomenon of time exhibits rotational symmetry, and is inherently CP violating then it is the combined effects of the rotational symmetry and symmetry breaking properties of time that causes the curvature of light. It is the rotational aspect of time in a clockwise direction that renders the beam of light in Rocket 2 to experience a curvature in a clockwise direction compared to Rocket 1, because the acceleration of Rocket 2 is measured over periods of time and it is the pathway of moments of acceleration in Rocket 2 that causes the light to experience a downward curvature in a clockwise expression in coherence with the line of acceleration, which is itself driven by the rotational symmetry and symmetry breaking properties of time.

Thus, fundamentally speaking, it can be stated that the beam of light in Rocket 2 is curved due to the effect of time that is inherent within the phenomenon of acceleration. Thus it is not the actual increase in velocity in Rocket 2 that causes the curvature of light since the velocity does not impact on light as the speed of light is constant, but rather it is the dynamic of time within the phenomenon of acceleration that causes light to curve. The average acceleration formula over a period of time is as follows:

\[
\bar{a} = \frac{\Delta v}{\Delta t}.
\]

Here is a diagram showing how the moments of time within the path of acceleration cause the path of light to curve:

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1 The rotational symmetry of time is exhibited in the fact that a length of time of a day on earth is measured in terms of how long the earth takes to rotate around the sun.
According to Einstein’s Theory of General Relativity the beam of light in Rocket 2 arises due to the presence of a gravitational field. Einstein said this was so because in the process of developing his Theory of General Relativity, he disparaged Sir Isaac Newton’s understanding that light does not affect gravity, in order to symmetrise the phenomenon of gravity throughout all reference frames. This was an unfortunate decision, since it means that for the past 108 years, scientists have taken on board Einstein’s perception that gravity affects light. It has also caused us to consider gravity as part of the geometry of space and time but that is the subject of another paper! However, I wish to boldly assert that Einstein should not have rejected Newton’s perspective of gravity in relation to its impact on light for the following four reasons:

The first reason is that Friederich Gauss had the insight to change Newton’s Law of Universal Gravitation and say that $g$ diverges. This is what Einstein did not follow. Einstein did not follow the path of Gauss in developing his Theory of General Relativity and admit that $g$ diverges because to do so would have meant that there was no general relativity between all reference frames. This is a very subtle yet salient point.

What Einstein should have done in developing his Theory of General Relativity is to say that $g$ is relative to all fields – i.e. that it is a singularity and that each frame of reference does experience gravity, but not that it does not diverge. I propose that gravity is relative to all reference frames but because inertial reference frames can experience different wavelength frequencies, the expression or physical manifestation or particle state in which $g$ arises can diverge according to the frequency of EMR in which it finds itself. Frequency is a phenomenon which is governed by the phenomenon of time, and as explained in Figure 2, time is an intrinsically symmetry breaking phenomenon. Therefore the phenomenon of time can cause gravity to break its symmetry and gravitational binding energy and thus cause objects to fall to the ground, as well as cause $g$ to diverge.

To give a simple example using the phenomenon of colour. The colour blue has a frequency of 610-670THz and thus has a higher frequency than the colour red which has a frequency of 430-480THz. Now gravity is constant in both colours of red and blue but the material expression of gravity (i.e. the frequency of colour or the wavelength interval) between the two colours of red and blue is different. Therefore, whilst the gravitational force is constant, it is expressed in different frequencies of materiality or time, according to which inertial frame of reference it finds itself in. Thus it can be said that gravitation, whilst being constant throughout all frequencies of space & electromagnetism does become diverged through the agency of time which is translated to the phenomenon of frequency at a material level. This is why time slows down in lower frequencies of inertial reference frames.

The definition of the verb “to diverge” is: “to get further and further apart (of a path or line or course)”. This is exactly what happens to the gravitational wave, that its frequency or periodicity (which is a function of time) changes. Thus it can be said that the phenomenon of time causes gravity to diverge, just like the phenomenon of frequency of the particle state causes the waveform of light to elongate which expresses itself in the seven colours of the visible light spectrum.

The second reason that Einstein should not have changed Newton’s view that light cannot impact on gravity is the assumption made by Gauss in his flux theorem for gravity, that $g$ is irrotational and therefore has zero curl. This means therefore that a gravitational field cannot
cause a beam of light to curve, since by its very nature, gravity is irrotational and has zero curl factor. Since the space inside Rocket 2 represents a rapidly decaying vector field, by virtue of its property of acceleration, then the Helmholtz decomposition applies to the space within the rocket and an irrotational (i.e. curl free) vector field (which I believe to be \( g \)) and a solenoidal (i.e. divergence free) vector field of the beam of light remain in place as the acceleration occurs.

The third reason that Einstein should not have changed Newton’s perspective on the relationship between light and gravity is that light, or a particle of light – the photon, is itself massless. The lack of mass in the phenomenon of EMR means that it simultaneously has no centre of gravity. Since there is no centre of gravity in a photon, then a beam of light cannot experience curvature as a result of gravity, since there is no centre of mass within the photon to which can be attracted by gravity! This means that there is zero gravitational attraction between the phenomenon of light and gravity. This is another reason why Sir Isaac Newton was correct in this regard.

