Aether Physics

Quantum mechanics with a twist

Fredrik Nygaard (2020)

Introduction

This book is a systematic review and in depth analysis of previous work in which I demonstrated that a strict particle model of physics can account for the universe as we know it. In this proposed model, nothing happens without direct interaction, and no particle can be created or destroyed. There are no mysterious variables that can only be understood in mathematical terms. Everything is strictly physical. At the lowest level of physics, everything is particles knocking into each other to produce force and hooking up to each other to create structures. It is not an unfathomable complex of unearthly vibrations and energies. Rather, it is an extremely simple and stripped down version of what we experience as reality in our everyday lives.

What follows is a step by step approach to understanding the mechanics of this model. We will start with the idea that all that we know in the universe derives in some way from particles existing in a void. From this we will build our entire theoretical framework by gradually introducing new concepts based on observation and experiment. The overall approach is layered. Each layer is based on previous findings combined with observations and experiments performed in the real world. In this way, we avoid circular reasoning and digressions into pure speculation. Rather than a confused mess, we end up with a coherent and straight forward story that represents a valid model of the world we live in.

With no further ado let's start with the basics and move on from there:

The void

A void is an infinity of nothing. It has no dimensions. It has no extent. It has no time. As such, it must not be confused with empty space, which we all know to have these three qualities. Two objects placed in empty space can be separated by any distance. However, two objects placed into a void will be in physical contact with each other regardless of where they are placed. This is because a void, contrary to space, is nothing. With nothing separating two objects, they must be in contact. The only ways to separate two objects in a void is to completely encapsulate one of them inside a third object, or put a bunch of objects all around the two objects in question.

Note also that if there is any kind of gap in the encapsulation of an object residing in a void, any texture that the object may have, small enough to brush into the gap, will be able to touch the outside object. This is because the gap itself is void of distance. It does not matter how thick the wall of the encapsulation is, if there is a gap, even the shortest hair or tentacle will be able to touch the outside object. This too is contrary to our experience of space. However, there is evidence to support the idea that the void is real, and not merely a quaint idea.

Experimental physics has demonstrated that subatomic particles that have been in such close contact that they have become entangled, will remain entangled even when separated in space by a considerable distance. This strange behaviour seems to defy the idea that things have to be in physical contact in order to interact. However, if space is full of little gaps, and these gaps are voids, all we need in order to explain the phenomenon of quantum entanglement is for our particles to have textures small enough to interact through these gaps.

Space

Space is not a void. We know this because space does not behave like a void. Space has dimensions and extent, something the void does not possess. The properties of space derive from particles that make up space. These particles are the aether, from which everything in the universe has its origin. The aether is the origin of photon and neutrino radiation, and photon radiation is the origin of ordinary matter. The aether is also responsible for the three field forces we know as the electric force, gravity and magnetism. All of this will be explained in this book.

For now, it suffice to say that space is an aether filled void, and as such, there must necessarily be little gaps between aether particles. Quantum entanglement can in other words be explained directly from our definition of space.

Time and distances

Time has the peculiar quality that it is always moving forward. Ideally, this too should be tied up to particles, but as things stand, there's no explanation for this quality in the theory presented in this book. This means that the forward arrow of time is a premise that we must take as a given. The same is true about the dimensions and extent of aether particles, as well as the presumption that aether particles have textures. We have no explanation for why this is so. Nor do we present any explanation for why there's anything at all. This book is not a cosmology. We present no explanation for existence itself.

What we do note is the fact that time and distance have no meaning without a reference to a clock and a ruler. For time and distance to exist, there has to be motion and extent. Particles must move and they must have an extent, otherwise, there's no time and no distance. Without particles we are left with a void, and a void is merely an infinity of nothing.

From this it follows that our perception of time is in fact relative motion. We perceive time because things move. If everything was to stop, including our heartbeats and biology, only to restart aeons later, nobody but God would know that there was a gap in time. Since this is a book about physics rather than religion, we must acknowledge that such gaps are of no consequence. They are undetectable and hence outside the realm of physics.

Likewise for distance. That too is a relative measure. We measure things in relation to ourselves or some other ruler. Without things, there are no distances. Without particles there are neither time nor distance, only a void where nothing exists and nothing ever happens.

