The Properties of Light

Based on the Quantum Force Model of the Universe

Catchments & Creeks

Version 2, 2025

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Based on the Quantum Force Model of the Universe

Version 2, August 2025

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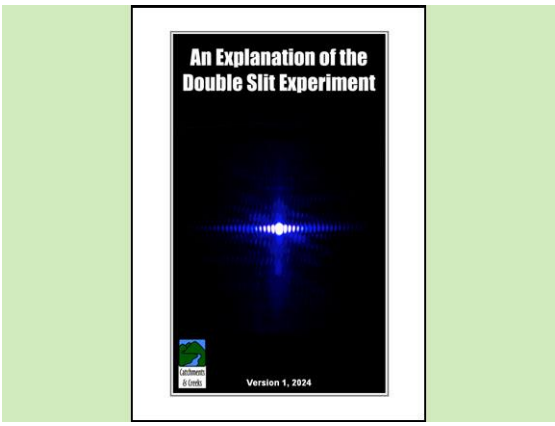
Introduction

- Light is not magical.
- Light is not more strange than you think.
- Light is not difficult to understand.
- Light is no more complex to understand than sound.
- Light does not have unique properties.
- Light obeys Newton physics.
- Light is not a transverse wave.
- Lights is not electromagnetic radiation, even though it produces electromagnetic radiation. Similarly, a petrol car is not exhaust gas, even though it produces exhaust gas.
- Light cannot travel through a vacuum.
- Light <u>does</u> have a constant velocity in a vacuum; its zero m/s!
- The speed of light is not a universal constant.
- Light is not a physical object that contains no mass.
- Light is massless only to the same extent that sound waves and deep water ocean waves are massless.
- Light can apply a force because light is a force.
- Light is not watching you to see if you are watching it.
- Light does not have a brain, so light cannot see you, watching it, seeing you, watching it!
- Light does not get embarrassed, and does not put on cloths if it feels it is being watched.
- Light does <u>not</u> decide what to wear to the ball only <u>after</u> it has arrived and checked out if everybody important has arrived.
- Light has no intelligence. In fact, if you can see light, or feel light on your face, then you have more intelligence than the light with which you choose to interact. (grammar?)
- Even I am more intelligent than light (on my good days).

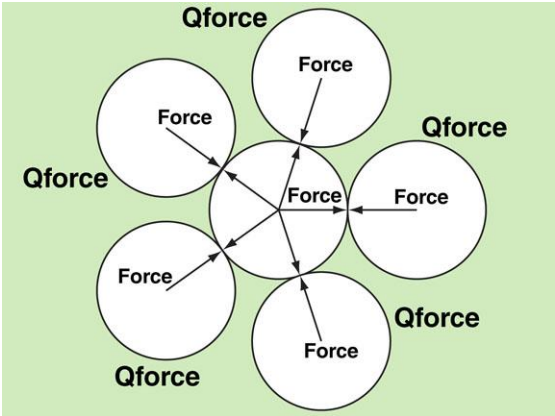
Introduction



Double Slit Experiment, Version 1

Introduction

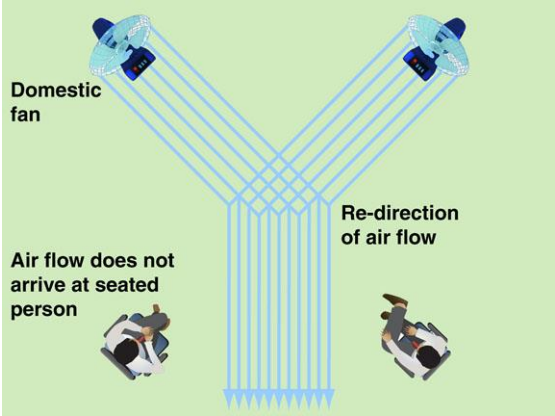
- The quantum force model of the universe was introduced in *'An Explanation of the Double Slit Experiment'* (V1, 2024).
- In this publication I stated that quantum forces generate all four of the fundamental forces:
  - gravity
  - electromagnetism
  - weak interaction
  - strong interaction.



Quantum forces

The quantum force model of the universe

- The quantum force model of the universe is based on the following assumptions:
  - the Big Bang (or Big Expansion) was created by the expansion of highly concentrated quantum forces
  - quantum forces have no physical existence
  - 'space' exists as a continuum of uniformly distributed quantum forces, which some have termed as: 'aether'.

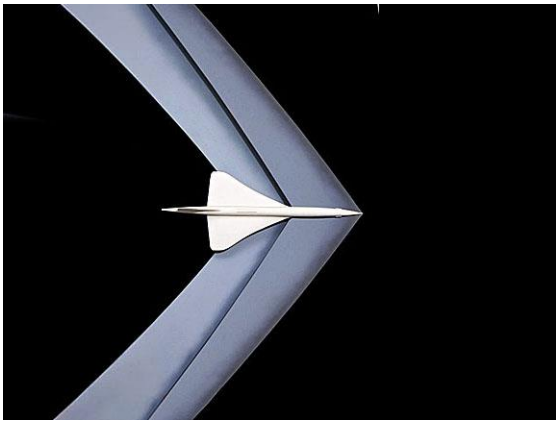


A flow of air cannot experience CDI

The contribution of wave theory to our understanding of light

- Wave theory can provide us with a major contribution to our understanding of the double slit experiment.

1. Only energy waves can experience constructive and destructive wave interference (CDI).
2. If a wave facilitates the transportation of particles (physical matter) then the wave cannot experience such interference.



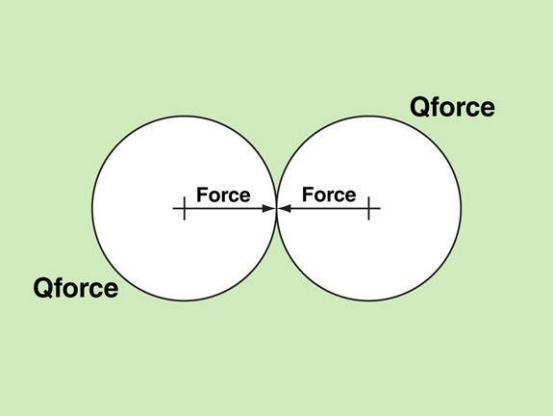
Sound-based shock wave

The contribution of fluid mechanics to our understanding of light

- Fluid mechanics provides us with another key contribution to our understanding of the double slit experiment.

1. A physical object moving through a media typically produces a wave in then media.
2. If an object moves at the speed of causality, then a shock wave is produced.
3. It does not matter if the object is a physical particle or a virtual particle, a shock wave is still produced.

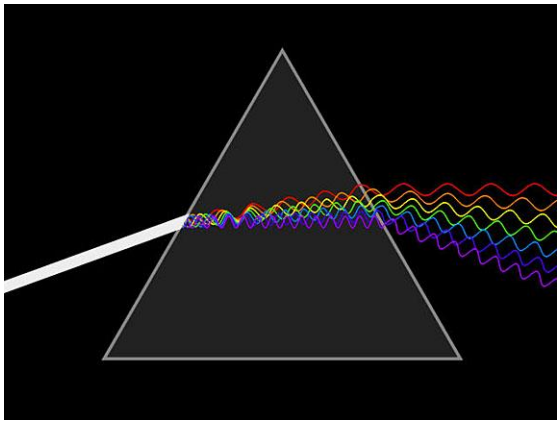
Light and quantum forces



Two quantum force units

Introduction

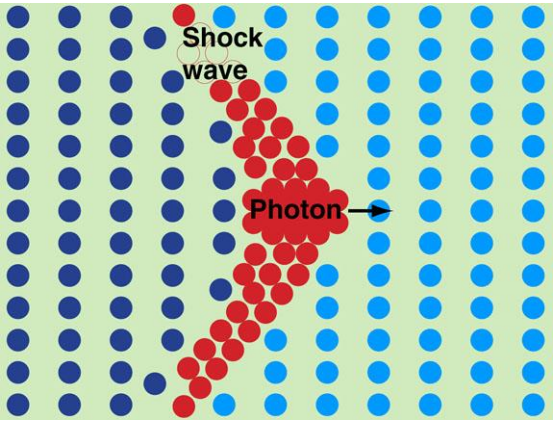
- This paper makes the following assumptions:
  - everything in the universe is formed from quantum forces (or similar)
  - every action that occurs within the universe occurs as a result of a force
  - a quantum force has one action, that being to repel all other quantum forces
  - free quantum forces (aether) push against a concentration of quantum forces (matter), which stabilises this concentration of forces.



Light

Light

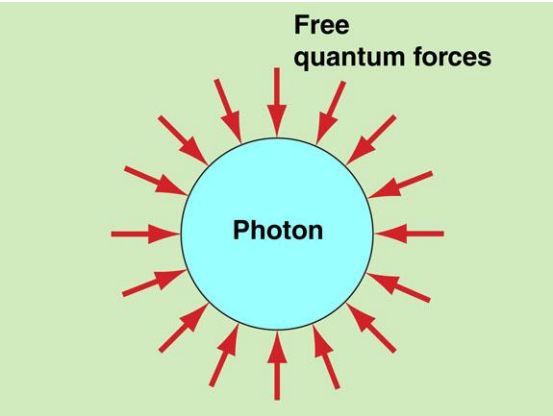
- Light, like everything else in the universe, is formed from the concentration of quantum forces.
- However, light only exists as a virtual particle, meaning that the concentration of quantum forces exists only in a temporary state, generated by the passing of an energy wave (i.e. a compression wave).
- Light passing through aether is equivalent to sound travelling through air (well, almost!).



Possible arrangement of a photon

Photons

- In reality, a photon is anything we define it to be (within any given language).
- However, in this paper I shall define a photon as just the central concentration of quantum forces.
- Thus, my definition of a photon does <u>not</u> include the attached shock wave.
- The photon uses part of its energy to form the attached, three-dimensional shock wave.

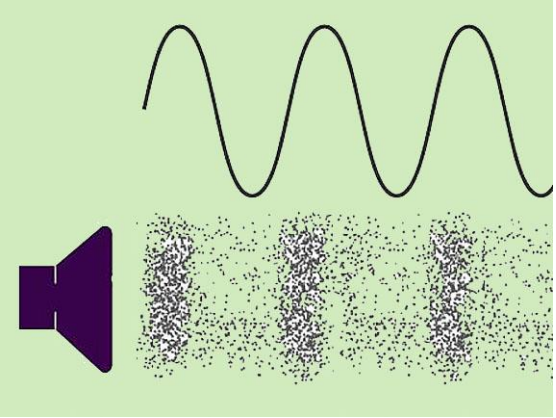


Stabilised photon

The stability of a photon

- Like any concentration of quantum forces, at any instant, the forces remains stable because of the surrounding non-concentrated quantum forces (aether).
- If the photon loses too much energy, then there can be insufficient quantum forces to maintain the stabilising effects of the surrounding aether, which will cause the photon to become unstable, and collapse.
- This means that all photons eventually turn back into aether.

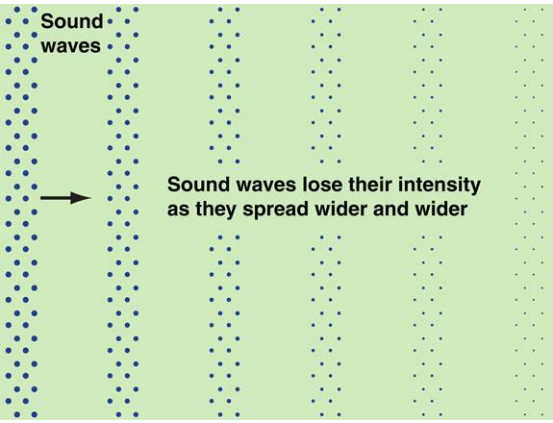
Why are photons stable, while sound waves are not?



Sound waves

Sound waves

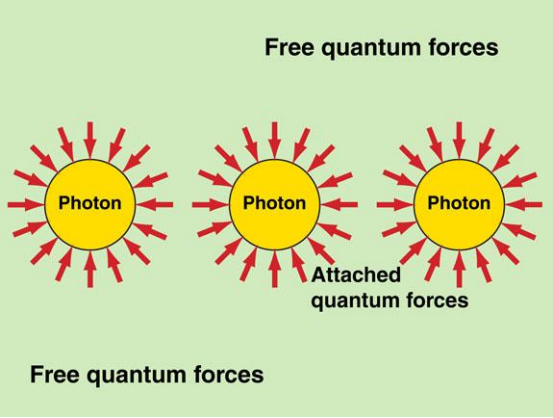
- If we accept that light shares many characteristics with sound waves.
- And if we accept that a photon is not a physical particle.
- Then why do sound waves have a relatively short lifespan, while photons have a very long lifespan, which allows them to exist for many years?



Reducing intensity of sound waves

The stability of sound waves

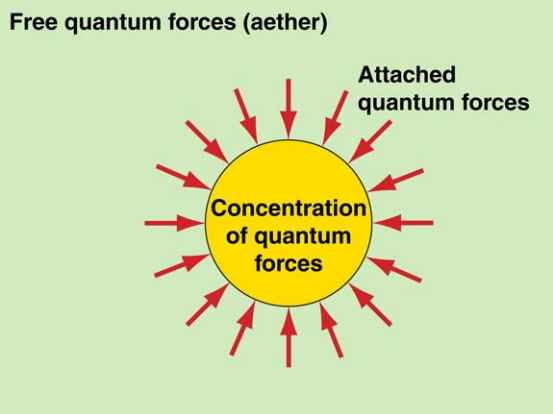
- Sound waves lose their intensity as they expand over wider and wider areas.
- The wide expansion, or spread, of sound waves is due to wave diffraction.
- Given that a sound wave is a transient compression or vibration of the media through which it travels, eventually:
  - the compression will fully dissipate, or
  - the vibration will stop due to friction.



External forces acting on a photon

The stability of photons

- A photon is also a transient compression of the media through which it travels, however:
  - the compression of quantum forces occurs because of the inward force of the surrounding quantum forces
  - a photon is limited in its expansion due to these same quantum forces
  - if the opportunity exists, the shock waves of several photons will join together, which links the photons.

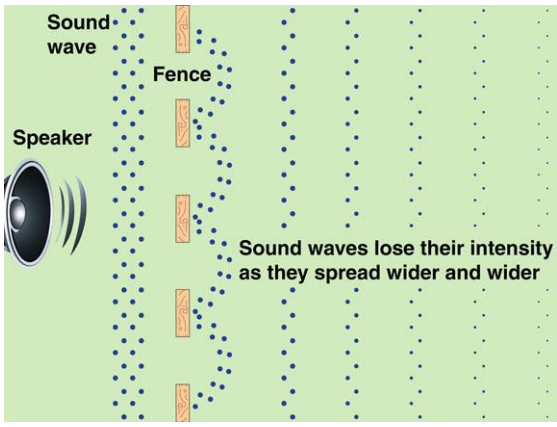


External forces acting on a matter

The stability of physical matter

- We could equally ask, why does a planet stay together, and not simply disperse into cosmic dust?
- Of course our answer would be 'gravity'.
- But, as will be shown in the final chapter, this thing called gravity, is just the effect of the quantum forces that surround the planet, all pushing inwards on the planet.
- Yes, gravity is a force.
- And, gravity is a pushing force, not a pulling force.

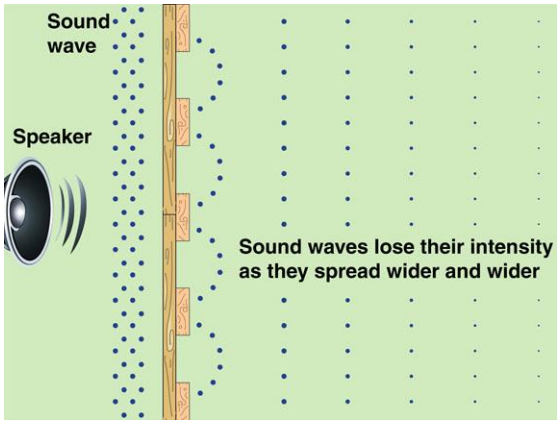
The collapse of sound waves



Sound passing through a picket fence

Introduction

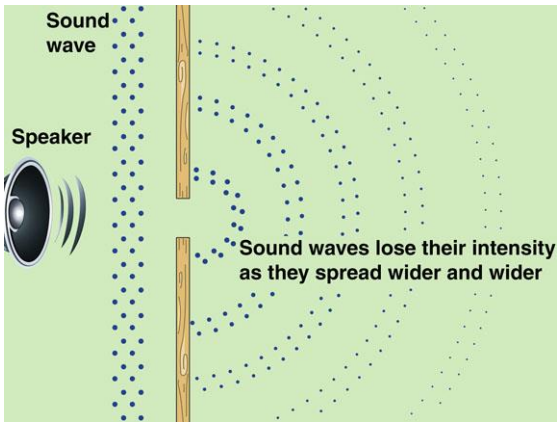
- When sound travels through several narrow gaps, such as a picket fence, the divided sound waves will likely rejoin beyond the fence and continue to expand (diffract).
- This continued expansion will decrease the intensity of the sound.



Sound passing through a lattice screen

Passing through a lattice fence

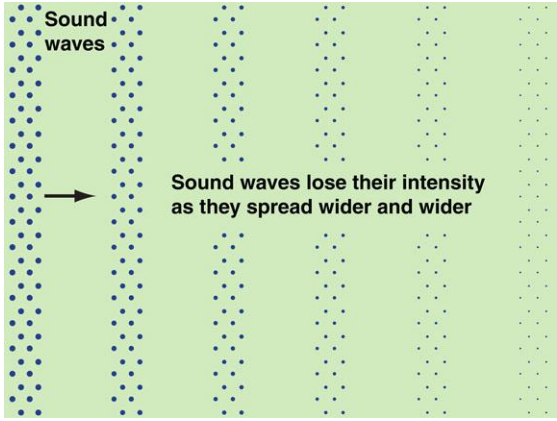
- When sound travels through the gaps in a lattice fence, there is an even greater loss of energy compared to a picket fence.
- However, once again the depleted sound waves will likely rejoin beyond the fence, and continue to expand (diffract).



Sound passing through a single gap

Passing through a single gap

- When sound travels through a single gap, the loss of energy is even greater.
- After passing through the gap, the sound waves will continue to diffract and lose their intensity.



Sound travelling over a distance

Sound travelling over a distance

- Ultimately sound waves lose their intensity because the compressed media (air) continues to expand back to the background concentration.
- Quantum forces will surround all air particles, just like they do around any form of matter, and these forces will try to maintain the compression of the air that forms the sound wave, <u>but</u> the Brownian forces that separate gas particles are stronger that the quantum forces that try to keep them together.

Brownian motion

Earth and Moon

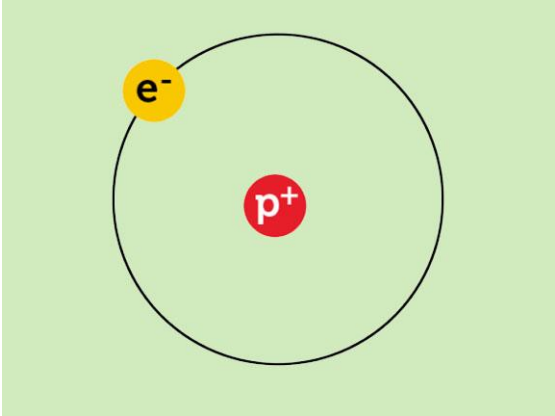
Introduction

- *'Brownian motion is the random motion of particles suspended in a medium'* (Wikipedia, 2024).
- An explanation of Brownian motion can be found in astrophysics.
- We know that the orbit of the Moon around Earth causes the Earth to orbit the centre of mass of the combined Earth and Moon.
- Therefore, the Moon's orbit causes the Earth to 'vibrate' very slowly.

Wheel balance test

An out-of-balance wheel

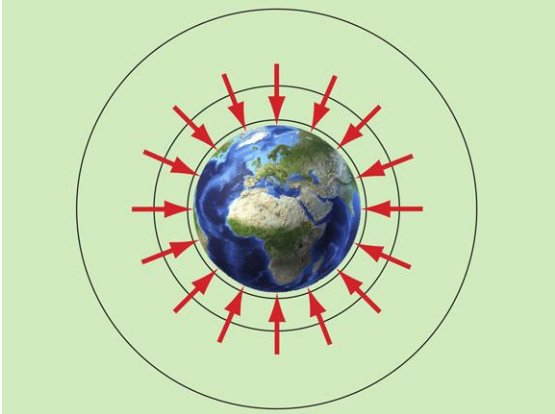
- We all know the effects of having an unbalanced wheel on a car—the wheel begins to vibrate.
- A similar action occurs if a ceiling fan is out of balance.
- If it were possible to place unbalance motors (i.e. vibrating motors) on several round sleds, and then release these onto a ice skating rink, a series of collisions would occur, in a manner similar to Brownian motion.



Atom

The vibration of atoms

- Just like the Moon's orbit causes a vibration in the Earth, the orbit of an electron around a nucleus can cause the whole atom to vibrate if the net movement of the electrons around the nucleus is out of balance.
- This vibration is very fast, and very powerful relative to the mass of the atom.
- The near-miss and exchange of electrons also contributes to Brownian motion.

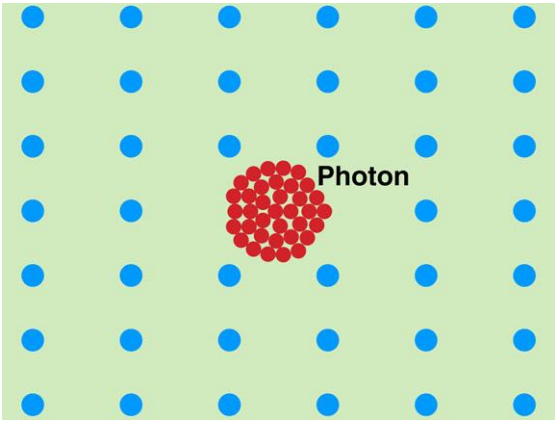


Earth's gravity

The power of Brownian motion

- The forces generated by Brownian motion far exceed the binding forces of quantum forces.
- This is why the gases of our atmosphere are able to expand as a 'shell' around the Earth, even though the quantum forces that fill space are pushing inward on these gases (i.e. as the force of gravity).

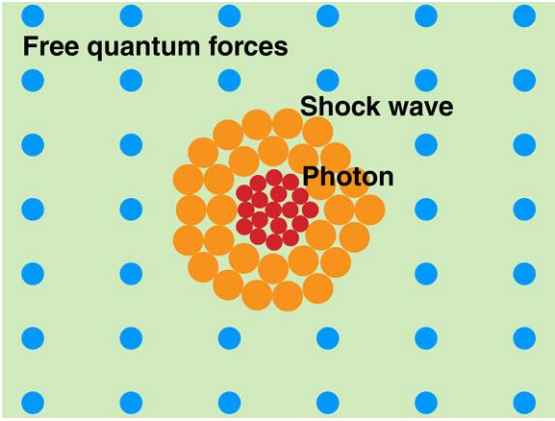
The collapse of a photon



Initial photon pulse (front view)

Initial photon

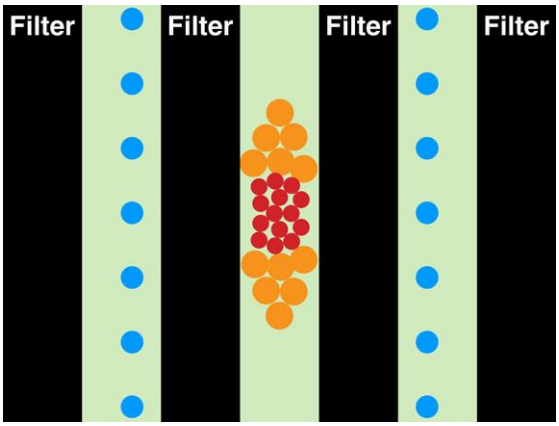
- A photon is a concentration of quantum forces, which is held in compression by the free and attached quantum forces that surround the photon.