The fourth reason that Albert Einstein should not have disregarded Newton’s perspective on the zero effect of gravity on light is due to the fact that a gravitational field is a conservative vector field. This means that whatever products are contained within the gravitational field, are themselves conserved. This means that the direction of a beam of light travelling within a gravitational field is conserved and therefore cannot become curved. This property of the conservative vector field of \( g \) was established by Gauss’ Law of Gravity when Freiderich Gauss states that \( g \) is a conservative force. He states: \( \nabla \times g = 0 \).

Conservative forces are intrinsically path independent and therefore do not affect the propagation direction of the beam of light. Therefore the gravitational force being a conservative force cannot effect the path of the beam of light.

Note, however, that Sir Isaac Newton was incorrect and Einstein was correct in relation to the bending of light with regard to mass, because light is bent towards an object with mass. However, I propose that this is not due to gravitational effects, but rather due to the CP violating nature of mass itself, which intrinsically contains the phenomenon of time – the cause of perturbation of states. It is the symmetry breaking property of time itself within mass, that causes the warping of a path of a beam of light in relation to mass. So Newton was right regarding the relationship between light and gravity but was incorrect regarding the relationship between light and mass.

It is for the above four reasons that are summarised below that Einstein’s perspective that Newton’s theory about light and gravity being independent phenomena was wrong, was in itself, incorrect.²

² For more information about the properties of gravity, please refer to my paper “What is Gravity?”.
4 Reasons Why Sir Isaac Newton was Correct Regarding the Relationship between Gravity & Light

1st reason = Gauss’ Law of Gravity states that gravity diverges.

2nd reason = Gauss’ Law of Gravity states that gravity has zero curl due to its property of irrotation.

3rd reason = That a photon is massless and therefore has no centre of gravity with which the attractive force of gravity can grasp.

4th reason = That the gravitational constant is a conservative vector field which are path independent and therefore cannot have any effect on the path of a beam of light.

Therefore, it can be demonstrated that Sir Isaac Newton was correct when he said that gravity has no impact on light. It is for this reason that it can be said that it is not the gravitational field in Figure 3 that causes the beam of light in Rocket 2 to curve, but rather, as explained earlier, it is the rotational symmetry and CP violating nature of the phenomenon of time which is intrinsic to the phenomenon of acceleration that is the cause of the curvature.

CONCLUSION

In summary, this article explains the mechanics of what causes a beam of light to bend and curve. It demonstrates how light bends due to the principle of refraction that arises due to the different refractive indices of two isotropic media travelling at different velocities. This paper also elucidates the mechanics of how light curves between two isotropic media in which one is accelerating relative to the other by explaining historically, how the misperception regarding the relationship between light and gravity established by Sir Isaac Newton arose when Albert Einstein was developing his Theory of General Relativity and that Friederich Gauss was correct regarding gravity in many respects.

Further, this paper provides the reasoning as to why Gauss’ Law of Gravity is a more exact expression of the properties of gravity (except for the lack of assumption that the field is zero infinitely far from a mass). It is due to the assumptions made in Gauss’ Law regarding the nature of the gravitational force that enables me to bring to light the true cause of the curvature of the beam of light – i.e. that light curves due to the effects of time and its intrinsic rotational symmetry and CP violating nature.

In the light of this new understanding regarding the relationship between gravity and light I hereby wish to state three new laws regarding the relationship of the deviation of the path of a beam of light.

1. Munns’ Law of the Bending of Light: “the bending of a beam of light between two identical states travelling at different velocities occurs as a result of the refractive index differential between the two isotropic media that arises due to the differential in phase velocity of the beam in light which creates a boundary condition that causes the path of the light to be refracted”

2. Munns’ Law of the Curvature of Light: “the curvature of a beam of light between two identical objects where one object is accelerating relative to the other occurs as a result of the rotational symmetry of time that is intrinsic within the phenomenon of acceleration. This curvature always follows a downward path in a clockwise direction.”
3. **Munns’ Law of Light Deviation**: “a path of a beam of light always deviates from its prescribed course due to the intrinsic CP violating property of time within the particle state”

**AUTHOR’S NOTE**

I can appreciate that this information about the bending and curvature of light is in itself pretty mind-boggling, since it not only over-rides many of the previous assumptions made about the nature of gravity and it relationship to the Theory of General Relativity (more of which will be covered in a separate paper entitled “What Is Gravity?”), but it also requires current science to re-evaluate its data in the light of this new understanding. This process needs to be welcomed, not denied, since it is only through understanding physics as it applies to the natural world and real living systems that we are able to further our understanding about the universe in which we live.

If we, as scientists, continue along the current path of believing that gravity affects light and causes it to both curve and bend, then we will be heading up a blind alley. It is far preferable (dare I say “imperative”?) that we accept that an error of judgement has been made by Einstein during his formulation of the Theory of General Relativity regarding the nature of gravity and its relationship to light, pick ourselves up off the floor, let go of our amazement and continue courageously on our corrected course. This will enable science to progress. May it be so.

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P.S. There is much more that I will be writing about the nature of gravity and its relationship to relativity and correcting our current misperceptions. I will endeavour to produce this work as soon as possible.

1 [http://www.rareuniverse.org/general_science/general_relativity.html](http://www.rareuniverse.org/general_science/general_relativity.html)
3 [http://hyperphysics.phy-astr.gsu.edu/hbase/acca.html](http://hyperphysics.phy-astr.gsu.edu/hbase/acca.html)