With this in mind, let us now turn our attention to the particle quantum: the smallest meaningful subdivision of a particle.

Particle quanta

A particle is anything that comes as a small package. It may be a bundle of strings. It may be a droplet. It may be a grain. It may spin or twist. It may be possible to subdivide further. This is of no consequence. As long as it comes in a neat little package, it's a particle.

A particle quantum has the additional quality that any subdivision of it will add nothing to our understanding. The particle quantum is not necessarily the physical limit of subdivisions. Rather, it is the logical limit beyond which further subdivisions are meaningless.

For the purpose of our proposed physics, particle quanta can neither be created nor destroyed. They are as eternal as the void.

Unlike the void, our particle quanta come with a set of properties. They are:

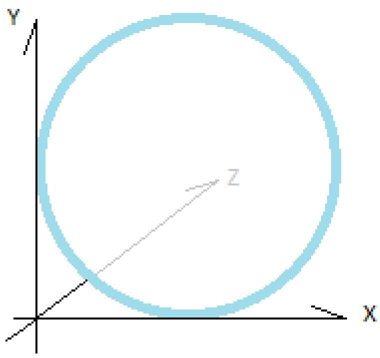
- **Dimensions**: Particle quanta have 3 dimensions.
- **Size**: Particle quanta have size. They have surface area. They have diameter. Particle quanta may or may not be spherical. However, for simplicity we will deal with them as if they are near perfect spheres.

- **Motion**: Particle quanta can move.
- **Texture**: Particle quanta come in 3 types, each with its own texture. The 3 possible textures are:
    - Abrasive
    - Woolly
    - Mixed (part abrasive and part woolly)

A lone particle quantum in a void

With the above in mind, we can consider a lone particle quantum in a void. Since the void is an infinity of nothing, the only thing with any properties in this imagined universe is the particle quantum itself. All attributes refer to the particle, not the void. The void is still an infinity of nothing, even as we place a particle in it.

From this, we see that it is not the void that has properties. It is the particle. All that can be known about this tiny universe that we have created is derived directly from the particle. Our notion of space is not derived from the void, but from particle quanta.



The 3 dimensions of space, derived directly from the particle quantum

It should also be noted that a single particle quantum can act as a unit for length. It has a diameter and circumference. For reasons that will become clear later, we will use the circumference of an electron as our real world unit of length.

Two particle quanta in a void

Let us now imagine a second particle quantum. The void is of course just as ready to accept this as it was in accepting the first one. The void is an infinity of nothing. It has no restrictions. Whatever we put into it is fine with it.

Note that in this particular case, the two particles will necessarily be directly adjacent to each other. This is because the void in which they are placed have no dimensions of its own. No matter where we place the two particles, they will always be in direct physical contact for the simple reason that there's nothing separating them.

Our second quantum may be of identical size, or different size from the first one. Either way the notion of relative sizes arises. We can arbitrarily choose one of the two particle quanta as our reference, and measure the other particle quantum relative to it. We can now make precise statements about distance and bearing of the second particle relative to our reference.

Furthermore, we can detect motion. We can give one or both of our particles a push, making them roll around each other. Importantly, we cannot separate our two particles. The void is an infinity of nothing. No matter how much void we put between our particles, they will still be in contact with each other. With only two particles in a void, the only possible motion is a circling motion.

The motion we have created is not very informative. There is no way to say how fast our particles are rotating around each other, because we have nothing to relate the speed to. We have no clock. What we have is a reference speed. It's only when we introduce a third particle that it becomes possible to make statements about relative speeds.

Three particle quanta in a void

When we add a third particle quantum to our void, the concept of time arises, again as a relative measure. We arbitrarily choose one particle to represent our unit of length. Then we let an equally arbitrary second particle represent our unit of speed. Every time our second particle circles our first, we have a unit time. This constitutes a clock where a unit time can be defined as follows:

1 unit time = 1 unit length / 1 unit speed

Now, we can make the following precise statements about our third particle:

- We can locate its position in terms of unit length, and bearing in 3 dimensions.
- We can calculate its speed in terms of unit lengths per unit time.