Photon and shock wave (front view)

Building of the shock wave

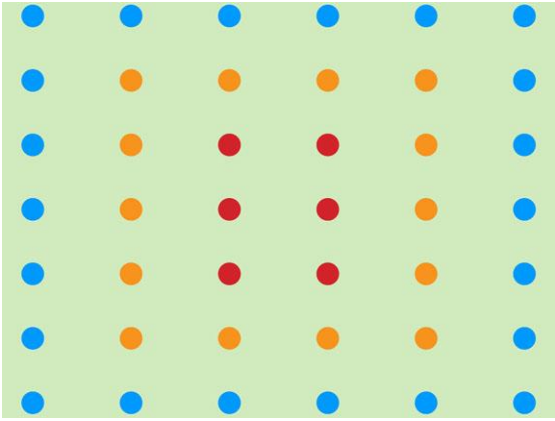
- The movement of a photon at the speed of causality creates a shock wave, which is attached to the photon.
- The shock wave is formed from the same compressed quantum forces as the central photon.
- Even though a photon has a diameter of a fraction of a millimetre, the shock wave can have a diameter that grows to a size of several centimetres (as evident by the double slit experiment).



Filtered light (front view)

Passing light through a filter

- When a photon and its shock wave pass through a polaroid filter, most of the shock wave is removed from the photon.
- The photon itself will either:
  - pass through one of the gaps
  - impart a force onto atomic particles within the filter, after which the photon will convert back into free quantum forces, or
  - reflect off the filter.

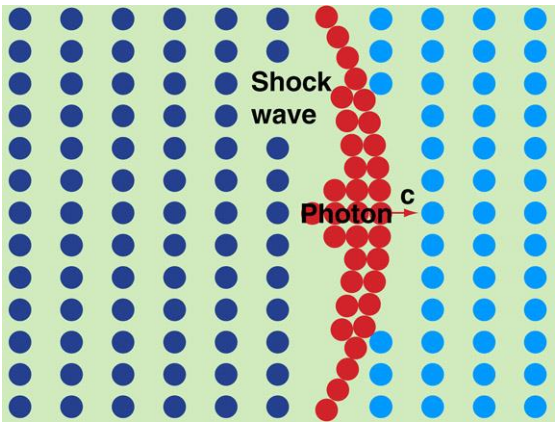


Collapse of a photon (front view)

Collapse of the photon

- After passing through a narrow gap, the photon will try to rebuild its shock wave because it continues to move at the critical velocity of the media.
- If the rebuilding of the shock wave takes too much energy from the photon, then the photon will no longer have sufficient energy to maintain its stability.
- Just like the collapse of a half photon, these depleted photons will collapse and return back into free quantum forces (i.e. aether).

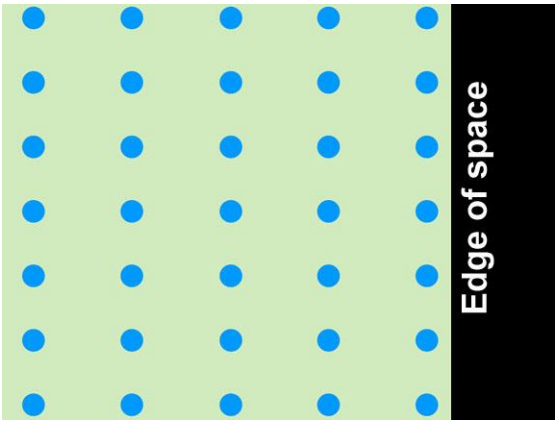
Light moves as an energy wave, <u>not</u> as a particle wave



Photon pulse

Introduction

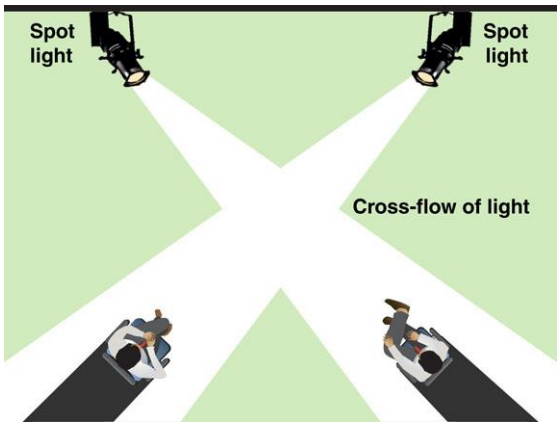
- Light travels as an energy wave.
- Light does not transport physical particles.
- The energy wave moves as a compression wave (pulse) of concentrated quantum forces.
- The central component of a photon is a virtual particle, which means the quantum forces (i.e. the media) do not move with the photon.



The edge of space

Expansion of the universe

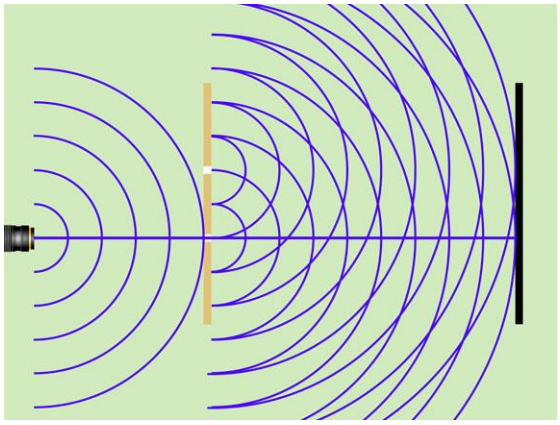
- Conformation of the energy wave theory can be seen in the rate of expansion of the universe.
- If light did exist as a particle wave, then such particles could readily move beyond the current edge of space.
- This would mean that the universe would be expanding at the speed of light.
- However, as an energy wave, light must collapse at the edge of space, and the expansion of space would be linked only to the local quantum force pressure.



Cross flow of light beams

Energy and momentum transfer

- Conformation of the energy wave theory can also be seen in the fact that light can impart energy and momentum onto physical matter, but not onto other examples of light.
- Rather than transferring energy and momentum between photons, light allows photon energy to pass through, and move beyond, other examples of photon energy without a change in energy or direction.
- This action is similar to the properties of ocean waves and sound waves.

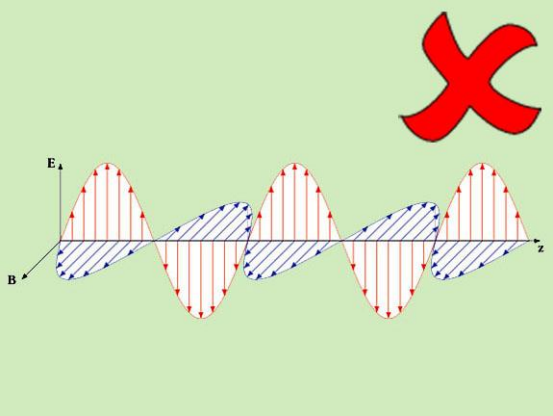


Constructive and destructive interference

Constructive and destructive interference

- Conformation of the energy wave approach can be seen in the occurrence of constructive and destructive interference within the double slit experiment.
- Particle waves <u>cannot</u> experience constructive or destructive interference.
- Only energy waves can experience constructive or destructive interference.
- Not all waves share the properties of all the other wave forms.

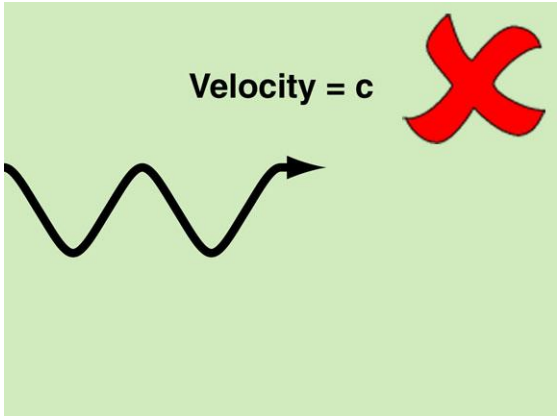
Light moves as a longitudinal wave, <u>not</u> as a transverse wave



Light is not electromagnetic radiation

Light is, or is not, a form of electro-magnetic radiation

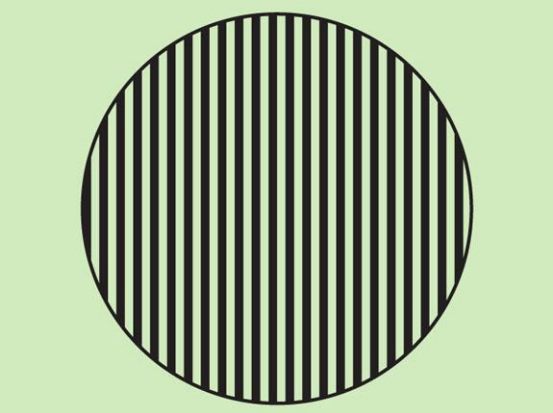
- A petrol-engine motor car produces exhaust gases, but that does not mean that a car is a form of exhaust gas.
- The movement of light produces electrical and magnetic effects, but that does not make light electromagnetic radiation.
- However, speakers of any language are masters of that language, so if we choose to call 'light' a form of electromagnetic radiation, then we are free to do so.



Light is not a transverse wave

Light travels as a longitudinal wave

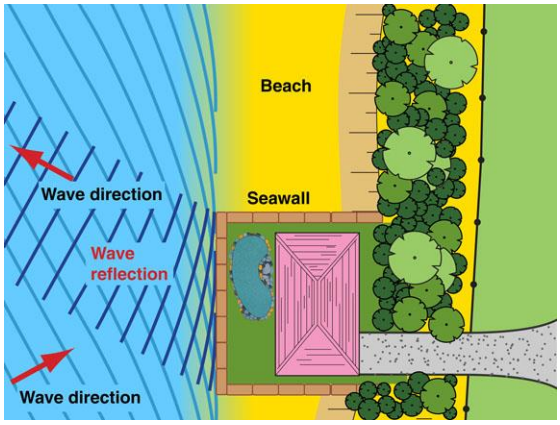
- Light exists as a compression wave (pulse) of compressed quantum forces.
- This compression wave moves through the media of free quantum forces in the same way that sound waves move through the air.
- A compression wave is a longitudinal wave, not a transverse wave.
- The fact that light may, or may not, generate a transverse wave as a by-product of its movement does <u>not</u> make light a transverse wave.



Polaroid (vertical-slot) filter

The polarisation of light

- The filtering of light through a polaroid filter does <u>not</u> prove that light moves as a transverse wave.
- Light exists as a centroid of concentrated quantum forces, surrounded by a three-dimensional shock wave of less-concentrated quantum forces.
- A photon will lose part of its shock wave when it moves through a filter, which turns a 3D photon into a near-2D photon.

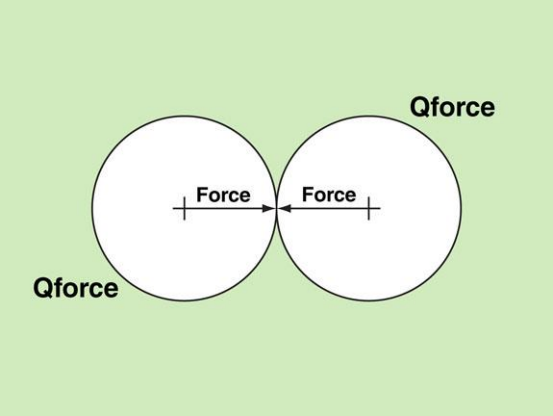


Reflected coastal waves

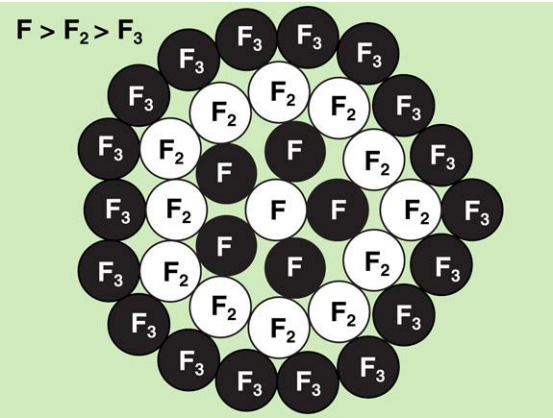
Reflected waves

- Reflected light waves are known to experience a polarisation effect which appears to align the waves to the plane of the reflecting surface.
- This outcome causes the shock wave to reflect back on itself, which can cause a cancelling of parts of the shock wave.
- This effect depends on the shape of the shock wave, and the roughness of the reflecting surface.

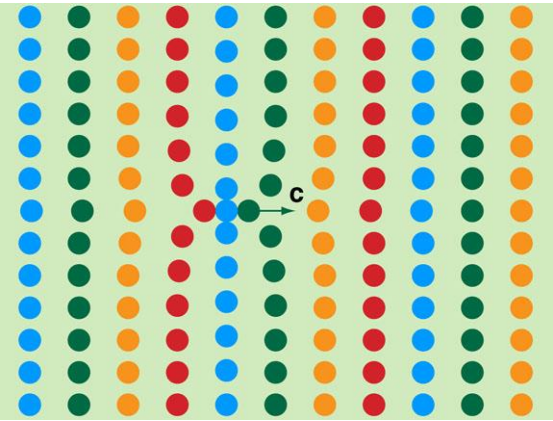
The movement of light generates electricity



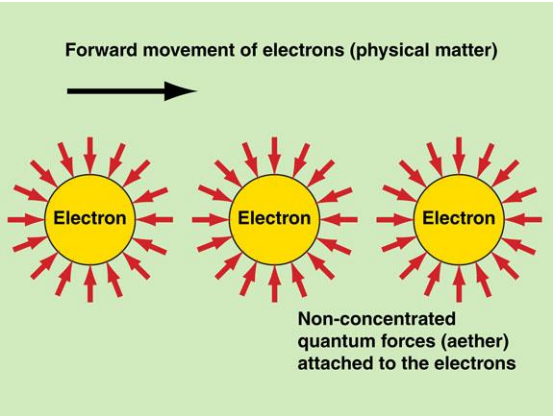
Repelling force



Concentration of quantum forces



Movement of a virtual particle



Flow of electrons and quantum forces

Quantum forces

- In order to understand the relationship between light, electricity and magnetism, we need to return to the properties of a quantum force.
- A quantum force has only one task, that is to repel other quantum forces.
- Through this one action it can be demonstrated that a region of concentrated quantum forces will be surrounded by free quantum forces, which act to further concentrate that region.

(For obvious reasons I have avoided use of the term: 'quantum force field')

- Through this simple action of physics, quantum forces are able to form stable concentrations of quantum forces, ultimately forming matter, planets, and the rest of the universe.
- Consequently, the stability of a concentration of quantum forces (matter) depends on the existence of the surrounding field of quantum forces (aether).
- If matter moves, it will also move some of the surrounding aether, and if the aether moves, it will move the attached matter.

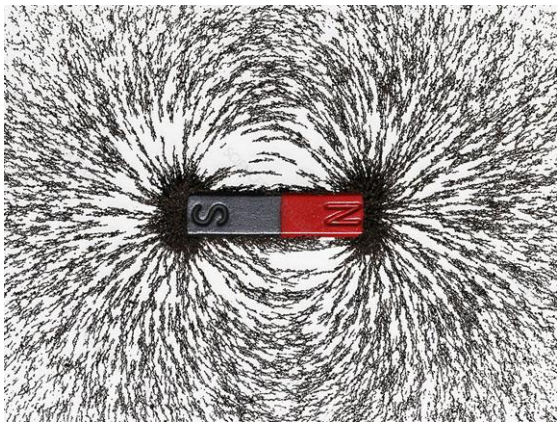
If matter is formed from a concentration of quantum forces, then why is 'light' not considered a form of matter?

- All matter is a product of concentrated quantum forces, and light also exists as a concentration of quantum forces.
- When matter moves, the same collection of quantum forces (Qforces) moves with the matter (more correctly; as the matter).
- However, when light moves, the forces that concentrate the quantum forces shift from Qforce to Qforce, without moving individual quantum forces.

The movement of an electron

- When electrons move along an electrical wire, each of these electrons will be transporting with it, its own attached quantum forces.
- The movement of the electrons (i.e. matter) is electricity, and the associated movement of attached quantum forces is magnetism.
- Because the movement of light causes the movement of concentrated quantum forces, it creates electricity, but much less than moving electrons.

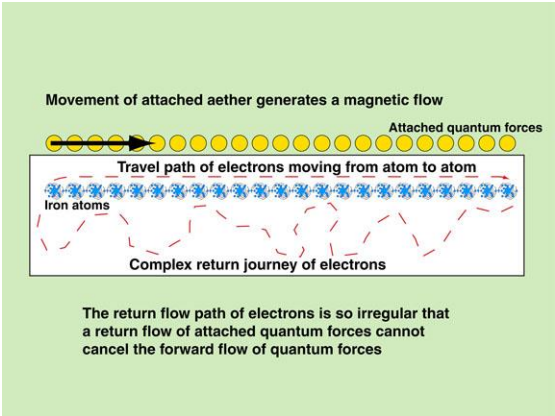
The movement of light generates magnetism



Magnetic field

Magnetic fields

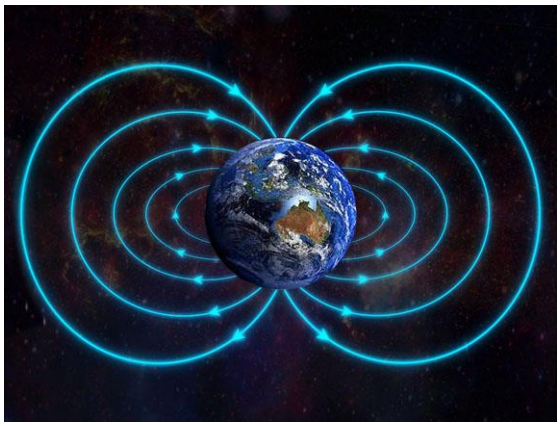
- Magnetising a metal bar causes the molecules to align in such a manner that electrons can freely flow in one particular direction.
- However, this process does not allow the electrons to follow a similar 'straight' path in the opposite direction.
- This dominant flow of electrons in a 'straight' path causes attached quantum forces to also move in the same direction, thus forming magnetism.



Electron flow in an iron magnet

The mechanics of magnetising an iron bar

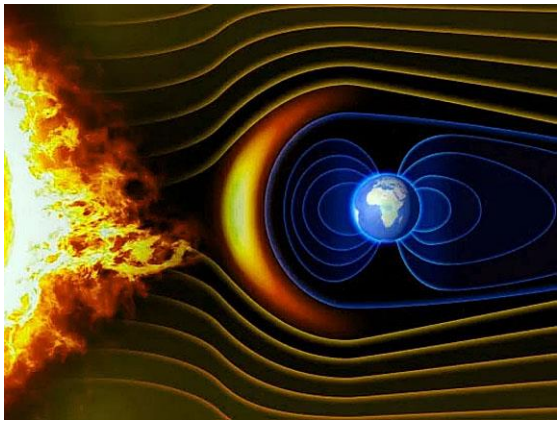
- Only certain materials can be magnetised, meaning that these materials can hold a magnetic charge while stationary.
- The material requires an atomic structure that, when aligned, allows electrons to move rapidly in one direction, but not in the opposite direction.
- This electron movement causes a similar flow of the attached aether.
- However, the return pathway of electrons remains random, which prevents the formation of an opposing aether flow.



Earth's magnetic field

Earth's magnetic field

- Because the Earth is formed from concentrated quantum forces, and because the Earth is held in space as a stable concentration of these forces, the Earth has an attached cloud of non-concentrated quantum forces.
- These attached quantum forces are just Earth's captured bit of aether (space).
- This captured aether moves with the dominant flow of electrons held within the Earth's iron core.

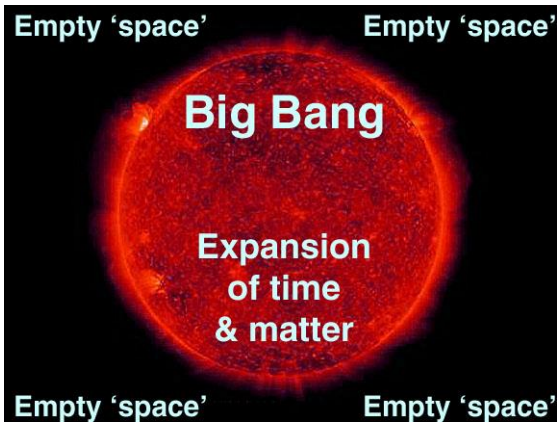


Protection from solar winds

Earth's protector

- Because the Earth's magnetic field is formed from the same non-concentrated quantum forces (aether) as the rest of space, the magnetic field is able to repel free aether, or aether winds (solar winds).
- It never seemed logical to me that Apollo capsules could bounce off Earth's atmosphere, but what does seem logical is Apollo capsules bouncing off Earth's magnetic field if they approached Earth at the wrong angle.

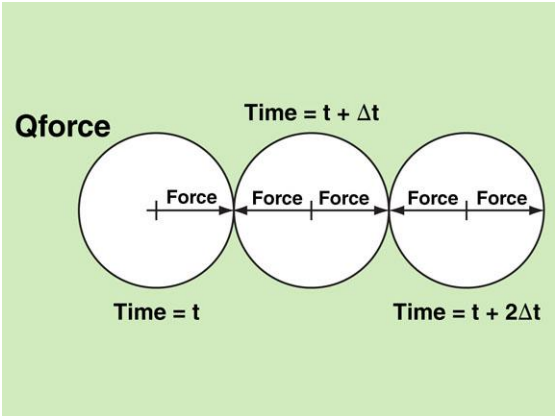
Light and Time



The Big Bang

The Big Bang

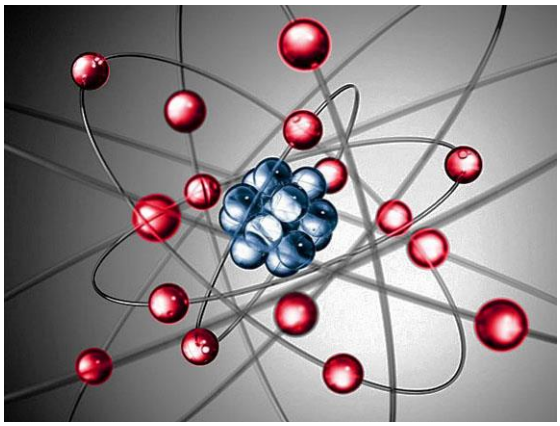
- It is assumed that nothing existed prior to the Big Bang.
- It is assumed that a quantum force has no physical existence, and therefore is equivalent to 'nothing'.
- It is assumed that after the Big Bang there was only an expanding cloud of quantum forces.
- This concentration of quantum forces was unstable because it was surrounded by empty space (i.e. no quantum forces).