A multitude of particle quanta in a void

Let us now proceed to put a multitude of particle quanta into our void. As already noted, every particle must necessarily be in contact with its neighbouring particles. This is because the void is an infinity of nothing. It cannot separate particles from each other. For a particle to be separated from another particle, there has to be another particle in between. This makes for a curved universe with no limit. No matter how far we move in one direction, there will always be another particle beyond it in the same direction. The way to picture this is to imagine ourselves at the final limit of our universe, from which we are staring into the void. Behind us are a huge but final number of particle quanta, before us only nothing. Let us now take one step forward. While there is an infinity of nothing in front of us, our next step must necessarily hit something, and that something must be another particle quantum.

Another interesting aspect of this multitude is that if one particle quantum moves, all neighbouring quanta must accommodate for this. This in turn, propagates throughout our universe. If one quantum moves, all quanta move. This goes a long way in explaining the curious fact that all photons and neutrinos in the real world move at the exact same speed.

If space is constituted of particle quanta, as postulated in our theory, we must conclude that there is an aether of very low energy particles governing the workings of things at the subatomic. One of the things that this aether does is that it ensures that photons and neutrinos always travel at the same speed. How this is done, is not explained in this theory. However, it must somehow be tied to the nature of the particles themselves, quite possibly in relation to the high density of the aether, the texture of aether particles, and the gaps that must necessarily exist between each particle.

Four stable particles

We have now arrived at a point where we can use our theoretical base to interpret real world experiment and observations. Our first task will be to describe the four stable particles known to us in terms of particle quanta. These particles are:

- The proton
- The electron
- The neutrino

- The photon

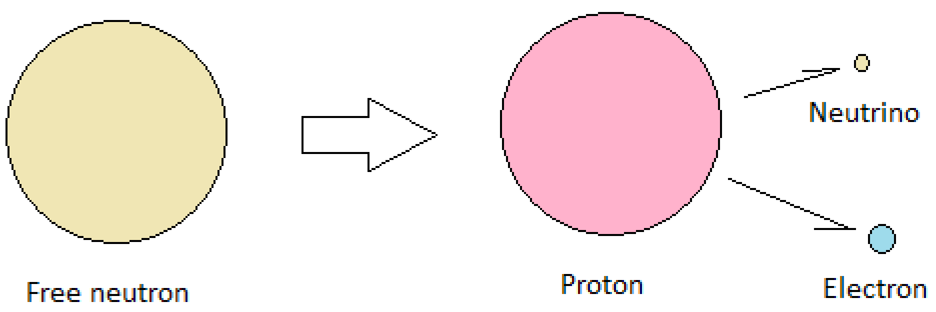
To aid us in this, we will consider the phenomenon of free neutron decay, and the phenomenon of electron-positron pair production:

Free neutron decay

The particle quanta described in this book are based on Morton Spears' particle quanta, used by him in his work on gravity. His thinking was based on data available at his time. In particular the relative masses of the proton, neutron and electron. These are measures that may have changed since he wrote his books back in the 1990's. The specifics may have changed. However, there is still general agreement that the proton is smaller than the neutron by the mass of a single electron, which is all that we need in order to make our calculations. The numbers presented in this chapter may in other words be outdated, but the thinking remains sound:

When Spears realized that the difference in mass between a proton and a neutron could be expressed as a ratio of 2177 to 2180, he drew the straight forward conclusion that the difference between a proton and a neutron must be exactly 3 particle quanta, 1 positive and 2 negative. Furthermore, the fact that the neutron has an overall neutral charge was interpreted to mean that a neutron consists of exactly 1090 positive quanta and 1090 negative quanta. The fact that the proton has a positive charge of 1 was interpreted to mean that it is composed of exactly 1089 positive quanta and 1088 negative quanta.

From this we can find out what the 3 remaining particle quanta may be by considering the phenomenon of free neutron decay, in which a neutron, removed from an atomic nucleus, decays into a proton, an electron and a neutrino within about 15 minutes.