Responding to a change in force

The speed of causality

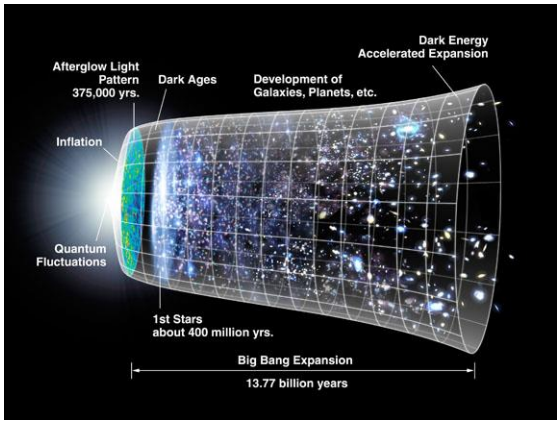
- All actions performed by the quantum forces are governed by the response rate of each individual quantum force (i.e. the speed of causality).
- This suggests that Time must be an integral property of each individual quantum force, or simply a by-product of movement.



Atom

If Time was an internal property of quantum forces

- If Time was an internal property of quantum forces, and if time did alter in response to velocity, then:
  - the rate of time experienced by an electron would be different from that of the nucleus
  - the rate of time experienced by an electron would be different for each orbital radius of each electron shell.

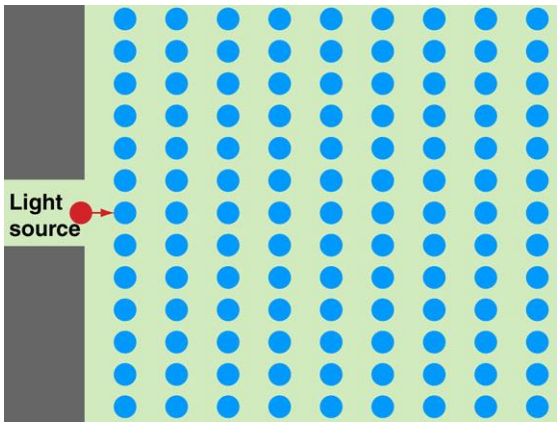


Accelerated expansion of space

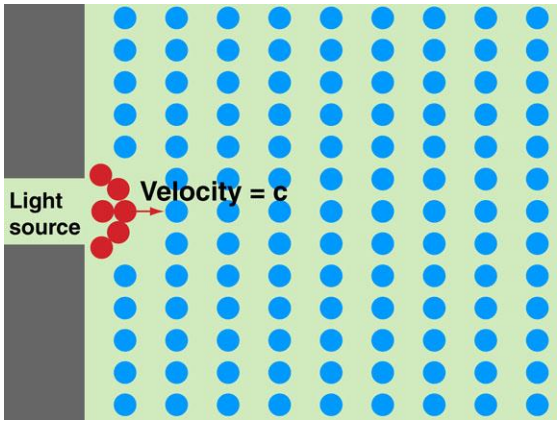
If Time was an internal property of quantum forces

- If Time was an internal property of quantum forces, and if the rate of time did alter in response to velocity, then:
  - to an observer located on Earth, planets and galaxies would appear to be moving faster if the rate of time slowed at the location of the observer.
- But, all of that involves a lot of 'IFs'.

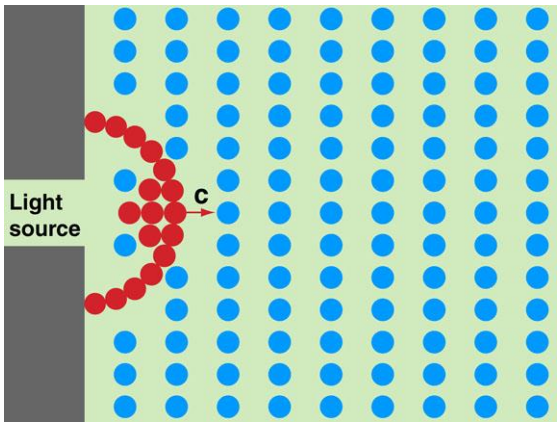
The initial acceleration of light up to its maximum speed



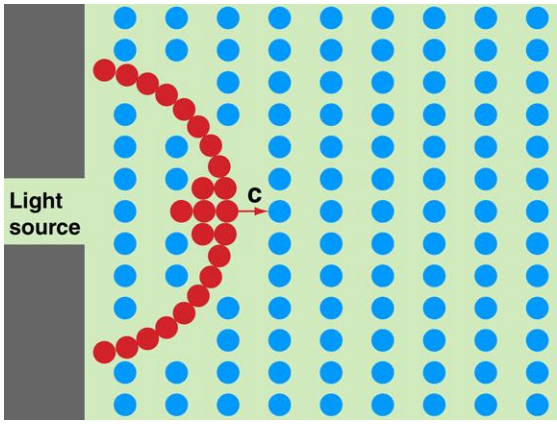
Initial release of a single photon



Growth of an energy shock wave



Growth of an energy shock wave



Growth of an energy shock wave

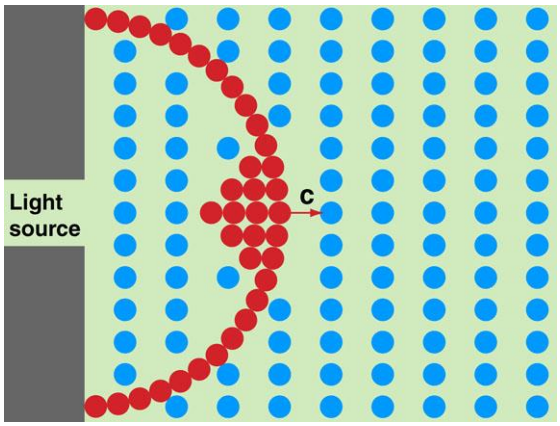
The 'physics' of movement at the speed of causality

- When a physical object, or a force message, travels at the speed of causality, then:
  - no 'warning' of its movement can move forward of the object, which causes a shock wave to occur
  - behind the object, other objects would know that this object had passed
  - if the object is physical matter, then it will act like a snow plough collecting more matter (i.e. unsustainable).

The initial movement and acceleration of light

- At the start, some type of trigger begins to form a concentration of quantum forces (aether).
- However, because the free quantum forces that surround this concentration of quantum forces are not uniform in their distribution, the growing photon is not held as a stable physical particle, but allowed to exist as a moving virtual particle.
- The virtual particle causes a transfer of forces, which occurs at the speed of causality (i.e. the speed of light).
- The free quantum forces in front of the photon have no idea that this virtual particle of compressed quantum forces is moving forward.
- This means the quantum forces in front of the photon still think that the quantum forces behind them are not concentrated, so they exert only a minor force towards the approaching photon.
- Meanwhile, the quantum forces behind the photon know these quantum forces are concentrated, so the force they exert on the rear of the photon is greater that the force being applied to the front of the photon.
- The rapid approach of the virtual particle creates a shock wave in the field of quantum forces, which behave like a fluid.
- Given the questionable mass of the virtual particle (the photon), this net force will generate an almost instantaneous acceleration.
- The shock wave attached to the photon is formed from the compression of free quantum forces, just like a jet fighter compresses the forward air.

The initial acceleration of light up to its maximum speed



Growth of an energy shock wave

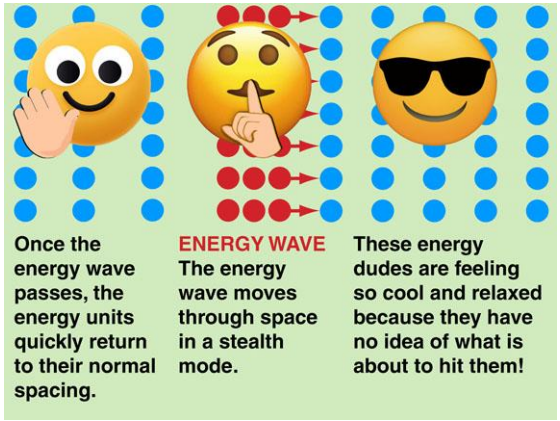
Why does light stop accelerating when it reaches the speed of light?

- Once the energy message reaches the speed of causality, it is now travelling as fast as the forces that were pushing it.
- If the photon ever slows, then it will be given a push to accelerate it back to the speed of causality.
- However, because no force message can travel faster than the speed of causality, there is no force that can push the photon to move faster.

Bobsleigh

Bobsleigh

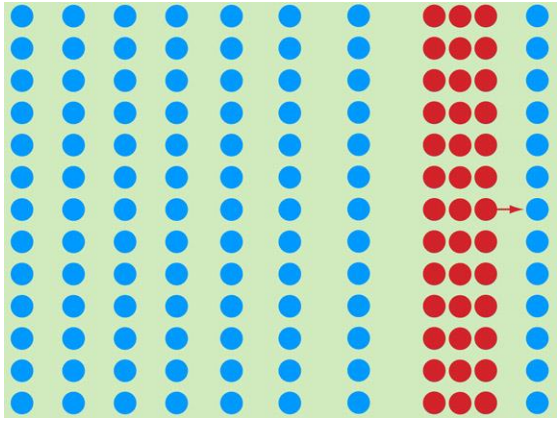
- Who should you pick to be in your bobsleigh team:
  - a runner with the fastest top speed, or
  - a runner with the fastest acceleration?
- Once a runner reach their top speed they can no longer push the bobsleigh, but the runner with the fastest acceleration will reach their top speed faster.
- Similarly, once a photon reaches the speed of causality, it can no longer be pushed by free quantum forces.



Energy shock wave

Light existing glass or water

- The energy wave that is 'light', conducts a surprise attack on the non-concentrated energy that rests in front of it.
- If the photon is ever slowed by something in front of the photon, then the forces behind the photon will help to accelerate the photon back to the speed of causality.
- Therefore, it does not matter how slow the photon travels through glass, once it re-enters air, it will accelerate back to the speed of causality for air (once again, there is no magic here).



Fully developed energy shock wave

Growth of the shock wave

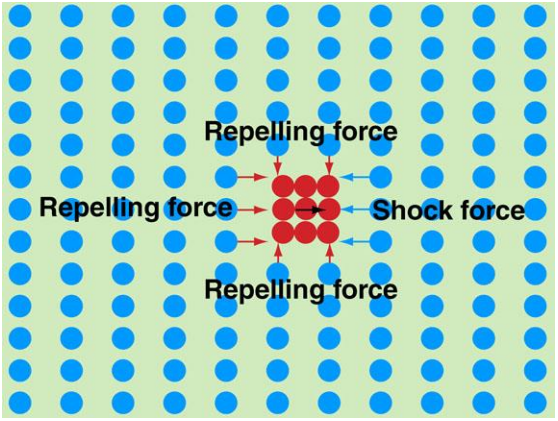
- According to fluid mechanics, a shock wave that is formed at the speed of causality (i.e. the critical velocity) will have a near-straight profile (i.e. level with the photon).
- However, I expect the shock wave could have a curved profile during its initial development.
- The maximum diameter of the shock wave would likely depend on the intensity of the light (i.e. the energy of the photon).

An explanation of why we can see stars at night

Sight

Question

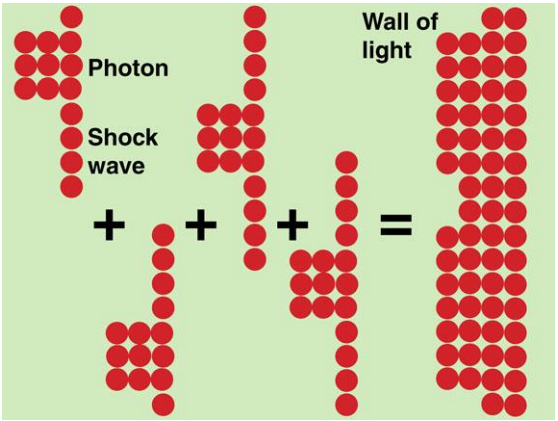
- **Have you ever asked yourself:** How many photons would need to leave our closest star if, after travelling for four light-years, a group of them could arrive in your eye with enough energy to be registered by your brain, yet, if you move just 1 cm to the left, another group of photons would similarly arrive at that location.
- That means there would be enough tightly packed photons to completely fill the surface area of a sphere with a radius equal to four light-years. Wow!



Forces acting on a photon

The effects of gravity on photons

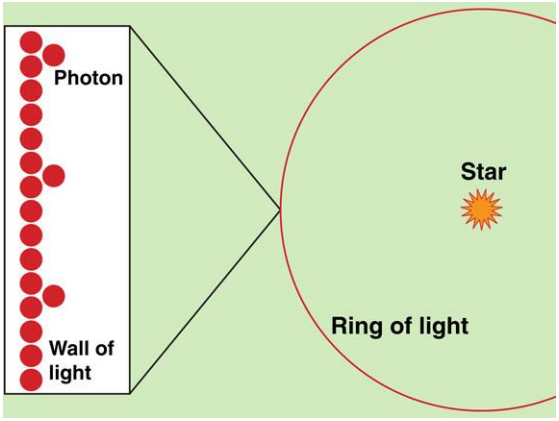
- This paper suggest that a photon is held together with the same force of gravity that holds planets together.
- Without this gravitational effect, the quantum forces contained within the photon would simply disperse into the surrounding aether.
- But what happens to the shock wave?



Overlapping shock waves

The superposition (constructive interference) of shock waves

- As each photon travels on its long journey from a star to your eye, its attached shock wave will, technically, continue to expand, but in reality there will be a measurable limit to this expansion.
- When two shock waves are in close proximity, the same quantum forces that push planets together, also push the shock waves together forming a more intense (i.e. visible), three-dimensional shock wave.

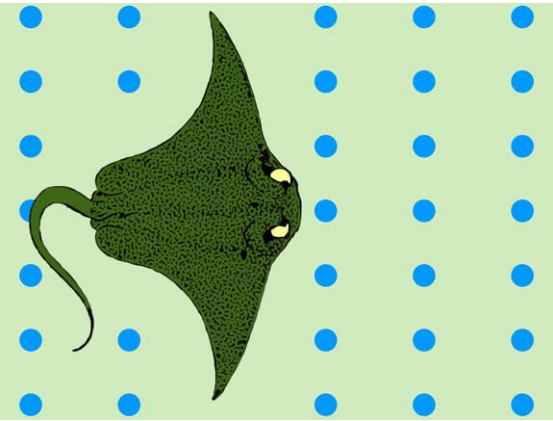


A ring of light projected from a star

The structure of light as it travels vast distances

- Over the vast distances of space, the individual photons and shock waves will eventually join together forming a giant spherical wave (ring) of light.
- Many overlapping shock waves will increase the energy density around the full ring of light to a point where the human eye can detect not just the photons, but also the shock wave.
- These three-dimensional shock waves would carry the full colour spectrum.

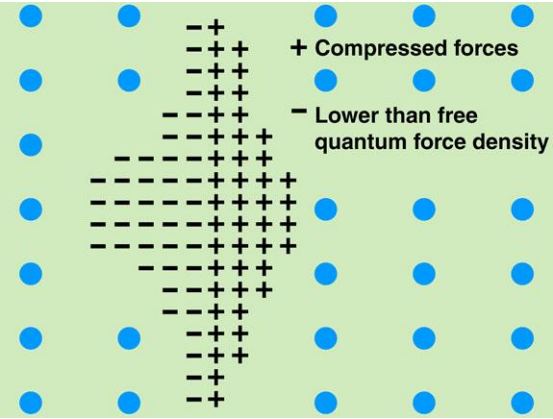
The colour spectrum



Manta ray

Introduction

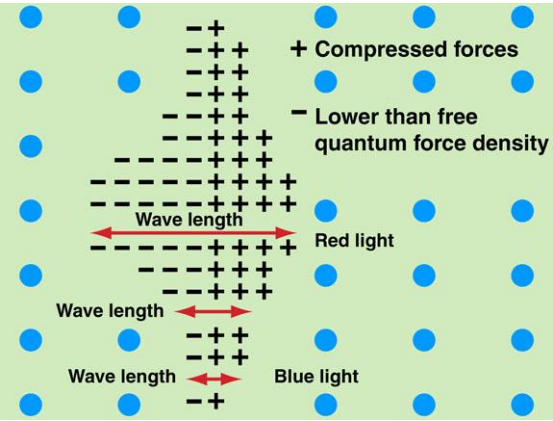
- Readers can imagine a photon and shock wave moving through a field of free quantum forces like a manta ray passing through water.
- (Except, a photon is very much three-dimensional, while the ray looks more two-dimensional.)



Photon and shock wave

A collection of compressed and relaxed quantum forces

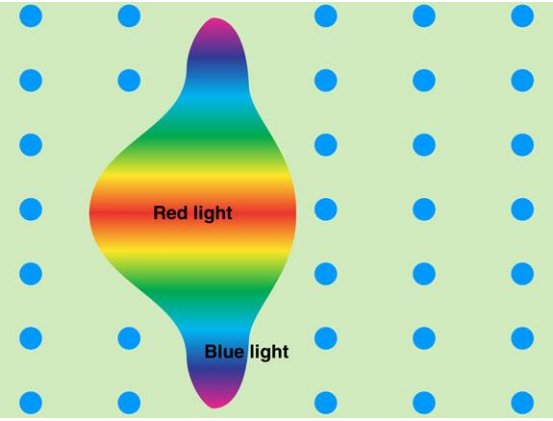
- The photon starts as an isolated concentration ('+' in the diagram) of quantum forces, which begins to form an attached shock wave.
- Behind the photon and shock wave there will be a region of quantum forces where the density of quantum forces is lower ('-' in the diagram) than background levels (i.e. aether).



Wave length

Variable wave length

- The wave length at any location <u>within</u> a photon and shock wave is defined by the length of the compression (+) and trough (-) at that location—just like any other longitudinal wave.
- The three-dimensional shape of a photon and shock wave means that a photon of white light would carry a range of wave lengths, and thus colours.
- In addition, the intensity of the photon can also vary the contained wave lengths.



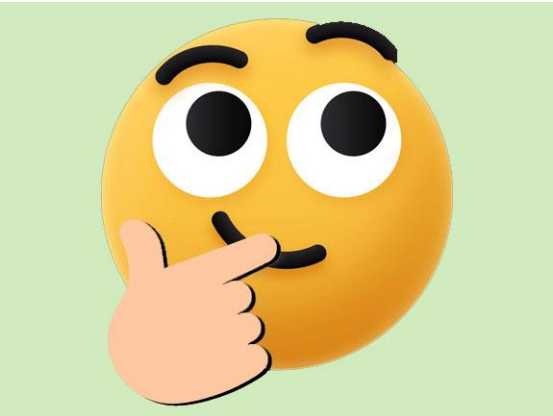
Colour spectrum

The visible colour spectrum

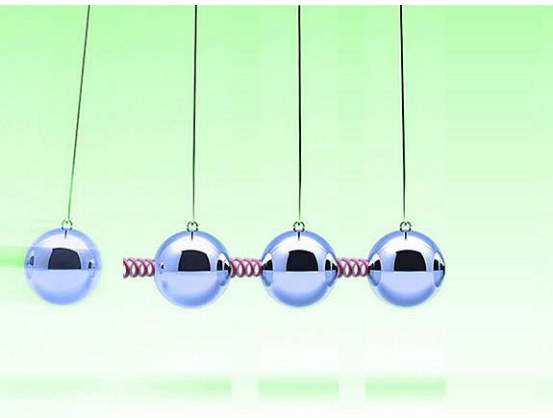
- White light travels with a full range of colours and wave lengths.
- The dispersion of the colour spectrum as light passes through an optical prism is caused by the fact that when a photon approaches an inclined translucent material, it is the 'blue' outer edge of the shock wave that begins to refract first.
- The shape of the shock wave, and therefore its variable wave length, is also likely to influence the degree of refraction.

The refraction of light

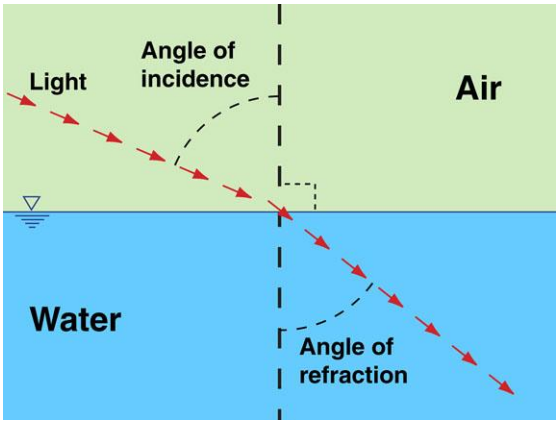
I feel so alone



Thinking



The slowing speed of causality



Refraction of light

Introduction

- Einstein based his theories on physics and mathematics, whereas I base my theories on fluid mechanics and wave theory.
- Therefore, when it come to discussion about astrophysics, Einstein wins hands-down.
- However, when it comes to a discussion about wave refraction, diffraction and reflection, I hope I can stand toe to toe with most astrophysicists.

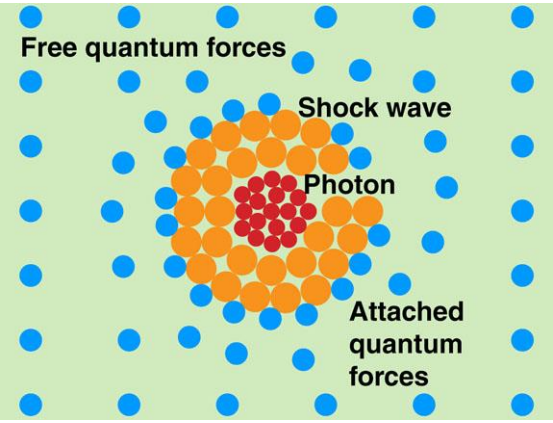
The Internet has some strange ideas!

- The refraction of light is not caused by light bouncing off electrons.
- Refraction is not caused by light stopping to have a chat and coffee with particles in the new media.
- Refraction is not caused by soldiers or tanks moving over muddy ground.
- Refraction is also not caused by the interference from the excitation of electrons which may, or may not, cause the generation of magnetic fields.

Refraction of light

- The primary cause of the refraction of light is the same as it is for the refraction of water waves—that being the partial slowing of the energy wave.
- The speed of the energy wave associated with a photon is governed by the speed of causality, which reduces as the density of free energy (quantum forces) reduces.
- The density, or distribution, of free energy reduces as the density of concentrated energy increases (really important!).
- As the density of a translucent material increases, the density of free energy inside the material must decrease, which means the speed of causality of the free energy component of the material must decrease, which means the speed of light within that material must decrease.
- Even though an ocean wave appears to move in one direction, the pressure force radiates out in three-dimensions from any point within the wave.
- Similarly, the energy message of a photon radiates out in 3-dimensions, and it is this 'force' that is slowed in a non-symmetrical way causing the refraction of light.

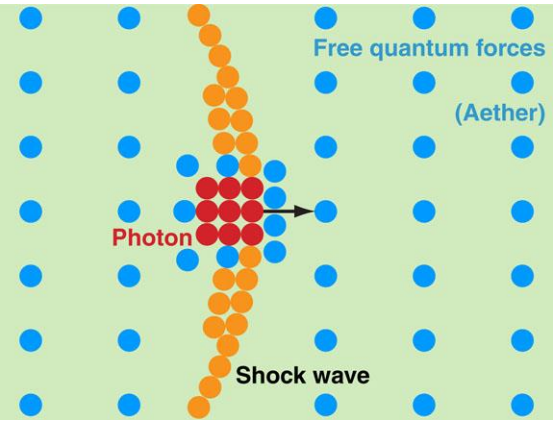
The reflection of light



Photon and shock wave (front view)

Introduction

- A photon consists of:
  - a central core of compressed quantum forces, which is likely to be near-spherical
  - an attached shock wave, that is likely to have a circular, shield-like shape
  - attached quantum forces (unsure) that may first attach, then detach, from the photon.



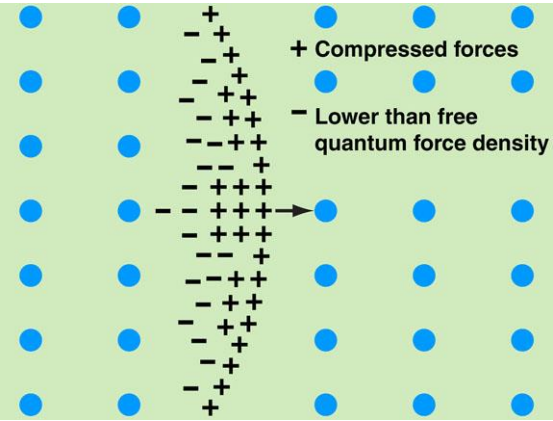
Photon and shock wave (side view)

Side view of a photon

- In a side view, a photon and shock wave would likely look similar to a frisbee, flying saucer, or manta ray.

Notes:

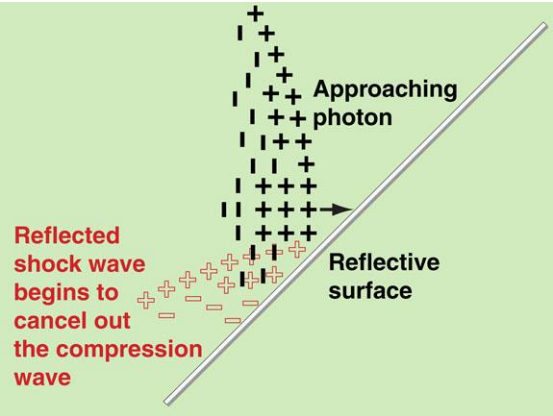
- The term 'compressed quantum forces' refers to quantum forces existing in a concentration greater than background levels (i.e. aether).
- The term 'uncompressed quantum forces' refers to quantum forces existing in a concentration lower than background levels.



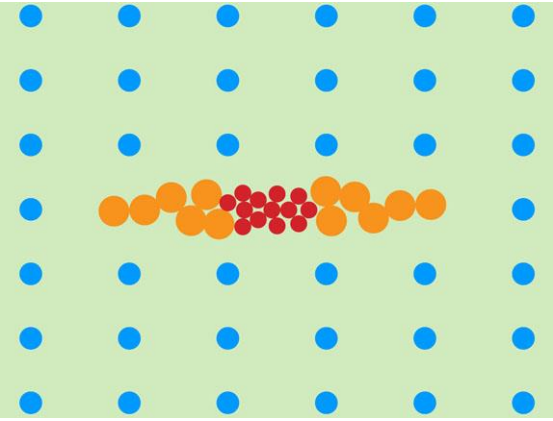
Compressed and uncompressed forces

Compressed and uncompressed elements

- Thus a photon consists of a shield of compressed quantum forces followed by a region of uncompressed quantum forces.
- When a photon reflects off a surface, the compressed region of the photon will fold back onto the uncompressed region.
- The end result of this interaction between compressed and uncompressed forces is a new photon that is more two-dimensional, than the original three-dimensional photon (in front view).



The reflection of a photon



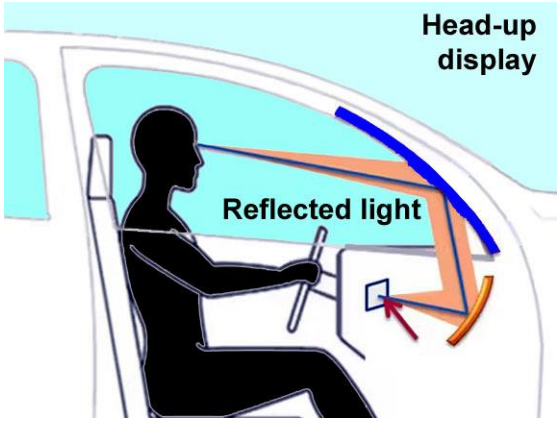
Initial reflected photon (front view)

The polaroid effect on head-up displays

Head-up display

Introduction

- Some cars are equipped with a head-up display that reflects off the windscreen.



Projection of a head-up display

Reflected image

- The reflection of this light causes the photons to have a distorted, near-horizontal alignment.

View through polaroid sunglasses

Image viewed through polaroid sunglasses

- Polaroid sunglasses are designed to filter that part of the light that has a horizontal alignment.
- This means that if drivers are wearing polaroid sunglasses, their vision of a head-up displace will largely disappear (i.e. the head-up display will appear very dull).

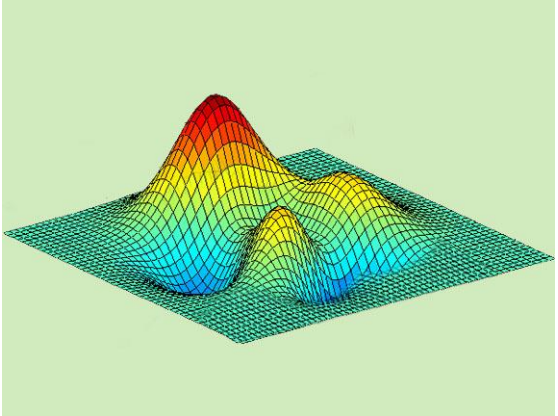
View through tinted sunglasses

Image viewed through tinted sunglasses

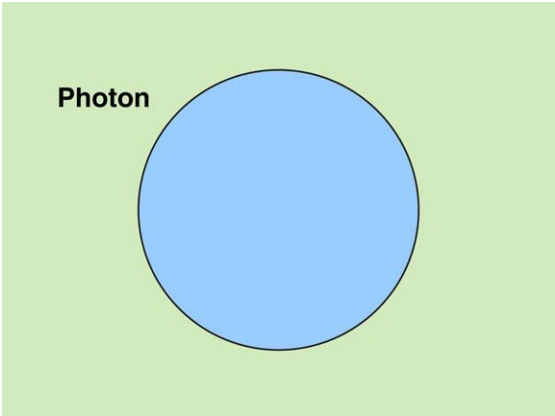
- The solution to this problem is to wear tinted glasses, rather than polaroid glasses.

Appendix 1. Is Light a Particle?

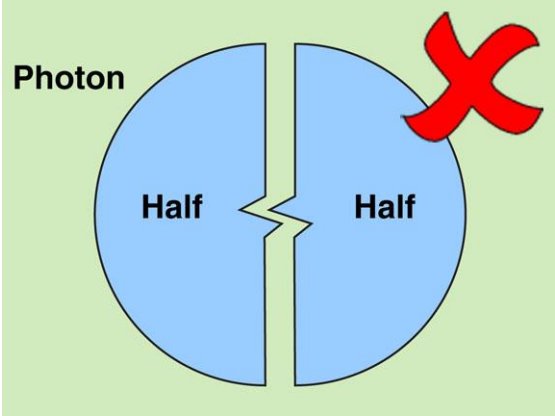
Introduction



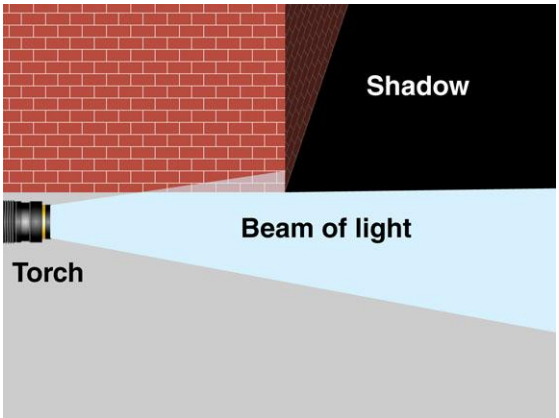
A concentration of energy or forces



Photon



Dividing a single photon



Minimal diffraction of light

What is a particle?

- If we accept that a particle is a concentration of quantum forces.
- And we accept that a water wave is a body of water shaped like a wave.
- And we accept that for ocean waves, the water does not travel with the wave, just as the rope fibres do not travel with a wave passing along a tort rope.
- Then we can introduce the terms, virtual particle and virtual wave, to represent those particles and waves where the media does not move with the object.

If light were a physical particle (?)

- If light travelled as a massless physical particle, then it would be reasonable to suggest that:
  - light would generate waves while moving through a media, but
  - light would <u>not</u> generate waves while moving through a vacuum.
- This means the double slit experiment would produce different results if performed in a vacuum (but where could we find a true vacuum?).

Reasons that could be used to support the idea that a photon exists as a physical particle (?)

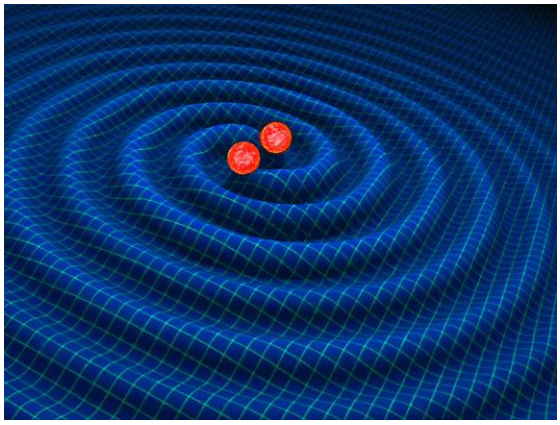
- The reasons and/or observations that could be used to support the idea that a photon is a physical particle include:
  1. Only a physical particle can pass through a vacuum, which is believed (by some) to exist across space between objects of matter.
  2. Only a physical particle could allow the existence of a half-photon (but tests suggest a half-photon cannot exist).
  3. Physical particles are considered to be less likely to experience diffraction around sharp corners compared to virtual particles.
  4. An isolated photon can be released from a laser, and then detected at a signal location on a detector plate, suggesting that a photon moves as a ‘package’.
- Each of these issues will be addressed over the following pages.

Issue 1: A photon passing through a vacuum

Empty space

Issue 1 – Passing through a vacuum

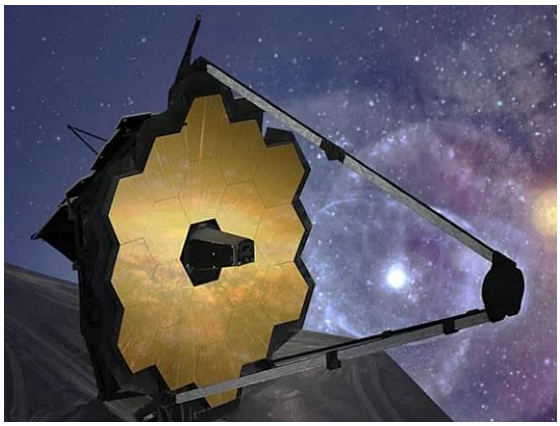
- If a true vacuum did exist in space, then an energy wave, or any form of wave, could not pass through that region of space.
- You simply cannot transfer energy through something that is no there.
- If space contains large regions that are true vacuums, then that would strongly support the idea that light travels as a virtual particle, not a physical particle.



Gravitational waves

Does a true vacuum exist in space?

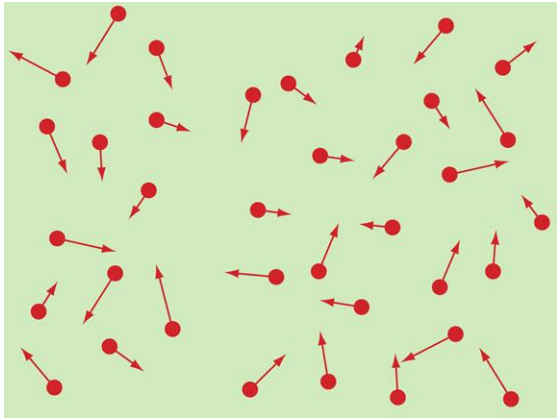
- It does not seem logical that space (i.e. the universe), would contain a true vacuum for the following reasons:
  - the detection of gravity waves indicates that space is a continuous media <u>without</u> vacuous zones
  - the Michelson–Morley experiment failed to demonstrate the existence, or non-existence, of an aether effect
  - there is no location in space where photons do not travel.



James Webb Space Telescope

James Webb space telescope

- If you were to transport the James Webb telescope to any location in space, then it is likely that the telescope would be able to identify billions of stars.
- If a billion stars can be detected by the telescope, then that means a billion stars are sending information (photons) to that location, on a continuous basis.
- If you moved the telescope just 1 mm in any direction, the same stars would be sending photons to that location—so how could any spot in space by 'empty'?

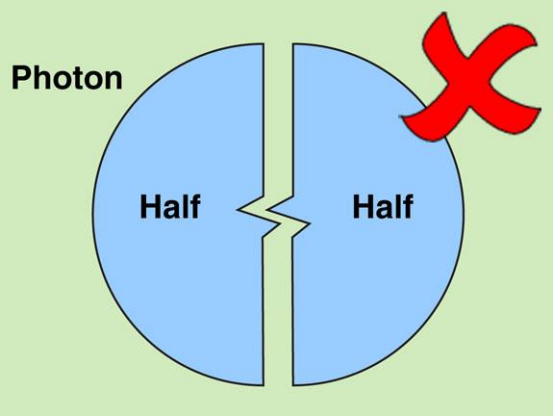


Quantum forces

Quantum forces

- One of the benefits of adopting a force-filled universe, instead of an energy-filled universe, is that it is easier to accept the idea that:
  - quantum forces have no physical existence
  - quantum forces cannot be detected
  - quantum forces would form part of the expected mass of the universe
  - it is reasonable to assume that quantum forces form a continuous media.

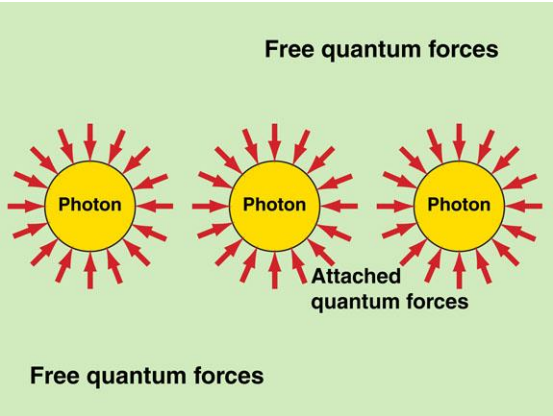
Issue 2: A half photon cannot exist



Dividing a single photon

Issue 2 – Splitting a photon

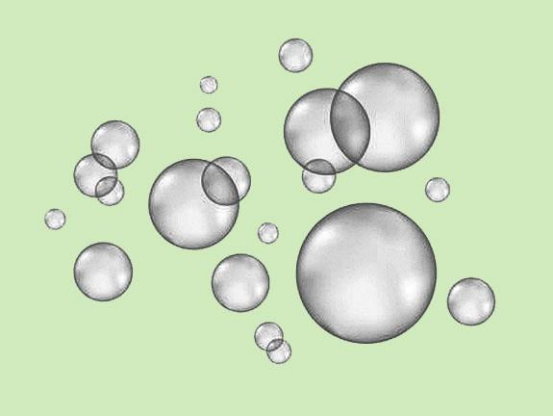
- Experiments appear to demonstrate that it is not possible for a single photon to be divided.
- To be honest, I have not spent much time researching these experiments, or understanding the concepts involved, but the premise seem logical.



Forces on a photon

The forces acting on a concentration of quantum forces

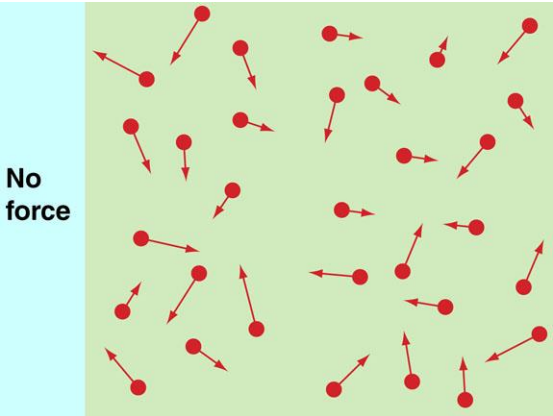
- In the final chapter of this paper, I describe how free quantum forces apply forces to a concentration of quantum forces.
- It would appear that quantum forces have just two stable conditions:
  - evenly spaced, ever expanding, and in constant 'contact' with the surrounding quantum forces (free quantum forces)
  - concentrated quantum forces surrounded by free quantum forces.



Gas bubbles in a fluid

Stability of concentrated quantum forces

- So, if quantum forces have just one task, that being to repel all other quantum forces, then how can a concentration of quantum forces be stable.
- I would ask you think about a concentration of quantum forces as being similar to a bubble of gas in a glass of sparkling water:
  - the bubbles of gas may be pressurised
  - but, the surrounding water pressure is able to stabilise this pressure.

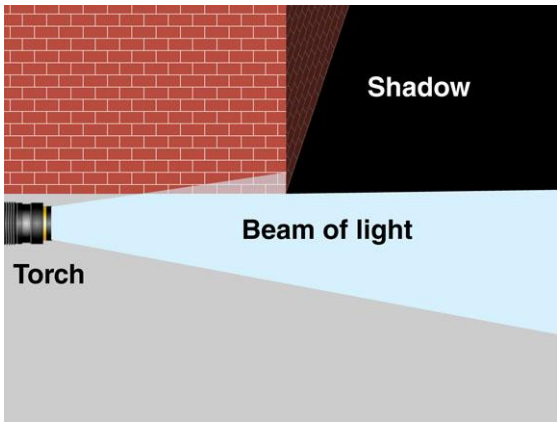


Edge of space

Collapse of a half photon

- When light reaches the edge of space, it no longer has the stabilising pressure of the surrounding free quantum forces, so the photon simply collapses into non-concentrated quantum forces (i.e. aether).
- It would appear that there must be a minimum concentration of quantum forces that is required to generate the <u>necessary</u> stabilising forces from the surrounding free quantum forces; otherwise, the concentration will collapse and disperse as free quantum forces.

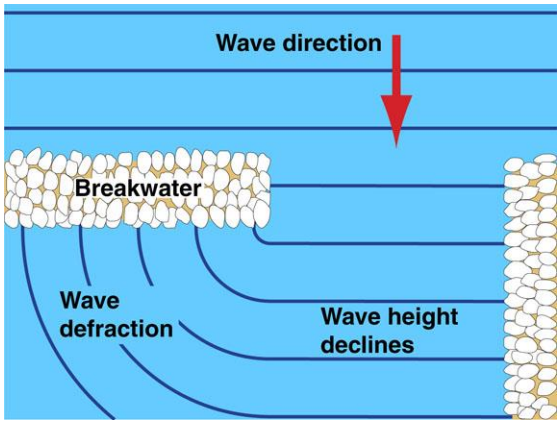
Issue 3: Diffraction around sharp corners (the creation of shadows)



Minimal diffraction of light

Issue 3 – Diffraction of light

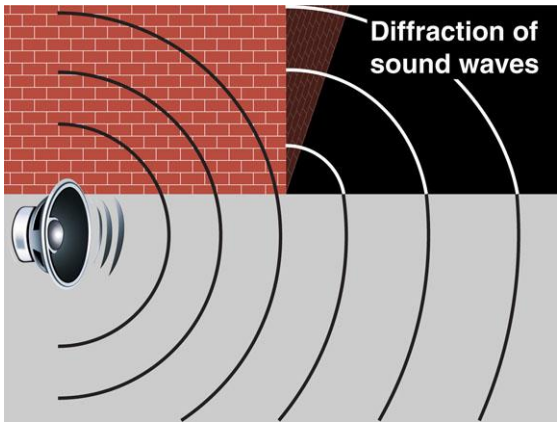
- This issue is based around the idea that light does not diffract around the edges of objects to the same degree as say, sound waves.
- The initial suggestion being that light does not diffract at all—thus it must be a particle.
- However, the current belief is that light does diffract to a very small degree, which supports, but does not confirm, the concept of light being a particle.



Wave diffraction

Diffraction of water waves

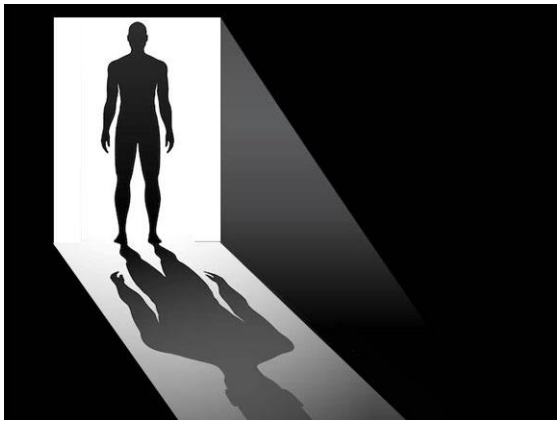
- Water waves are primarily powered by water pressure.
- This water pressure radiates in all directions.
- When a water wave passes a solid object, the water pressure that was being imparted onto that object, now spreads laterally around the edge of the object, which causes an almost instantaneous diffraction of the transverse water wave.



Diffraction of sound waves

Diffraction of sound waves

- Sound waves are primarily powered by air pressure.
- This air pressure radiates in all directions.
- When a sound wave passes a solid object, the air pressure that was being imparted onto the object, now spreads laterally around the edge of the object, which causes an almost instantaneous diffraction of the longitudinal pressure wave.

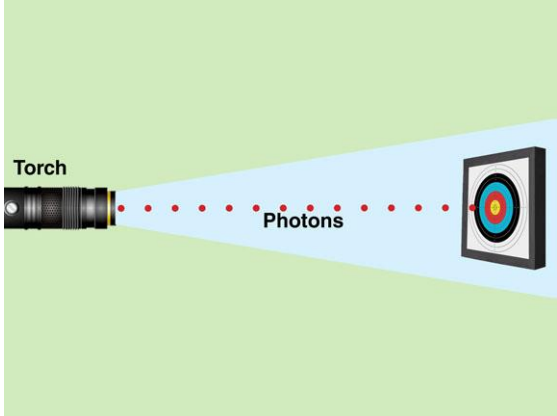


The creation of sharp shadows

Diffraction of light

- The movement of photons is primarily powered by quantum forces.
- These forces radiate in all directions, but are repelled by the free quantum forces that surround the photon.
- When a photon passes a solid object, the 'shock wave' generated by the photon can expand slightly into the open space.
- However, the photon cannot expand due to the stabilising forces of the surrounding free quantum forces—thus a photon does not have to be a physical particle.

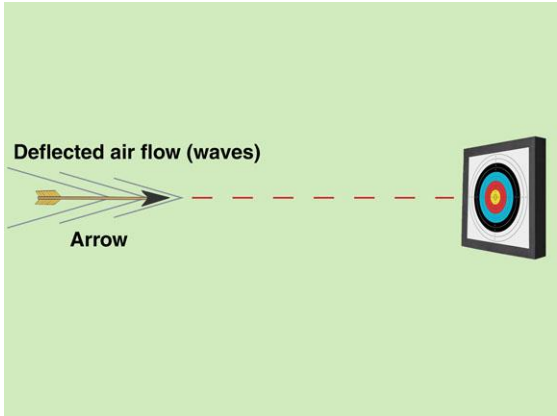
Issue 4: Generating and detecting a single photon



Travel of a single photon

Issue 4 – Detecting a single photon

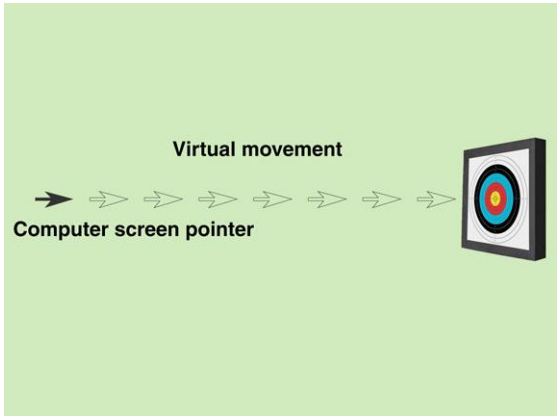
- The issue here is that a single photon can be generated, sent on its way, and then detected as a single object on a light detector, thus suggesting that the photon is a particle.
- The question being: If light travelled only as a wave, then why does it arrive at its final destination as a point source (point impact)?