Free neutron decay

One way of interpreting this is to assume that an electron consists of a single negative quantum, and the neutrino is an assembly of one negative and one positive quantum. However, the electron is generally understood to be larger than a neutrino. It's therefore logical to conclude that the electron is constituted of 3 particle quanta: 2 negative and 1 positive. The neutrino becomes in this way something separate from the original assembly. It must have come from the aether rather than the neutron. Being smaller than the electron, we can conclude that the neutrino must be a single neutral quantum.

We can further conclude that the neutron is not a fundamental particle, but an assembly of 1 proton and 1 electron. This assembly is only stable inside the atomic nucleus. This in turn leaves us with three stable particles. They are:

- The proton
- The electron

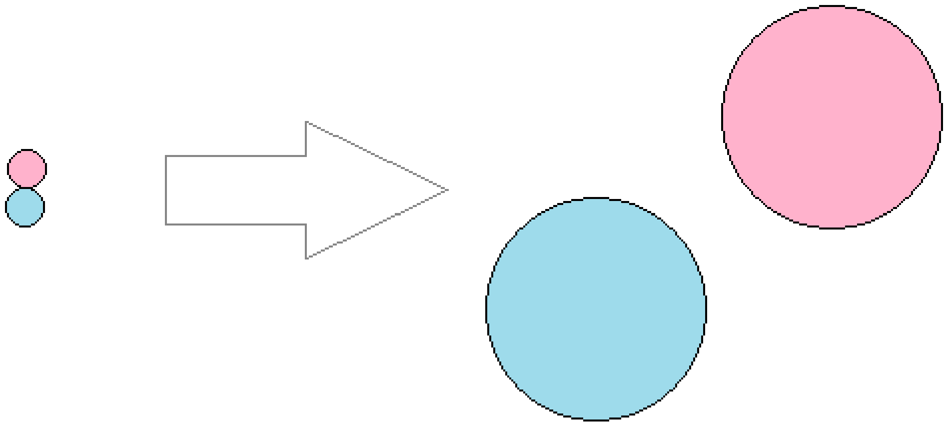
- The neutrino

Left unaccounted for, we have the photon. However, once we consider the phenomenon of electron-positron pair production in light of what we have calculated so far, the constituent parts of the photon come out clearly defined:

Electron-positron pair production

When high energy photons, such as gamma-rays come into close contact with large charged particles, they sometimes disappear spontaneously into nothing but an electron and a positron. At the very moment that the photon disappears, an electron-positron pair comes into existence.

The way to interpret this in terms of our strict particle model, where no particle quanta can be created or destroyed, is that the photon is ripped apart:



Electron-positron pair production from a photon

We must therefore conclude that the particle quanta making up the electron and the positron are the exact same particle quanta that made up the original photon. Given that the electron and positron have identical mass, but opposite charge, we can further conclude that the positron is made up of 1 negative quantum and 2 positive quanta. Since the electron is made up of 1 positive quantum and 2 negative quanta, we get that the total assembly for a photon is 3 positive quanta and 3 negative quanta.

All the dominant particles of the universe have thus been explained in terms of particle quanta:

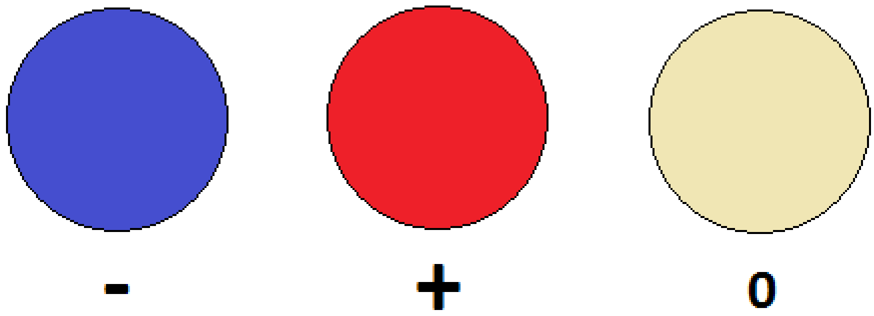
- Protons consist of 1089 positive quanta and 1088 negative quanta, a total of 2177.
- Electrons consist of 1 positive quantum and 2 negative quanta, a total of 3.
- Neutrinos consist of 1 neutral quantum.
- Photons consists of 3 positive quanta and 3 negative quanta, a total of 6.

Real world particle quanta

All of this gives support to our model. Morton Spears' particle quanta correspond neatly to our three theoretical quanta as follows:

- Abrasive quanta are positive (+)
- Woolly quanta are negative (-)
- Mixed quanta are neutral (0)

For illustration purposes, we can use the colour blue to denote negative particle quanta, red to denote positive particle quanta, and beige to denote neutral particle quanta. This can be illustrated as follows:



Three particle quanta: woolly, abrasive and mixed

The assignment of woolly texture to negative particle quanta, and abrasive texture to positive quanta is not arbitrary. Rather, this assignment is essential in order to explain the enormous size of the proton relative to the electron:

The size of protons

Compared to the electron, the proton is surprisingly large, and its size seems arbitrary. While the electron corresponds to exactly half a photon as far as particle quanta are concerned, the size of the proton is merely a big number with no clear relationship to anything. The size does not add up to an even multiple of 3, which would be required if it was a straight forward assembly of electrons and positrons. It is as if the proton is an assembly based on a seed particle of 2 particle quanta.

The way we arrive at this conclusion is by taking the size of the proton, and divide it by 3. What we get is 725 and a rest of 2. This corresponds to 363 positrons, 362 electrons, 1 positive quantum and 1 negative quantum. The two lone quanta appear to be the seed required to assemble the proton from the remaining 725 electrons and positrons. The origin of this seed may in turn be found with the photon which may under certain conditions split into three such seeds instead of the more usual electron-positron pair.

However, none of this explains why the proton is assembled in such a different way from an electron. To understand this in terms of our theory, we have to consider the effect of texture on particle assemblies.

Electrons are negatively charged and therefore predominantly woolly, while protons are positively charged and therefore predominantly rough. Rough textures are slightly more reactive than woolly textures. The analogy that springs to mind is Velcro. Anyone who has played around with Velcro knows that woolly strips do not react with other woolly strips. However, rough strips do react ever so slightly with other rough strips. Similarly, woolly electrons cannot in any way combine with other negatively charged particles. Protons on the other hand are able to react weakly with other positive particles. This means that positively charged particles can assemble into larger structures than negatively charged particles.

A logical consequence of this is that the proton may under certain conditions be able to gobble up both an electron and a positron, growing a bit in the process. If so, protons may have originally started out fairly small, but grown over time to the enormous size they have today. As it turns out, this does indeed appear to be the case. About fifty years ago, the astronomer Halton Arp made the remarkable observation that young astronomic structures appear to be constituted of atoms that are lighter than corresponding atoms in older structures. It appears then that we have observational support for our suggestion that protons grow larger over time.

Keeping things together

From the above analysis, a number of important aspects related to our theory have transpired.

Implicit in our above argument has been the idea of affinity between positive and negative particles. Assemblies are formed due to the natural affinity between woolly and abrasive particle quanta. Velcro is the macro-world analogy that best fits this idea, and the reason my original two books in this series were titled the Velcro Universe and the Velcro Cosmos.

Conventional physics invokes an electric strong force in order to explain particle assemblies. This extremely short range force does not exist in the model proposed in this book. Rather, we explain all short range affinities between particle quanta in terms of texture, something that by definition must be short range.

While woolly and abrasive particle quanta react strongly with each other, mixed particle quanta don't. Mixed particle quanta do not take part in assemblies.

Being a mix of woolly and abrasive textures, mixed particle quanta carry footprints of what they have most recently been in contact with. Mixed particle quanta that have recently been in contact with a woolly particle will be more abrasive than average. Conversely, a mixed particle that has recently been in contact with an abrasive particle is more woolly than average. The more abrasive or woolly an assembly is, the bigger and more pronounced are the footprints left on mixed particle quanta after collision. Note that only particle quanta with mixed textures can have this property. Woolly particles remain woolly, no matter what. The same goes for abrasive particles.

From this, we can explain why neutrinos come in many different charge-flavours, while protons, electrons and photons don't. Being unique among particles in being of mixed texture, the neutrino is the only one impacted with footprints on collision. It is therefore the only particle that can come in a variety of charges and charge intensities.