Travel of an arrow

Creating waves

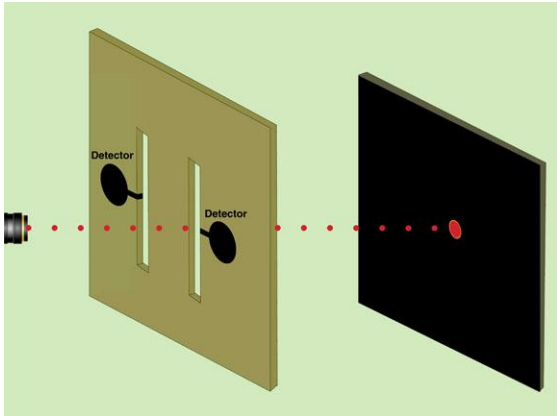
- The fact is, any physical particle can create waves as it travels, but still arrive at its destination as a single particle.
- However, a virtual particle, in the form of an energy wave, which causes a transient concentration of quantum forces, can:
  - also appear to be generated as a single photon
  - can generate waves as it travels
  - can arrive as a stable concentration of quantum forces, appearing to be a single particle.



Travel of a computer screen pointer

Computer screen pointer

- A computer screen pointer can be:
  - generated on the left-hand side of your computer screen
  - moved through virtual motion to the right-hand side of your screen, and yet
  - be observed by your eyes as retaining its original shape.
- But this does <u>not</u> make the pointer a physical particle.

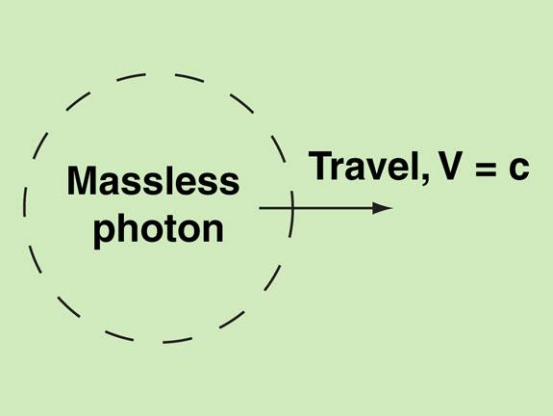


Projection of single photons

The detection of a single photon

- I have no idea how photon detection equipment works, but I assume that the sensitivity of any type of instrument would need to be adjusted such that it is able to detect the energy from a single photon.
- This means, there could be a shock wave surrounding the photon; however, the instrument is calibrated in a manner that would not allow the detection of this much weaker shock wave.

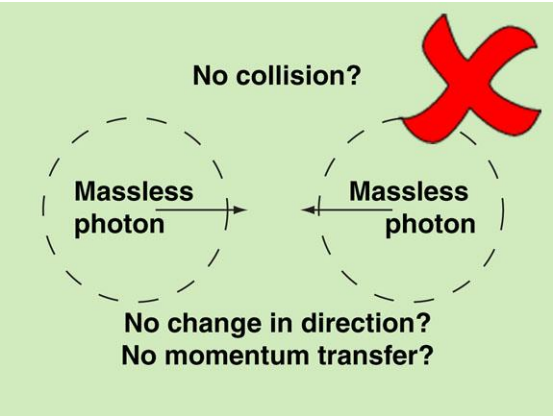
Further proof that photons do not exist as physical particles



A 'massless' particle ???

A photon is said to be a massless particle

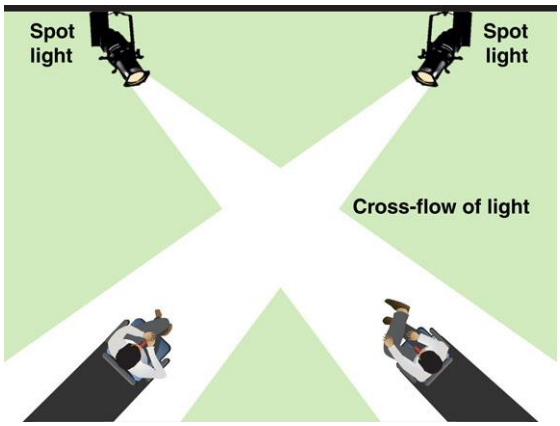
- It seem logical that if a photon were to be a physical particle, then it would need to be massless, otherwise we would feel more that the heat of the Sun hitting us.
- The real reason why a photon should be considered massless is because it is a virtual particle, not a real particle, just like an ocean wave is a massless virtual wave.



No impact? No deflection?

A photon is said to be able to impart momentum on matter, but not on itself

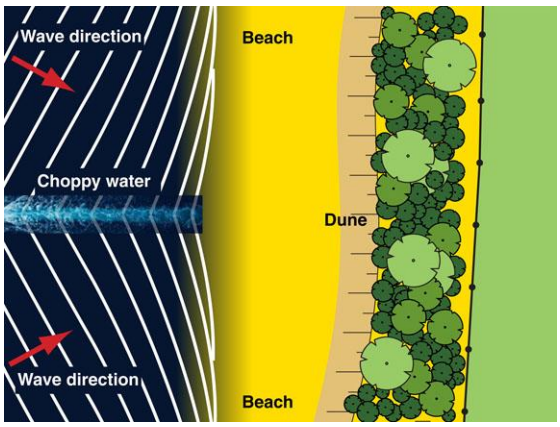
- Based on my very, very limited understanding of the currently accepted properties of photons, I believe that science states that a photon:
  - can transfer momentum to physical matter, but
  - it cannot transfer momentum to another photon.
- This outcome would agree with the idea that a photon is a virtual particle.



Cross flow of light beams

A beam of light can cross another beam of light (i.e. move past the point of intersection) without experiencing a change of momentum or direction

- Two beams of light (spot lights) can cross paths without a change in momentum or direction.
- This suggests that light travels as an energy wave, and not as a particle wave.
- This means that 'light' shares some common properties with sound waves and deep water ocean waves.

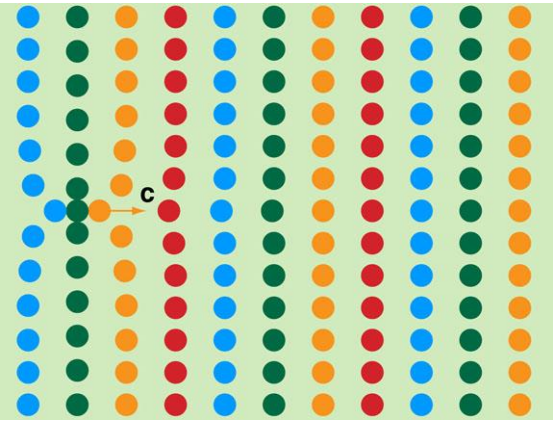


The 'collision' of two broken waves

A particle wave cannot experience constructive or destructive interference

- The double slit experiment proves that light travels as an energy wave, because a particle wave cannot experience constructive or destructive interference.
- This means that no matter travels with the light, or as light; instead, light is an energy message being transferred through an energy field.
- Light represents a compression of energy that transfers its energy message from energy unit to energy unit.

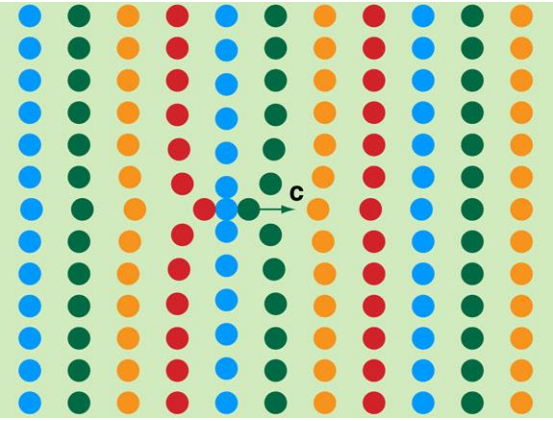
Physical particles and virtual particles



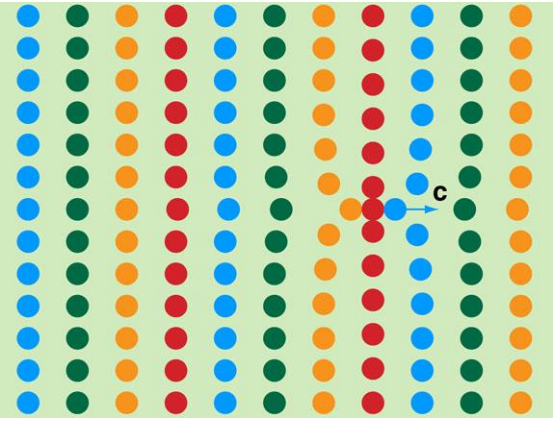
Virtual movement of energy

Virtual movement

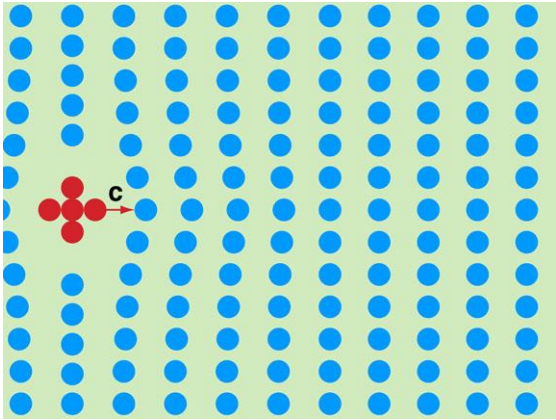
- It is difficult to demonstrate the difference between virtual movement and particle movement using still images, but these images are the best I can do.
- Virtual movement can consist of:
  - the transfer of energy, by a force, from energy unit to energy unit (e.g. light)
  - the appearance of movement via the incremental movement of a virtual object (e.g. screen pointer)
  - stop-motion image flipping (e.g. movie).



Movement to the blue column



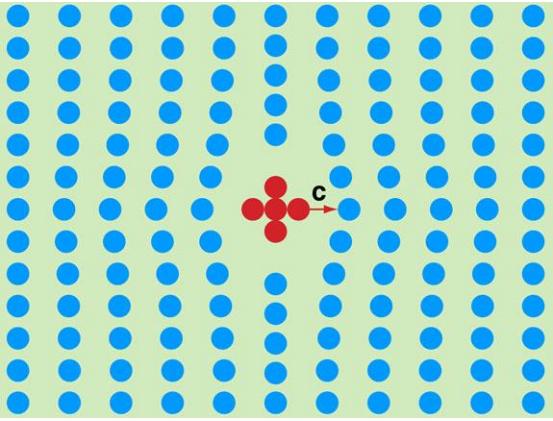
Movement to the green column



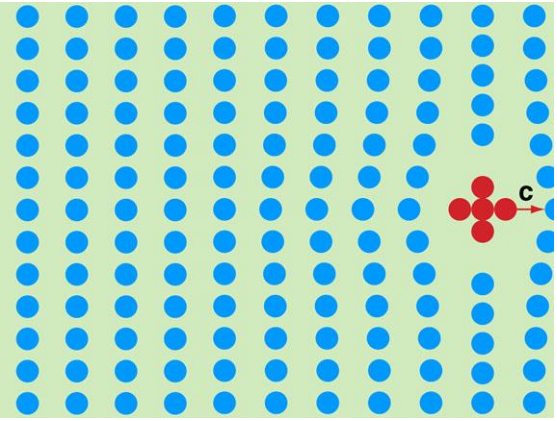
Particle movement

Particle movement (physical movement)

- Particle movement can also be termed physical movement because the particles physically move through a medium.
- If light moved as a particle, then light would have mass, and it would not be able to travel at the speed of causality.
- Light is not a particle, the same as an ocean wave is not a specific group of particles; it is an energy message, which displays virtual movement, allowing it to appear to travel as a massless particle.

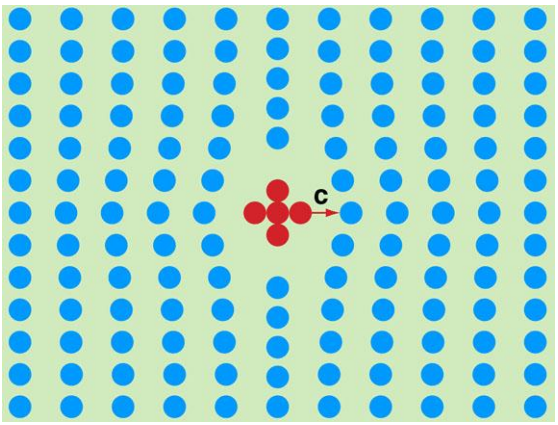


Particle pushes energy units away



Particle content stays together

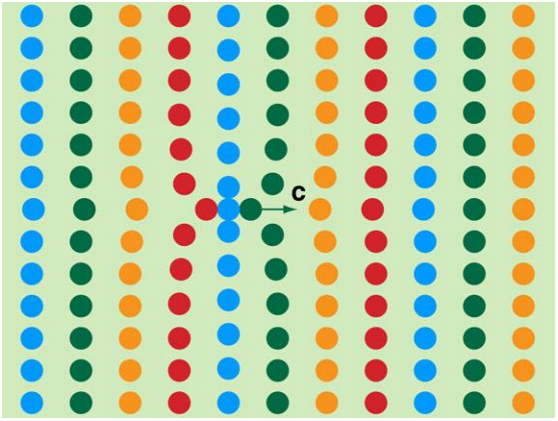
Light travels as a virtual particle



Movement of a physical particle

If a photon were a 'physical' particle (?)

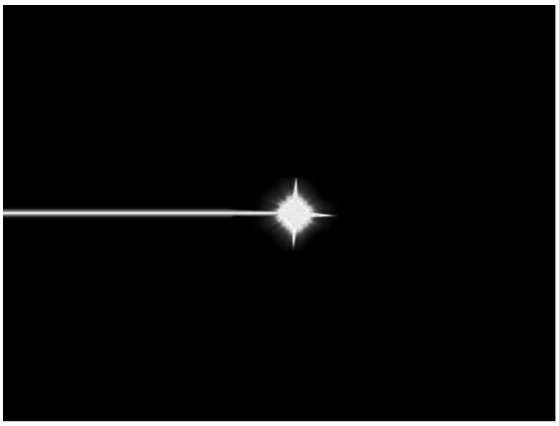
- If we were to accept that a photon of light is a 'package' of concentrated quantum forces existing within a field of non-concentrated quantum forces, then:
  - we must accept that this package of quantum forces moves with the photon
  - and that this package of quantum forces moves at the speed of light.
- However, this idea is asking us to believe that a photon can transfer momentum to matter, but <u>not</u> to another photon!



Movement of a virtual particle

If a photon were a 'virtual' particle

- On the other hand, if we consider a photon of light to be just a transfer of energy, then:
  - we can consider that the quantum forces that form the photon at any instant in time, do <u>not</u> move with the photon
  - the photon exists only as a virtual object (like a computer screen pointer)
  - it is only the transfer of energy that travels at the speed of light.



Photon

How can a photon impart a force on matter, or transfer energy?

- A virtual particle is a force without mass.
- A physical particle is a force with mass.
- Light can deliver a force because light is a force without a mass.
- If light is stopped from moving, then it becomes neither a force, nor a mass, so it returns to being aether, and the force that it carried turns into an action.

Class room explanations

We can keep calling a photon a 'particle'

- A photon may not technically be a particle, but we can choose to keep calling it a particle because it makes it easier to explain the science.
- After all, many of those out there that believe gravity is not a force, are willing to use the expression; *'The force of gravity'.*
- And, most people say the Moon orbits the Earth, instead of it orbiting the centre of mass, simply because these words are easier for growing minds to accept.

Appendix 2. Is Light a Wave?

Introduction

Rope wave

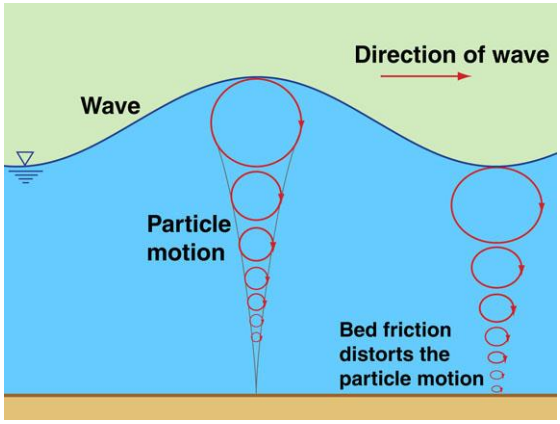
What is a wave?

- The Macquarie Dictionary defines a wave as:
  - disturbance of the surface of a liquid body
  - any surging or progressing movement
  - a swell, surge or rush, as of feeling, excitement, prosperity
  - a widespread movement
  - one of a succession of movements
  - a progressive vibrational disturbance
  - the act of waving (and so on).

Hand wave

Can something travel as a wave, but not itself, be a wave?

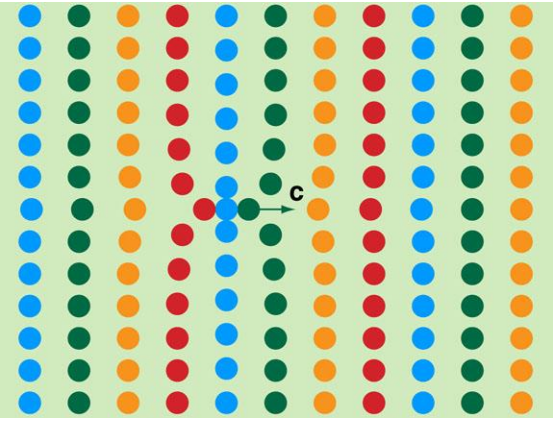
- You can have a wave of emotions, but an emotion is not a wave.
- You can wave a hand, but a hand is not a wave.
- And a wave of hair may consist of actual hair, but this type of wave does not require any movement
- A water wave, on the other hand, can consist of an actual moving wave, a non-moving wave, or a virtual wave.



Particle motion inside an ocean wave

Is a water wave a true wave if the water does not move with the wave?

- When a coastal wave breaks near a beach, the water that forms the wave will move with the wave towards the beach.
- However, for a deep water ocean wave, the water is only a temporary companion of the wave—the wave continues to move along its path, while leaving the water behind (the energy moves, not the water).
- But we still call an ocean wave, a ‘wave’.

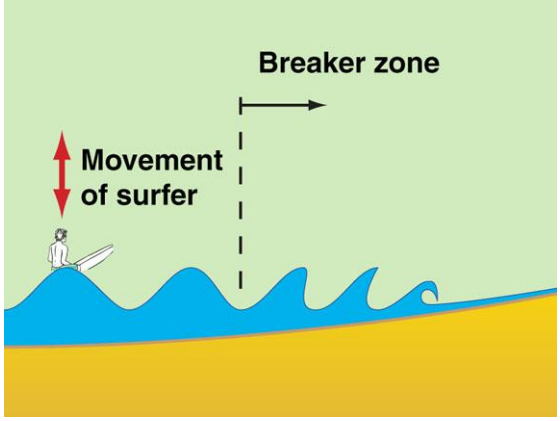


Movement of a virtual particle

Is a photon a wave if the media that forms the photon, does not move with the photon?

- The characteristics of a photon are very similar to sound waves and ocean waves.
- For these types of waves, it is only the energy message (compression wave) that moves with the wave, not the media that form the wave.
- If we can call an ocean wave a wave, and if we cal call sound a wave, then it would seem acceptable to refer to a photon as a wave (but <u>not</u> a particle wave).

Can a photon be a particle and a wave?



Ocean waves outside the breaker zone

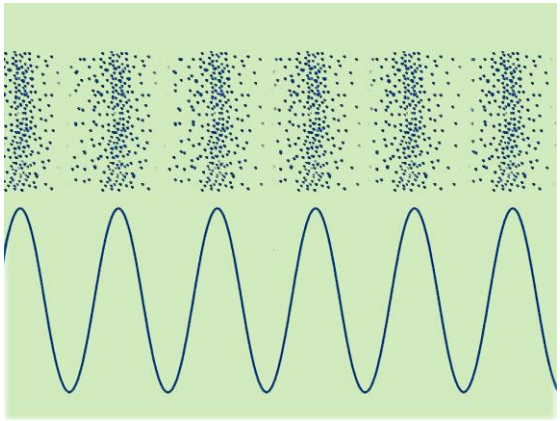
Deep water ocean waves

- Deep water waves are virtual waves.
- An ocean wave, at any instant, is formed from water particles, but those particles don't travel with the wave.
- This means that if you were floating in the ocean, and you were 'hit' by an ocean wave (i.e. a deep water wave), then you would feel only a very minor lateral force, even though the wave may have a mass of several tonnes.

Being 'hit' by a wave

Coastal waves

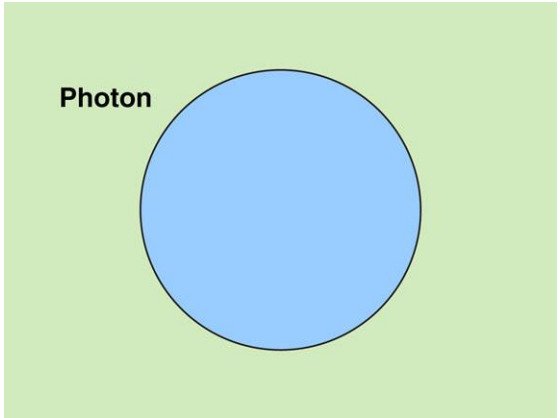
- A breaking coastal wave is in fact a particle wave.
- This means the water that forms the wave is now moving with the wave.
- This means that a coastal wave can transfer momentum.
- This means that if you are standing in the surf zone, and you are 'hit' by a wave, you will feel the crashing force of the wave, and this force will try to push you towards the beach.



Sound waves

Sound waves

- Sound waves are virtual waves.
- This means that the media that forms the wave, does not move with the wave.
- This means that when a sound wave hits you, you may feel the effects of the media vibrating (e.g. the air), but <u>not</u> the effects of the air moving at the speed of sound.
- This means, that even though sound travels at about 335 m/s, it is not the same as wind hitting you at 335 m/s.



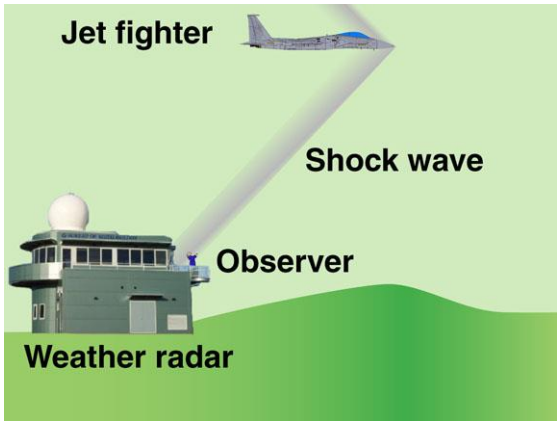
Photon

Photons

- So, the question remains: Does a photon travel as a real wave or a virtual wave?
- Is it:
  - a virtual particle that creates a wave
  - a virtual particle that takes the form of a transverse wave (like an ocean wave)
  - a virtual particle that takes the form of a longitudinal wave or pulse (like a sound wave), or
  - a wave that contains a massless particle at its core?

The story of two types of waves

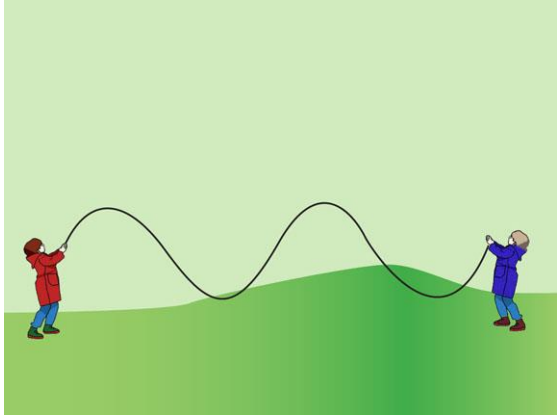
FA-18C in transonic flight



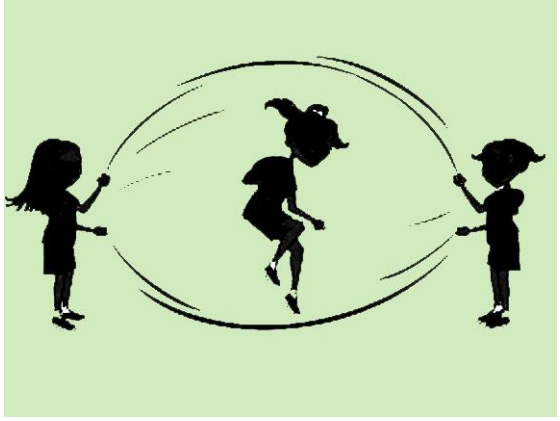
Shock wave

Story of a fighter jet

- Imagine a world where human flight did not exist; where aircraft were just something we imagine may exist one day.
- Now imagine you have a job at the local weather station, which has an advanced weather radar system.
- Suddenly there is a tear in the fabric of time, and a modern supersonic fighter jet passed through this tear, and enters your world.
- You detect the fighter jet on your weather radar, and it is clear that this UFO is a single object, and it is travelling very fast—faster than any known weather front.
- The fighter jet flies past your weather station at a speed exceeding the speed of sound.
- You hear the sonic boom, and you see the windows shake all around your weather station.
- So, the radar detected a ‘particle’, but the observer (you) detected only a ‘pressure wave’.



Rope wave



Skipping

Story of a skipping rope

- You and a group of friends are skipping for a bit of fun and exercise.
- Someone stands next to the rope ready to start skipping; however, the person at the far end of the rope is not paying attention.
- You shake the rope to get your friend’s attention (i.e. you send an energy message in the form of a wave).
- You create the wave by quickly moving your hand up and down.
- You know your friend received your energy message because you see the rope move her hand.
- So, is it correct for you to say that the wave that you created, actually travelled the length of the rope?
- Did the ‘wave’ travel at all?
- Well, the profile of the wave travelled, but the rope did not travel.
- It is really only the energy that moves, which is what actually gets your friend’s attention.

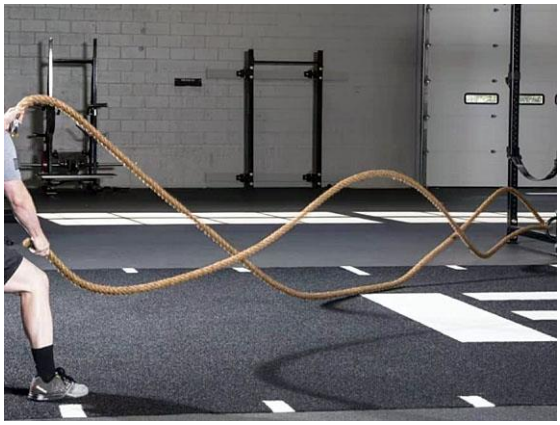
Moving particles always generate waves

Arrrrrrrrrrrrrrrrrrrrrrrr!

What we can learn from the fighter jet story

- What we can learn from the first story is:
  - a 'particle' in motion can produce a moving wave, but that does not make the particle a wave.
- Even an engineer (like myself) would act like a particle, that would produce a screaming sound wave, if pushed off a building.

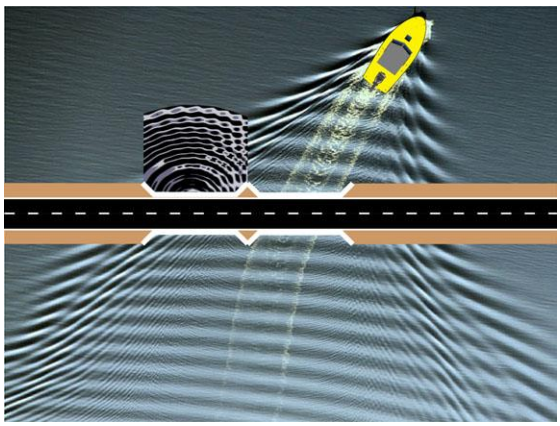
(Yes, there is a long queue people wanting to give me a little push, and I fear the queue is only getting longer).



Rope wave

What we can learn from the skipping rope

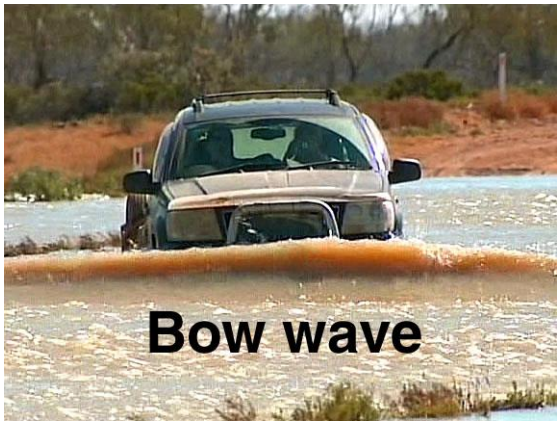
- What we can learn from the second story is:
  - if you generate a wave at one end of a communication line (such as a rope)
  - and you detect a similar wave at the other end of the communication line
  - that does <u>not</u> mean that anything, other than energy, has travelled along that communication line.



Boat wake passing under a bridge

<u>Particles</u> that generate <u>waves</u>

- I am not sure why it is difficult for people to accept that a 'photon' can display the properties of both a particle and a wave, after all, many of the day to day items that we interact with have both particle and wave properties:
  - a plane with a sound wave
  - a car with an engine noise
  - a boat with a wake.
- If you drove a speed boat through a double arch bridge, then you would have a double slit experiment!

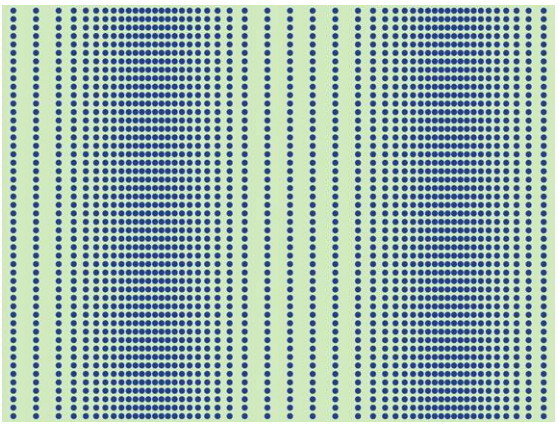


Vehicle crossing at subcritical velocity

Cars crossing a flooded causeway

- Cars driving through floodwater can produce a bow wave.
- The profile of the wave, and the horizontal curvature of the wave, depends on the speed of the car, and the depth of the water.
- The car travels as a particle, and that particle generates a wave, which means that collectively it will display the properties of a particle and a wave, but a car is not a wave.

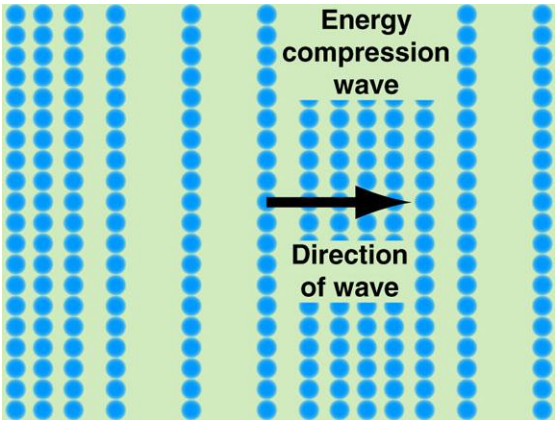
Energy waves, compression waves and virtual waves



Energy waves moving left to right

Energy waves

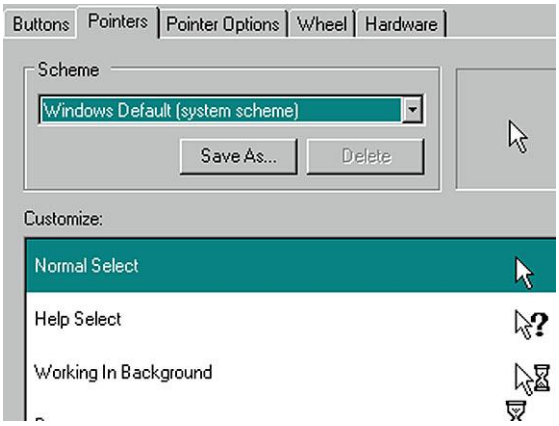
- An energy wave is a flow of energy through a series of objects.
- In effect, an energy wave is a flow of forces from object to object.
- This is because all of the actions that occur within our universe, occur because of the application of forces—even human thought.
- When dominos fall, it is a force that transfers the energy onto the next domino.



Compression waves

Compression waves

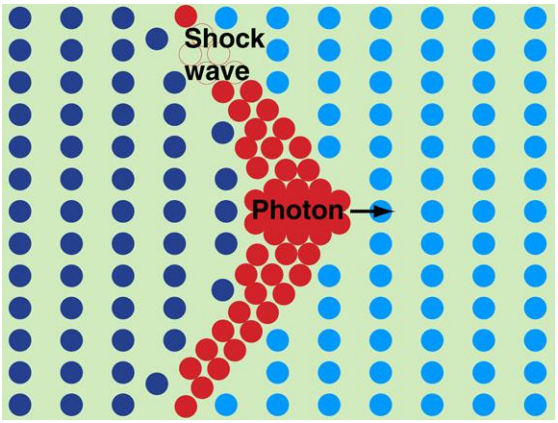
- A compression wave is an energy wave that progresses due to a compression of the media.
- This compression is generated by a force.
- This compression is then followed by an expansion, which is all part of the wave.
- This expansion, like the compression, is caused by the transfer of forces from object to object.



Computer screen pointer

Virtual waves

- A true virtual wave is the situation where a wave appears to exist, but only in a person's mind.
- In reality there is no movement of energy or media.
- The movement of a computer screen pointer is an example of virtual movement.
- All movies and videos use virtual movement, including virtual waves.
- A fixed panel of lights can be used to create a virtual wave of flashing lights.



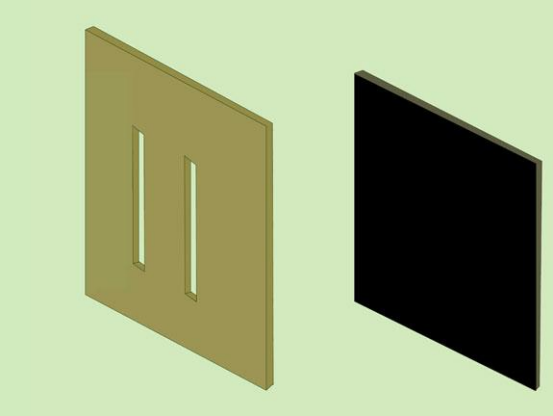
Photon and attached shock wave

Photon waves

- A photon consists of:
  - a central concentration of quantum forces, which forms a virtual particle, and which moves as a pulse
  - which is surrounded by a shock wave of compressed quantum forces, generated by the fact that the central pulse is moving through a field of quantum forces at the critical velocity of the quantum forces
  - it is within this shock wave that the full colour spectrum exists.

Appendix 3. The Double Slit Experiment

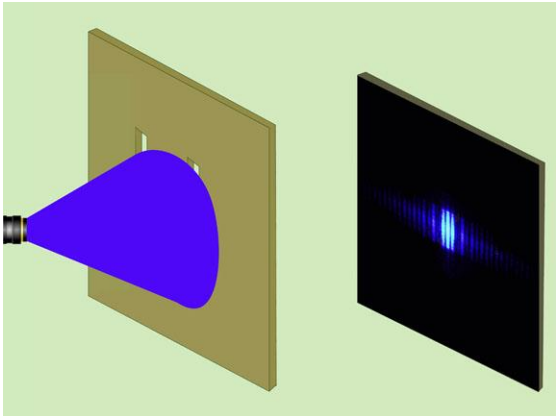
The double slit experiment



Test set-up

The double slit experiment

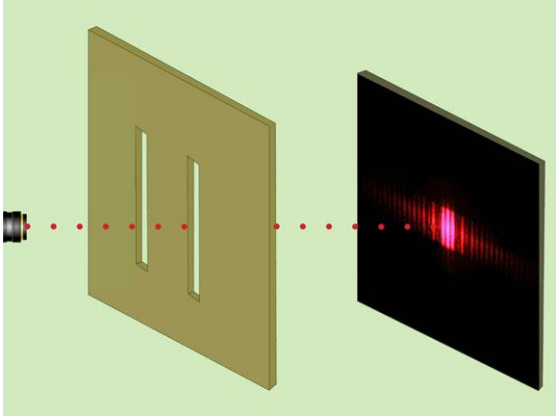
- The double slit experiment involves projecting light onto two narrow slits cut into a screen, which allows some light to be projected onto a back screen.
- The double slit experiment can also be performed with a single fibre (e.g. hair).
- The experiments are normally performed with a single colour of light in order to:
  - reduce the rainbow effect (because colours travel in the shock wave)
  - improve the sharpness of the image.



Blue-light torch on double slits

Results achieved from a beam of light

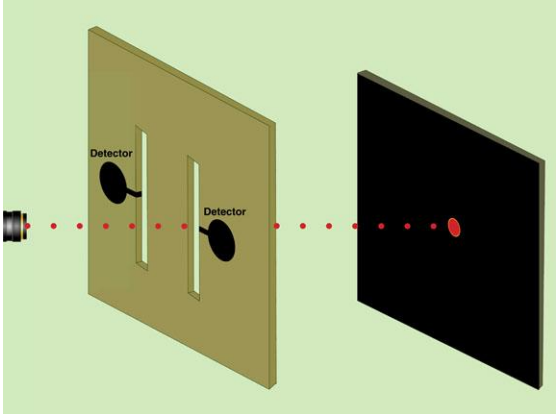
- If a single beam of light is projected towards the two slits, then the projected image will be:
  - a series of glowing bars of light
  - higher intensity light in the centre, flanked by much lower intensity bars.
- If a beam of light is projected onto just one slit, then the projected image will be:
  - a single column (bar) of light parallel with the slit.



Projection of single photons

Results achieved from the projection of photons sent one at a time

- If a series of individual photons are projected towards the two slits, then the projected image will be:
  - similar to that produced by a beam of light.
- If a series of individual photons are projected towards a single slit, then the projected image will be:
  - a single dot, or column of light, depending on the angle of projection of each photon.

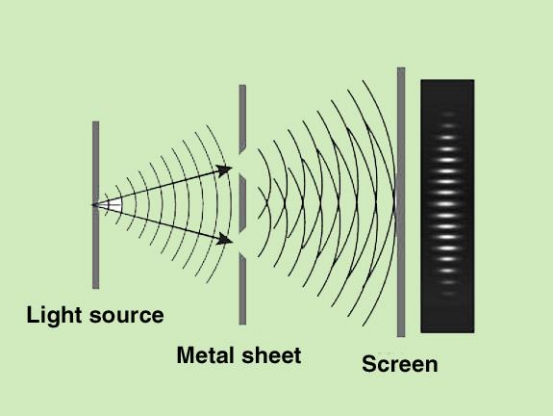


Counting each photon

Results achieved when the photons are being watched

- If a detector is placed on one of the slits to count the photons passing through that slit, then the projected image will be:
  - a single dot or column of light.
- If detectors are placed on both slits, then the projected image will be:
  - the same outcome as above.
- The claim being that light reacts to being watched—**Yeah, right!** This is all part of the **magic** of light we are told to accept.

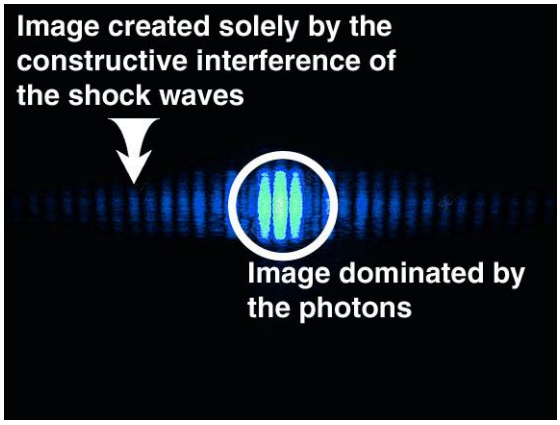
Explanation of the double slit experiment



Traditional illustration of wave conditions

A question

- **Question:** What exactly are the semi-circular lines suppose to represent on traditional double slit diagrams (left)—are these lines suppose to represent electromagnetic waves?
- **Answer:** I suggest that these lines mimic what 2D water waves look like if they experience interference.
- However, by accident, these lines do represent the wave pattern of the energy shock waves that actually produce the interference pattern.



Interference pattern

Beam of light projected onto <u>two</u> slits

- If a beam of light is projected onto two slits, then:
  - the photons will travel straight towards the back board (screen).
  - a few very weak energy shock waves will be developed by the photon in the beam of light, which will pass through both slits
  - some of the overlapping shock waves that hit the back board will have enough intensity to be visible.

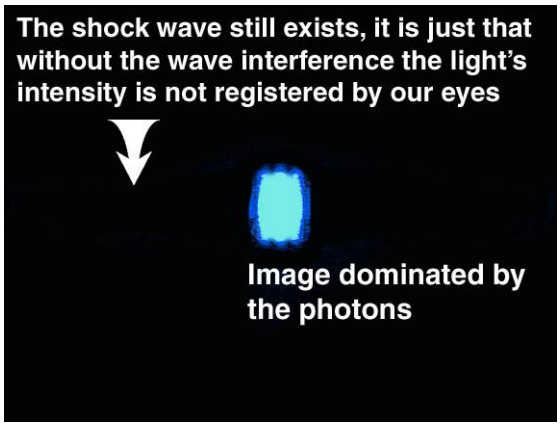
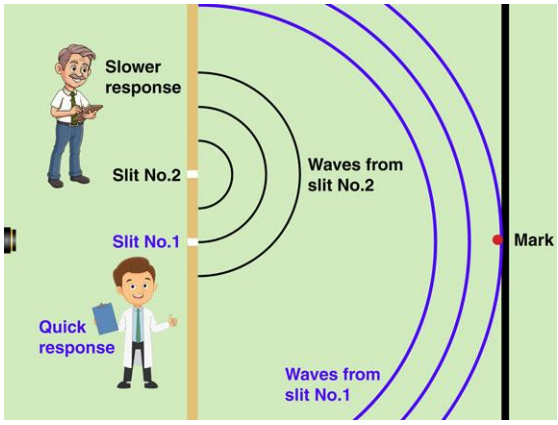


Image generated by a single slot

Beam of light projected onto <u>one</u> slit

- If a beam of light is projected onto just one slit, then:
  - a portion of the light will be projected straight onto the back board
  - a series of very weak shock waves will reconstruct after the beam of light passes through the slit, but these waves will not build a constructive interference pattern, and thus will not build the necessary intensity to become visible.

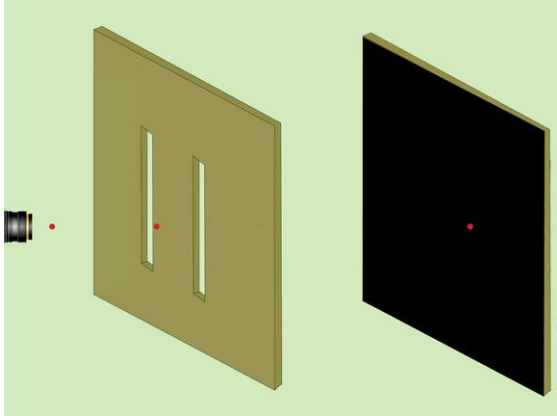


Phase shifting

The 'observer' effect

- I cannot state with certainty what is happening without understanding the equipment that is being used to count the photons.
- However, the obvious explanation is that the detection equipment causes an ever-so-slight delay in the photons, and given the light speed of the shock wave, this delay could result in a phase shift occurring between the two sets of shock waves, even if a detector is placed on both slits.

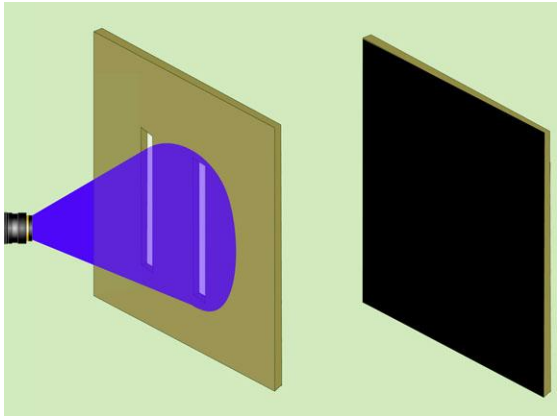
The explanation of a single photon test



Projection of individual photons

Initial travel of a single photon

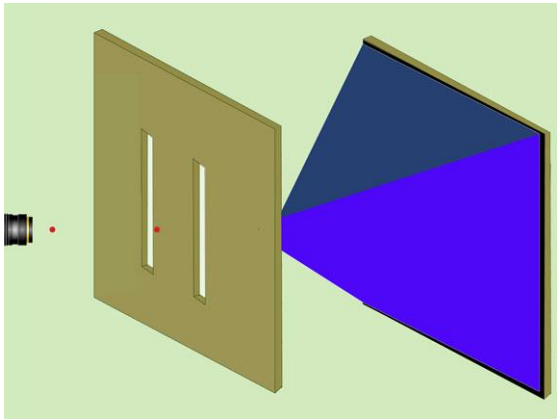
- Individual photons will pass through whichever slit that they are aimed at.
- Nothing magic to see here!



Initial energy shock wave

Initial shock wave

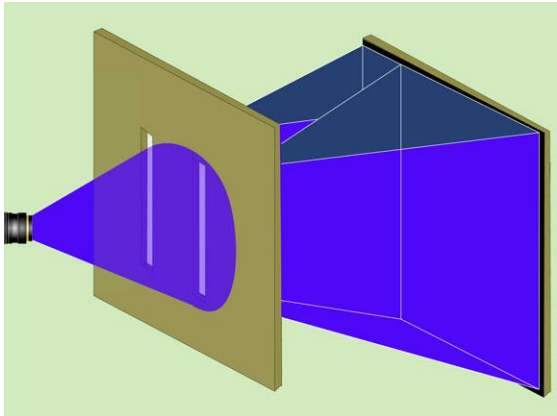
- Each photon will generate it own energy shock wave, which will likely expand to cover both the slits.
- What is important to note is the vertical height of the generated bars of detected light (refer to the cover image of this document)—this vertical spread of the light is important if the source of light is a laser.
- The blue cone shown in the diagram represents the initial shock wave, not a beam of light.



Secondary shock wave

Second photon-generated shock wave

- When the photons pass through the first slit they will be stripped of most of their initial shock wave.
- The photons will then start to rebuild a new shock wave.
- Again, the blue rectangular pyramid shown here represents the rebuilding of a new shock wave—one for each photon, independent of whether the photons are sent one at a time, or as a beam of light.

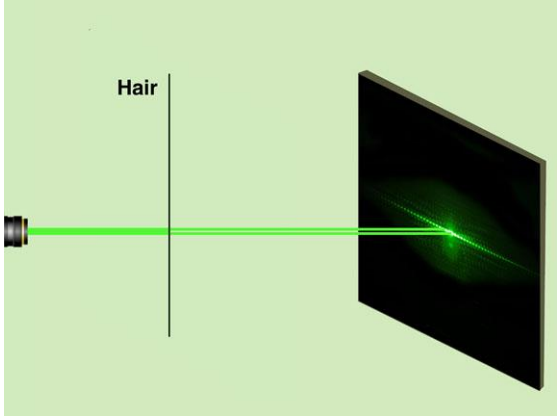


Shock waves formed from front wave

The shock wave-generated shock waves

- When the initial shock wave hits the two slits, most of the shock wave will be absorbed or reflected.
- Those parts of the shock wave that pass through the two slits will begin to expand once the shock wave has passes through the slits.
- These secondary shock waves will be much weaker than the initial shock wave.
- Constructive interference of <u>all</u> the shock waves will generate the <u>several</u> parallel columns of light that are observed.

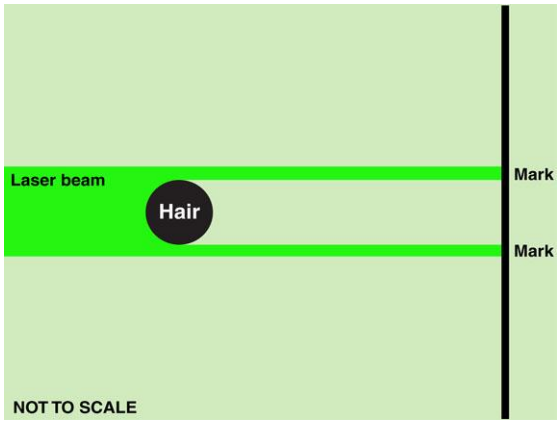
An explanation of the single hair test



Split ray test using a human hair

Some facts

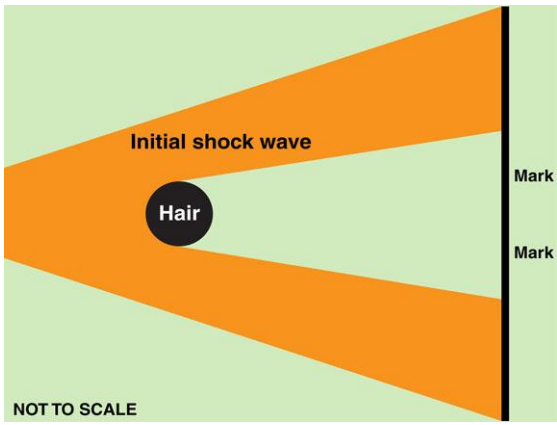
- The single hair experiment works a bit differently from the double slits in that two semi-circular shock wave are produced each side of the hair (the shock waves are not able take the shape of a slit).
- Each photon within the beam of light will develop each of these shock waves.
- In order to explain the single hair experiment I have chosen to use top view diagrams in order to better display the multiple shock waves.



Laser beam

Beam of light

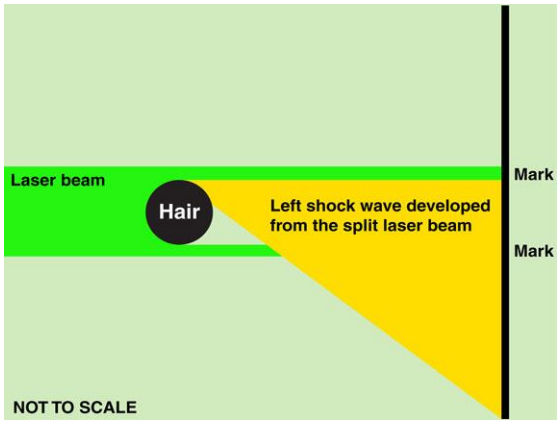
- The parts of the laser beam that can pass by the hair, will project straight onto the screen.



Initial shock wave

Initial shock wave

- Each photon in the laser beam will build its own energy shock wave, and many of these shock waves will join with each other.
- This initial shock wave will be partially blocked by the hair.

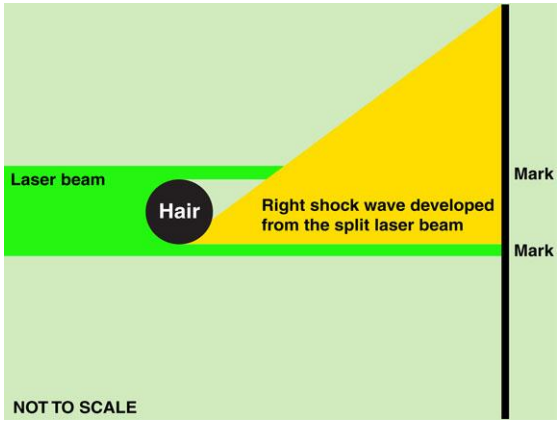


Building a new shock wave

Building a new shock wave

- The split beam of light will start to construct a new energy shock wave behind the hair.
- Only the left side is shown here.

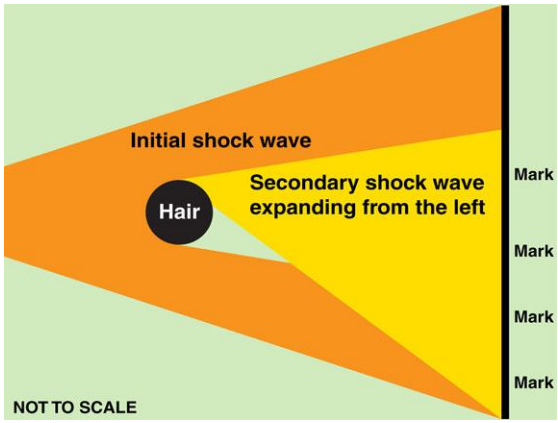
An explanation of the single hair test



Building a new shock wave

Building a new shock wave

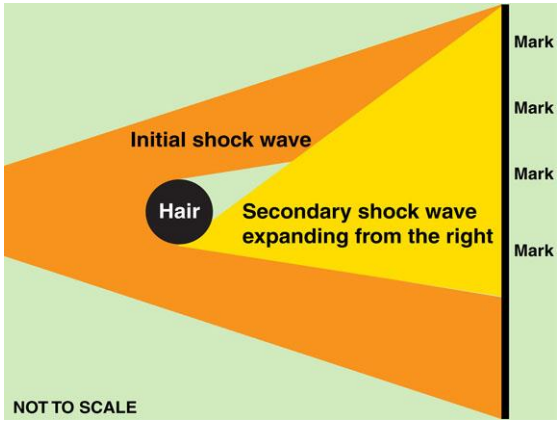
- Similar to that discussed for the previous image, but showing the right-hand side of the beam of light.



Building a new shock wave

Shock wave building a new shock wave

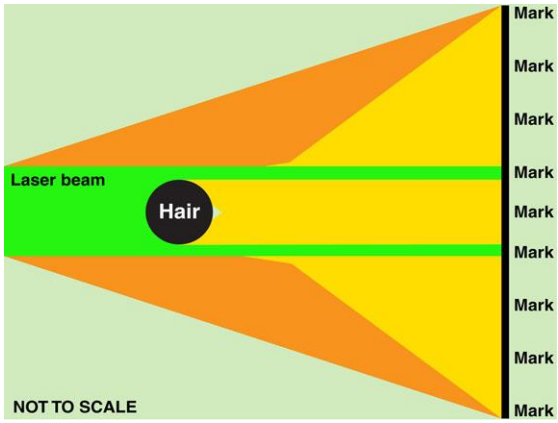
- The split initial shock wave will also begin to expand behind the hair.
- Only the left side is shown here.



Building a new shock wave

Shock wave building a new shock wave

- Similar to that discussed for the previous image, but for the right-hand side of the beam of light.
- Note; only the existence of these multiple shock waves can explain the **many** parallel bars of light, which the water wave theory cannot.

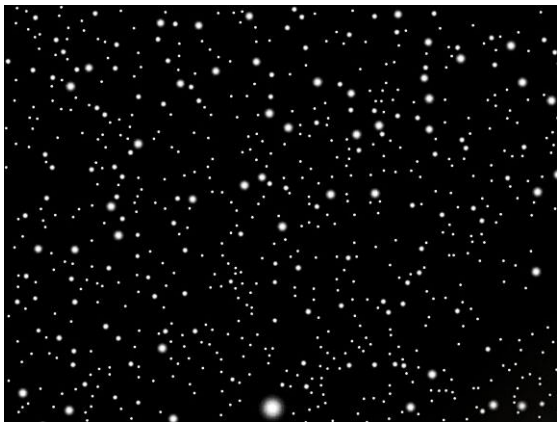


Overlapping energy shock waves

Final outcome

- This complex structure of light produces several evenly-spaced bars of light.
- Each photon within the beam of light will develop all five shock waves, so even though each shock wave has a **very** low intensity, thousands of small intensity glows can join to make a visible glow.
- **If you are looking for a challenge;** try to figure out an explanation of the triple polaroid filter experiment before reading the next chapter.

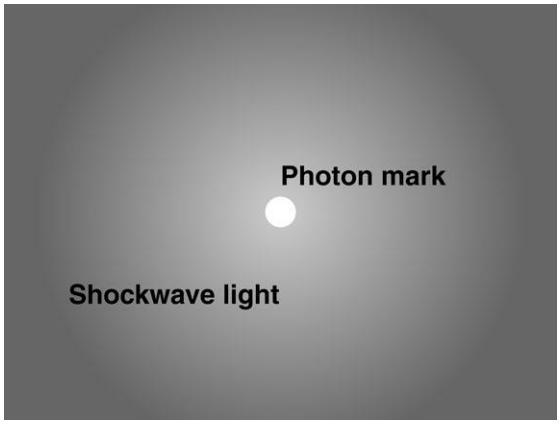
The properties of energy shock waves



Stars

Why can't we see a shock wave?

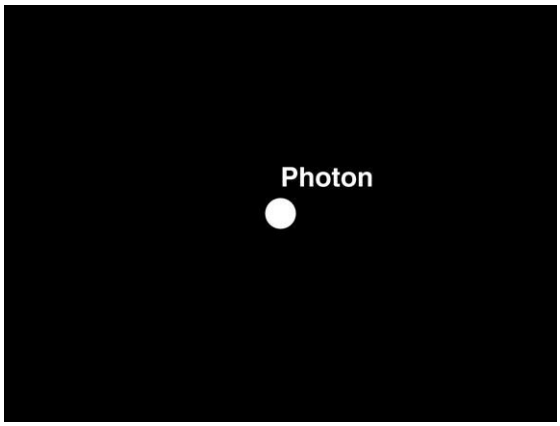
- **Question:** If an energy shock wave is just concentrated energy, and a photon is a localised concentration of energy, then why don't we see the shock wave?
- **Answer:** In some circumstances you do see the shock wave.
- When you look at stars at night, mostly what you are seeing is the shock wave.
- In the double slit experiment you can see evidence of shock waves.
- When you see a colour spectrum you are seeing evidence of shock waves.



Energy of a photon and shock wave

Concentrated energy

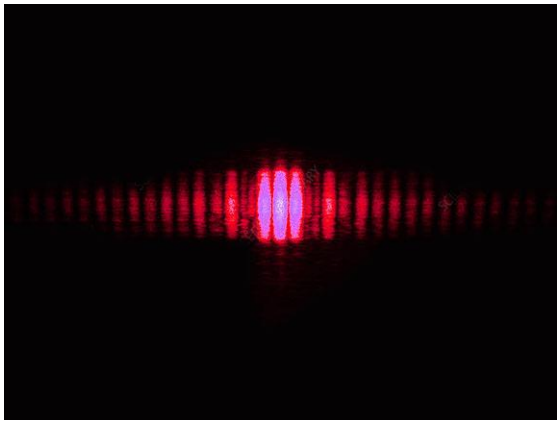
- If you had an instrument that could register any level of concentrated energy (i.e. any light intensity), and you projected one photon at a sensor, then the image you would likely get is shown here.
- Technically, the term 'light' only applies to an energy concentration that can be observed by the human eye, not the light detected by a sensor.



Light observed by the human eye

Visible light

- If we look at the same image with a human eye, the sensors in the eye will only register the bright light of the photon (or should I say, multiple photons).

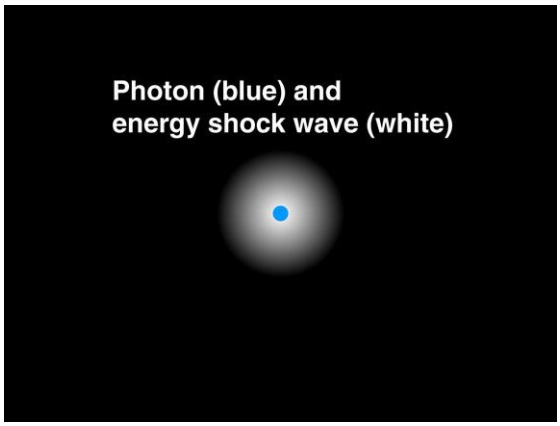


Double slit experiment image

Relative energy

- We can get an idea of the difference in energy between a photon and shock waves when we look at the image generated by the double slit experiment.
- The high intensity light of the photon is visible in the centre.
- The intensity of the shock wave effect adjacent to the photon's mark is much less than the photon.
- Again, note the vertical height of each bar of light.

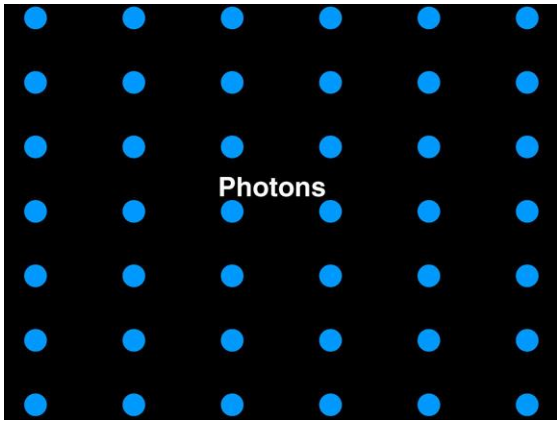
The properties of energy shock waves



Assumed single photon and shock wave

Expand the view of a single photon and shock wave

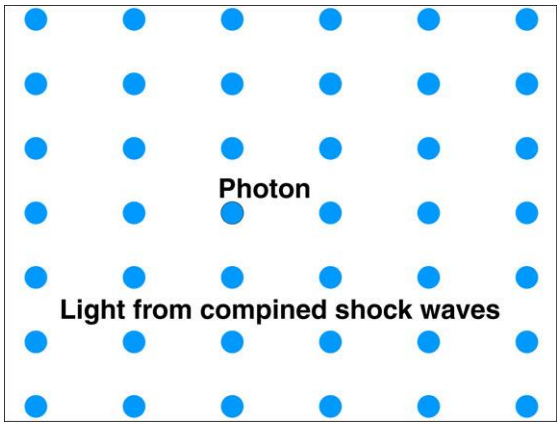
- If we expand the previous image of a photon and its shock wave, and we pretend the shock wave has only a limited radius, then we may get the image shown left.



Photons without the shock wave effect

A cluster of photons

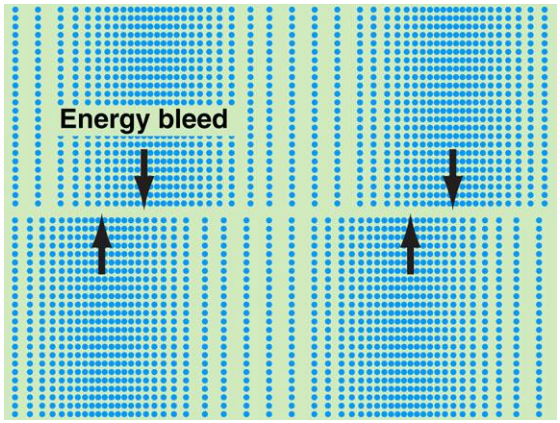
- If we now consider a cluster of photons arranged as shown left.
- The position of these photons are shown without the light that could be generated by their associated shock waves.



Photons with the shock wave effect

Image produced by a cluster of photons

- If we now apply a shock wave circle to each of these photons, and we superimpose their energy, then we end up with a wall of light.
- As photons travel from a distant star to your eye, the photons spread further and further apart.
- However, all the shock waves overlap each other, and eventually a three dimensional sphere of light radiates out from the star, which allows the light to reach every corner of space.



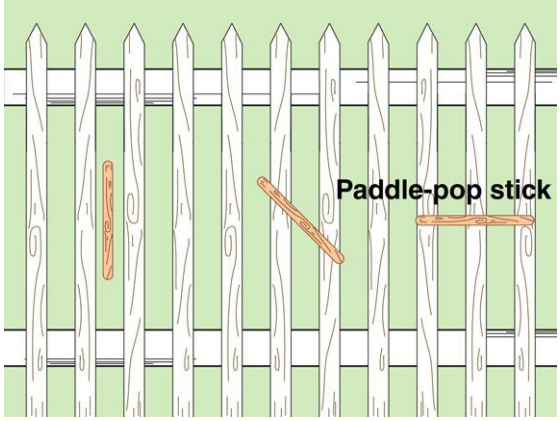
Merging compression waves

How do all these individual shock waves get in phase with each other?

- A shock wave is just another example of compressed quantum forces (or energy, if you prefer).
- As discussed in the final chapter, free quantum forces apply forces to concentrated quantum forces that:
  - stabilise a concentration
  - try to force two concentrations together.
- Thus free quantum forces push shock adjacent waves together.

Appendix 4. Polarisation and the Triple Filter Experiment

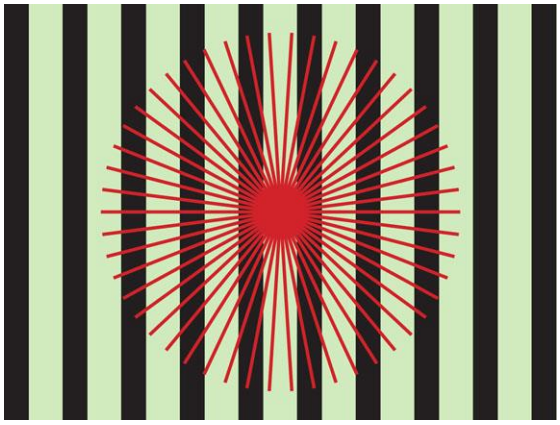
If light were to travel as a transverse wave



Horizontal paddle-pop stick

Introduction

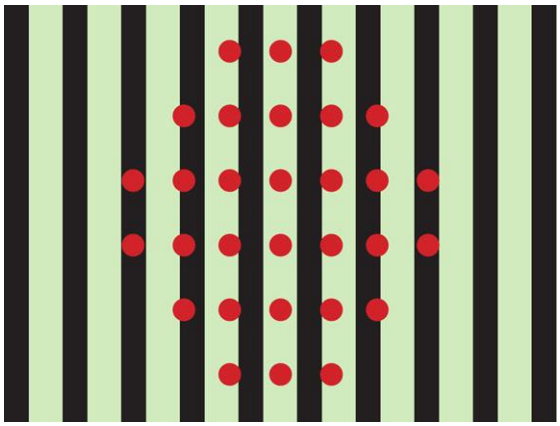
- Some writers have compared the filtering of light to the passing of a paddle-pop stick through a slatted fence.
- I disagree with this analogy:
  - if a photon did travel as a transverse wave, then at the instant the photon arrived at the filter, it would exist only as a single point, not as a 2D wave
  - and, the paddle-pop analogy suggests that far more than 50% of the light would be filtered.



Photons arriving in a starburst pattern

Light as a transverse wave

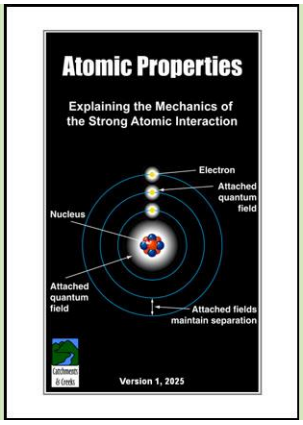
- If light did travel as a transverse wave, and these waves arrived in a 360-degree spectrum, then it would be reasonable to expect that a polaroid filter would filter more than 50% of the light.



Photons approaching a vertical filter

Light as a compression wave

- If light travelled as a longitudinal compression wave, then it would be reasonable to expect that a polaroid filter would filter around 50% of the light.

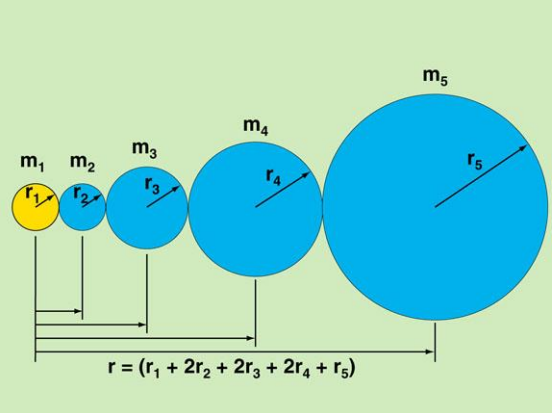


Atomic Properties, 2025

The collapse of divided photons

- If a filter removes a significant portion of an individual photon, then the divided photon will collapse and convert into background aether.
- Based on my investigations into the weak and strong atomic interaction, it would appear that if the primary mass (m_1) is close to the size of the secondary mass (m_2), then a net force of attraction will collapse, which appears to explain the collapse of a half photon—the earlier mathematics is repeated over the page.

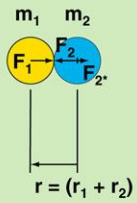
This is a repeat of a previous page that demonstrates the mathematics



Electron and attached quantum forces

$$F_1 = F_2 - F_{2*} + F_3 - F_{3*} + F_4 - F_{4*} + F_5 - F_{5*} + \text{etc}$$

$$F_2 = \frac{G.m_1.m_2}{(r_1 + r_2)^2}$$



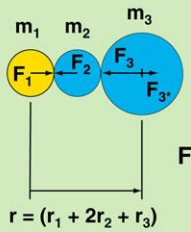
$$F_{2*} = \sum \frac{(G.m_2.m_n)}{(r_2 + 2r_3 + 2r_4 + 2r_5 \ldots)^2}$$

F_{2*} = sum of forces of attraction to outer quantum forces

Forces acting on mass-2

$$F_1 = F_2 - F_{2*} + F_3 - F_{3*} + F_4 - F_{4*} + F_5 - F_{5*} + \text{etc}$$

$$F_3 = \frac{G.m_1.m_3}{(r_1 + 2r_2 + r_3)^2} + \frac{G.m_2.m_3}{(r_2 + r_3)^2}$$

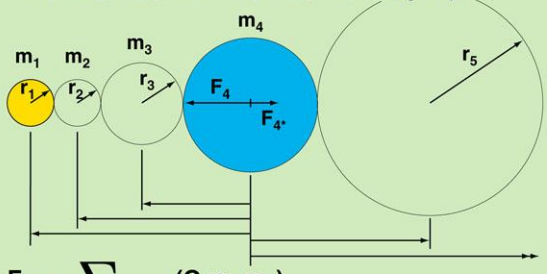


We could assume $m_2 = m_3$

$$F_{3*} = \sum \frac{(G.m_3.m_n)}{(r_3 + 2r_4 + 2r_5 + 2r_6 \ldots)^2}$$

Forces acting on mass-3

$$F_4 = \frac{G.m_1.m_4}{(r_1 + 2r_2 + 2r_3 + r_4)^2} + \frac{G.m_2.m_4}{(r_2 + 2r_3 + r_4)^2} + \frac{G.m_3.m_4}{(r_3 + r_4)^2}$$



$$F_{4*} = \sum \frac{(G.m_4.m_n)}{(r_4 + 2r_5 + 2r_6 + 2r_7 \ldots)^2}$$

Forces acting on mass-4

Introduction

- On this page I will describe the type of mathematics that demonstrates how the attached quantum forces ultimately generates a net force of attraction.
- This is NOT the correct mathematics, because in this example I have assumed that the effective size of the quantum force increases in proportion to distance, which is not correct (I believe).
- The correct analysis requires consideration of the mechanics in three dimensions—too hard for me!

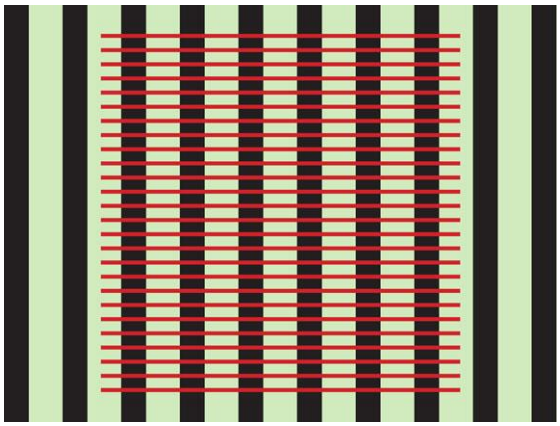
Forces acting on primary mass (m_1) and first secondary mass (m_2)

- There is a repelling force that exists between the primary mass (m_1) and the first attached quantum force (m_2).
- The primary mass can be anything from an electron to a planet, or a black hole.
- Key to this analysis is the relative size of the primary mass (r_1) compared to the attached quantum forces (r_2, r_3, r_4, etc.).
- For an electron; $r_1 > r_2$.
- For a nucleus; $r_1 >>> r_2$.
- The repelling force (F_2) that exists between the primary mass (m_1) and the first attached quantum force (m_2) is governed only by masses m_1 and m_2.
- The repelling force (F_{2*}) that exists between the first attached quantum force (m_2). and the outer attached quantum forces involves mass m_2 and all the masses outside m_2.
- This same analysis is repeated for all the attached quantum forces until the outer most attached quantum force has an inward repelling force equal to the background repelling force of free aether.

The effect of particle size

- For a mass the size of our Sun, the attached quantum forces will extend beyond Pluto before the attached quantum force ‘pressure’ equals the background aether, after which, the net force converts to the repelling force of aether.
- For a primary mass the size of an electron, the distance from the electron before the net force converts from attraction to repelling in microscopic, which means electrons repel each other, rather than attract each other.

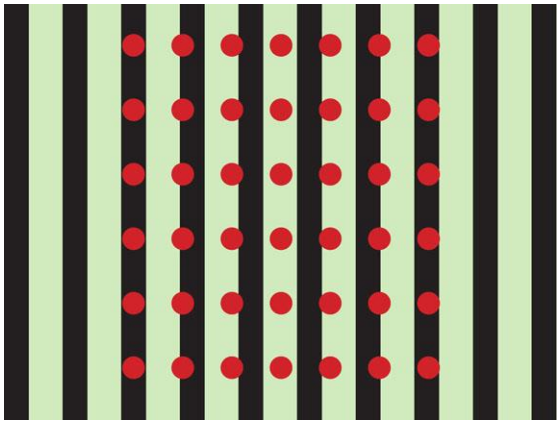
If light were to travel as a transverse wave



Horizontal paddle-pop stick

Introduction

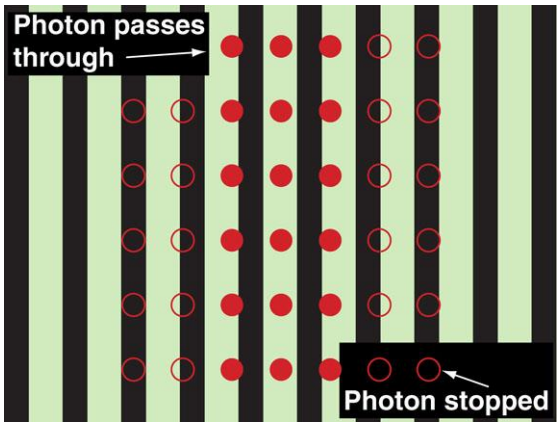
- If light did travel as a transverse wave, and:
  - if the light approaching a polaroid filter was reflected light with a dominant horizontal alignment (shown here)
  - then logic would suggest that most of the reflected light would be stopped
  - which is the case for polaroid sunglasses.
- So, on first inspection, the transverse wave theory does sound reasonable.



Starburst pattern approaching a filter

Looking at individual photons

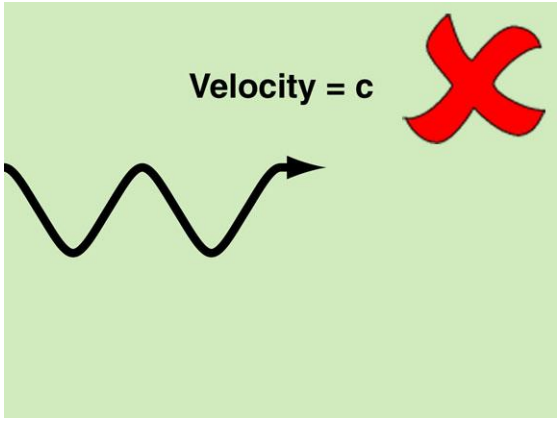
- However, if we accept that each photon would exist as a single virtual particle at the time that it arrived at the filter, then the above image would convert to something like the image shown left.
- Here, each red dot represents just one photon.



Photons at any given 'instant'

Filtered light

- If a polarised filter filtered the above photons, then the outcome would likely be around 50% filtration, not the near 100% filtration that is observed for polaroid filters.

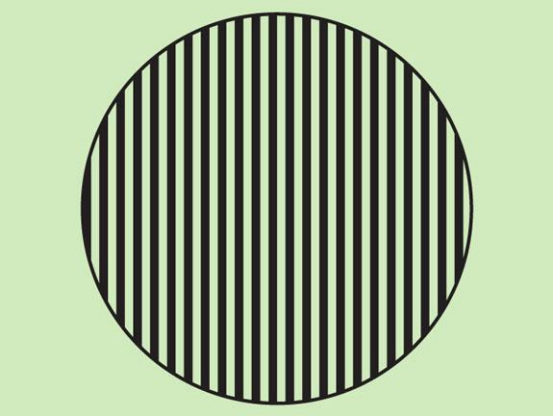


Light is <u>not</u> a transverse wave

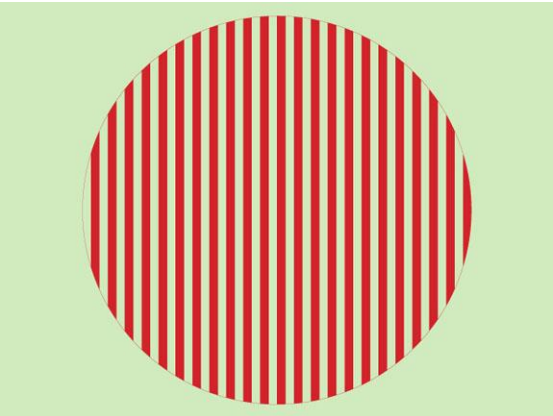
Not a transverse wave

- So, based on my understanding of physics and light, the transverse wave theory does not appear to support our observations of polaroid filters.

Double filter experiment

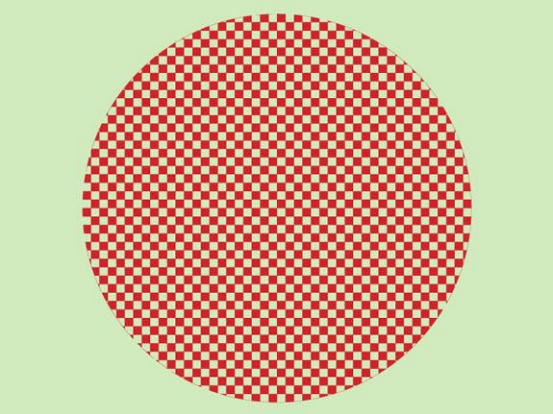


Vertically aligned filter (50%)

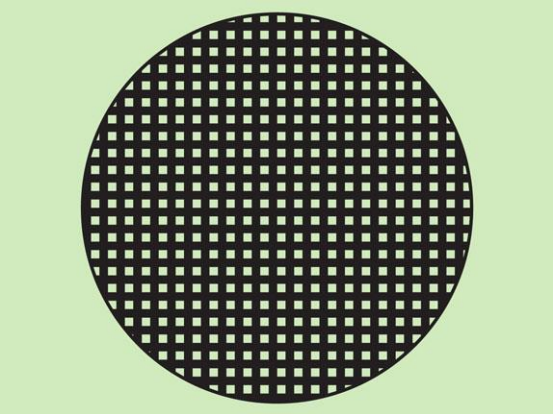


Polarised light (shown in red)

Horizontally aligned filter (50%)



Theoretical light passing the filter



Combine filters (25% blockage)

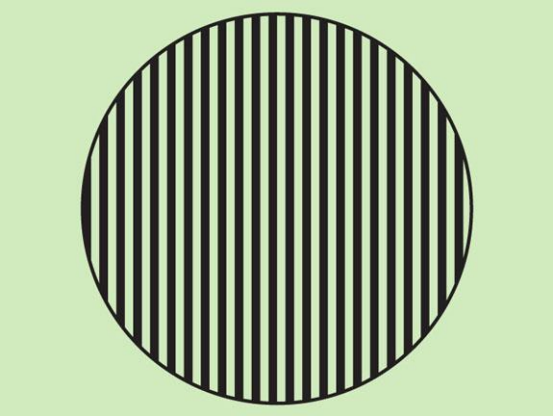
Light passing through a vertical filter

- If we were to send a beam of light towards a polaroid filter, then it would be expected that around 50% of the light will be filtered.
- The image (left) shows a vertically aligned polarised filter.
- It would appear that some people believe that if two polarised filters are held at 90-degrees to each other, their combined silhouette would represent a 100% shadow; not the 75% coverage that actually occurs (refer to bottom image).

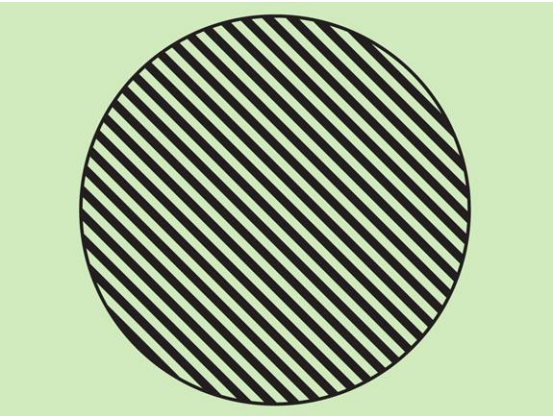
Polarised light

- The image shown left, represents the potential filtered (red) light passing through a vertical filter.
- If this filtered light were to be projected onto a horizontal filter (below left), then it would be reasonable to expect that the passing light would look something like that shown below (bottom left).
- This theoretical projection of light represent around 25% of the original light.
- However, we know from experiments that two miss-aligned polaroid filters will stop nearly 100% of the light.
- The reason for the near-100% filtering is:
  - each photon that passes through the second filter will lose around 75% of its shock wave
  - each of these photons are still travelling at the critical velocity, so the photons will try to rebuild their shock wave
  - however, if this rebuilding process takes too much energy from the photon, then the photon will collapse, and the light will cease to exist.

Triple filter experiment

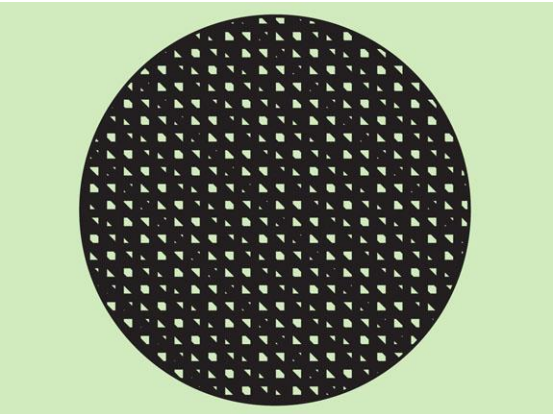


First filter: Vertically polaroid (50%)



Second filter: Tilted polaroid (50%)

Third filter: Horizontally polaroid (50%)



Combined filters (12%)

First filter

- The triple filter experiment involves passing light through three polaroid filters; each filter rotated 45-degrees from the previous filter.
- Unlike the double filter experiment, which blocks almost 100% of the light, the triple filter experiment shows that approximately 12% of the light is able to pass through the three filters, even though the net 12% unobstructed passage is half of the unobstructed passage available on the double filter experiment.

Second filter

- If the first filter is vertical (top left), then the second filter (left) will be at 45 degrees.

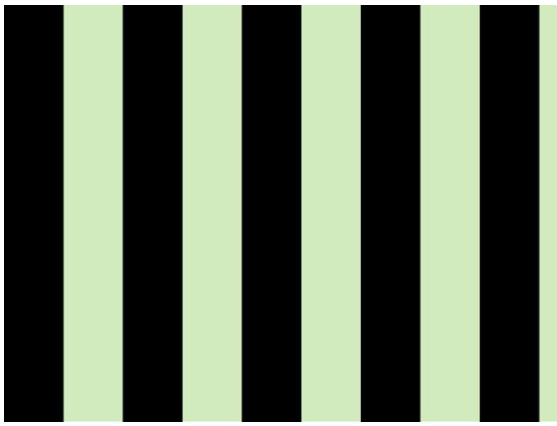
Third filter

- If the first filter is vertical, then the third filter (left) will be horizontal.

Image of combined filters

- The net clear area of the three filters is around 12 to 13% depending on the positioning of each filter.
- The conventional theory of light cannot explain this counter-intuitive outcome of around 12% of the light passing through the three filters.
- However, the outcome can be explained by the longitudinal compression wave theory of light that is being proposed within this document.

Explanation of the triple filter experiment



(a) Vertical filter (54%)

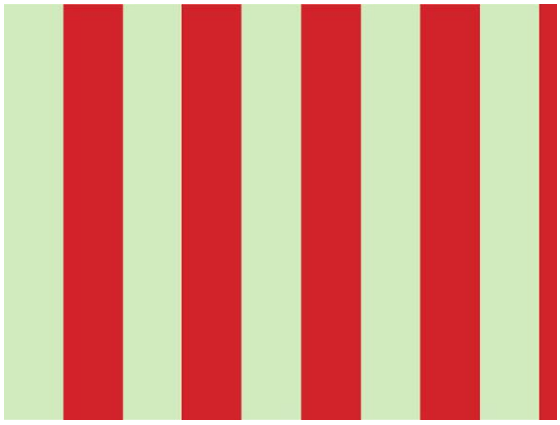
Introduction

The following images represent a magnified view of a polarised filter.

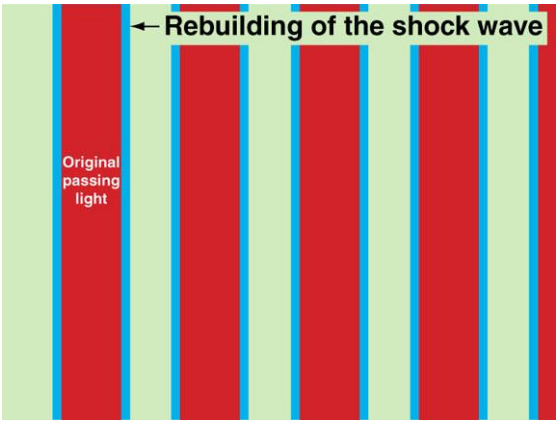
(a) The first image represents the first vertical filter.

(b) The net image represents the light (red) immediately after it passes through the vertical filter.

(c) Image (c) represents this filtered light beginning to rebuild its shock wave (blue), which has increased the total light to 61%.



(b) Light passing through filter (46%)



(c) Rebuilding of the shock waves (61%)

(d) Expanded light all shown in red (61%)

Second (tilted) filter

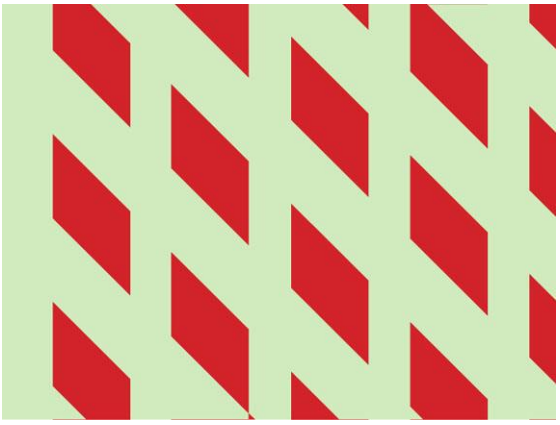
(d) Represents the total light approaching the second filter. This light is the total of the red and blue regions shown in image (c).

(e) Image (e) represents the expanded light shown in (d) as projected onto the second (tilted) filter.

(f) Image (f) represents the amount of light (31%) that is expected to pass through the second filter.

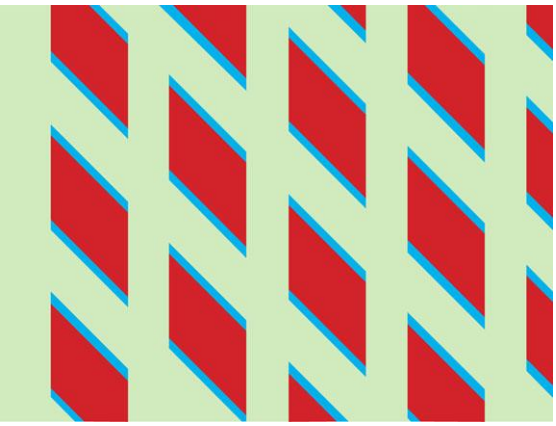
The percentages are only estimates based on an assumed growth of the shock waves.

(e) Light projected onto the second filter



(f) Light passing through the filter (31%)

Explanation of the triple filter experiment



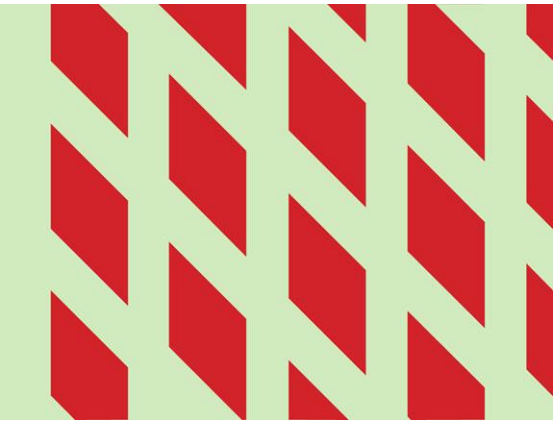
(g) Rebuilding of the shock waves

Light passing through the second filter

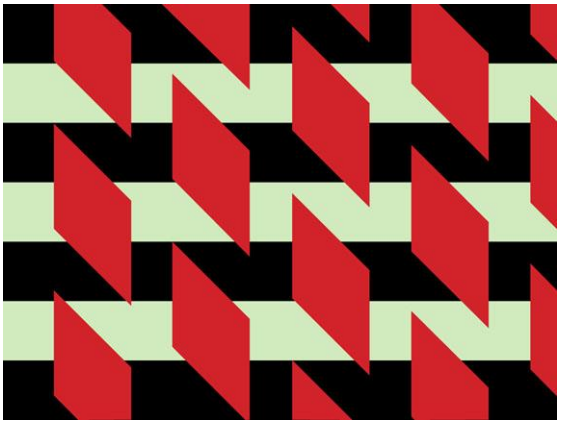
(g) Image (g) represents the rebuilding of the various shock waves (blue) from 31% (f) to 39% (g), but this is based on my guess as to how rapidly the shock wave is rebuilt.

(h) Image (h) represents the total amount of light approaching the third filter. This light is the total of the red and blue regions shown in image (g).

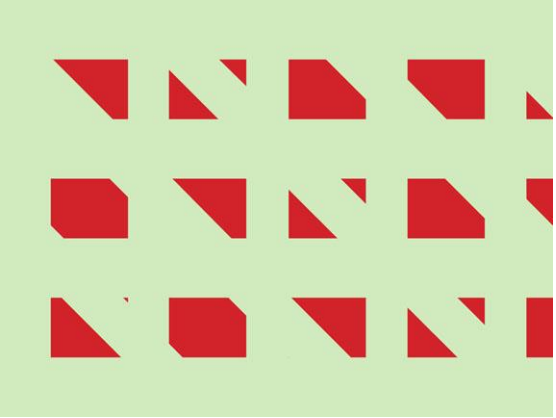
(i) Image (i) Represents the rebuilt light approaching the third and final filter. This final filter is aligned horizontally.



(h) Expanded light all shown in red (39%)



(i) Light projected onto the third filter

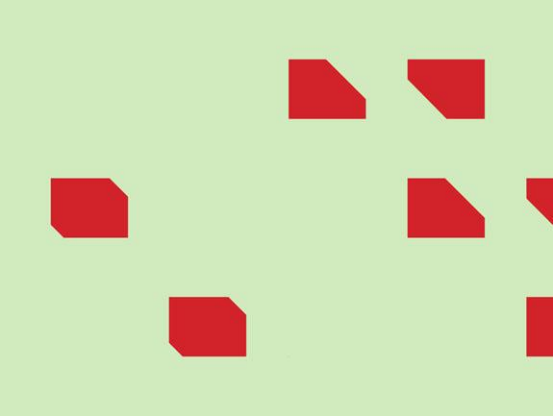


(j) Light passing through the filter (16%)

Light passing through the third filter

(j) Image (j) represents the theoretical amount of light that could pass through the third filter based on 100% blockage by the filter.

(k) Image (k) represents the amount of light (10% in this example) that would likely remain stable, and therefore remain visible. The smaller segments of light would not have the energy to maintain their stability, and thus would return back to being background aether.



(k) Collapse of minor light elements (10%)

Conclusions

- The physics observed here has **<u>nothing</u>** to do with the magical properties of light.
- The mechanics is based on a photon rebuilding its trimmed shock wave (at the speed of causality), but only along the sides where the shock wave was filtered.
- This means that the smaller the change in angle from one filter to the next, the greater the potential for the rebuilt shock wave to pass through the next filter, which means the photon has to do less work to rebuild its shock wave.