The aether

Photons have the peculiar property that they often seem to appear right out of nowhere. All that is needed is to heat a suitable material to a high enough temperature, and it starts to glow. But the material is made up of protons and electrons, where then do all the photons come from?

The only way to answer this in terms of the theory proposed in this book is that photons originate in the aether. They are somehow made visible through the interaction between the aether and heated materials.

Energy is transferred from the heated material to the aether in such a way that visible photons appear. But what is energy, and how exactly does energy interact with the aether to produce light?

As to the mechanism of production, it is either one in which photons are produced on the fly from particle quanta, or one in which energy makes pre-existing photons visible. The more reasonable of these suggestions is the latter. It is also the one that serves us the best in explaining a whole range of other phenomena encountered later in this book.

From this, we get that the aether serves as a reservoir of low energy photons. Since we know that neutrinos also have this peculiar tendency to appear out of nowhere, we can conclude that the aether is a mix of very low energy photons and neutrinos. From our theory, we must also conclude that the aether is so dense that no single particle is ever out of contact with its adjacent neighbours. With every particle in this aether travelling at the speed of light, it is extremely fluid as well.

Another property of the aether is that it has no absolute reference point. Every particle in it travels at the speed of light relative to its immediate surroundings. The aether is so void of energy that anything with a bit of energy quickly becomes a reference frame. The aether inside a car travelling down the highway, has the car as its reference frame. The aether in a forest, has the forest as its reference frame. Earth as a whole, drags the aether with it as it turns. The solar system in turn, is another reference frame. This spans the entire size hierarchy from the subatomic to the galactic and beyond.

Relative to the local reference frame, the aether moves with equal number of particles in every direction. Furthermore, the local reference frame sets the speed of its particles in such a way that when the forward speed of the local frame, relative to the outside frame, is added to the local speed of the aether, we get the speed of the aether outside the local frame.

This means that the aether inside a speeding train is slower than the aether outside of it. The aether inside a rocket moving at close to the speed of light is close to standstill.

To allow for all of this, the aether must be tolerant of differences in speeds between frames. However, it is extremely intolerant when it comes to dissenting member particles inside a frame. It behaves as a mob of wimps, ganging up on anything smaller than itself, while quickly conforming to anything bigger than itself.

There is no explanation for this behaviour in the theory presented here. However, this behaviour is required in order to explain a number of phenomena described later. We must therefore use the above description of the aether as a premise as we progress through the rest of this book.

A notable consequence of this model is that all frames of reference have some higher reference frame that can be viewed as static compared to itself. Viewed from such a top, every reference frame contained in it will have an aether that moves slower than its own. The degree to which the reference frames contained within the top reference have slower moving aether depends on the speed of the reference frames.

Since the particles in the aether move in all directions, the most natural analogy we have is a gas in which fast moving particles are hot and slow moving particles are cold. Similarly, we will describe fast moving aether as hot and slow moving aether as cold. The aether inside the above mentioned rocket ship is in other words extremely cold relative to its external reference frame.

Energy

Sticking with our theory, we must take the position that energy is a property of particle quanta. This is especially true since we know that neutrinos, consisting of single neutral particle quanta, are capable of carrying energy. Energy is therefore something fundamental, requiring no complex assembly or structure to exist.

As stated at the beginning of this book, particle quanta have four fundamental properties. They are their 3 dimensions, their size, motion and texture. Additionally, we can propose vibration and spin as fundamental.

Neutrinos do not speed up or slow down when given extra energy, so energy can not be speed. Dismissing the idea that dimensions or texture may have anything to do with energy, we are left with spin, vibration or size as top contenders. Noting that large particles, such as protons, are known to carry more energy than smaller particles such as electrons and photons, our prime candidate becomes size. Choosing this as our definition of energy, we get that an increase in size of particles at the subatomic is equivalent to an increase in energy.

Pilot waves

We can now explain the phenomenon of visible light, as well as all other energy carrying photons, in terms of the aether and energy as size. When a suitable material is heated in the right way, electrons in that material start to kick low energy photons, everywhere available in the aether, one or more notches up in energy.

The more energetic a particle is, the larger it is, and the more it interacts with the aether. This in turn has two consequences:

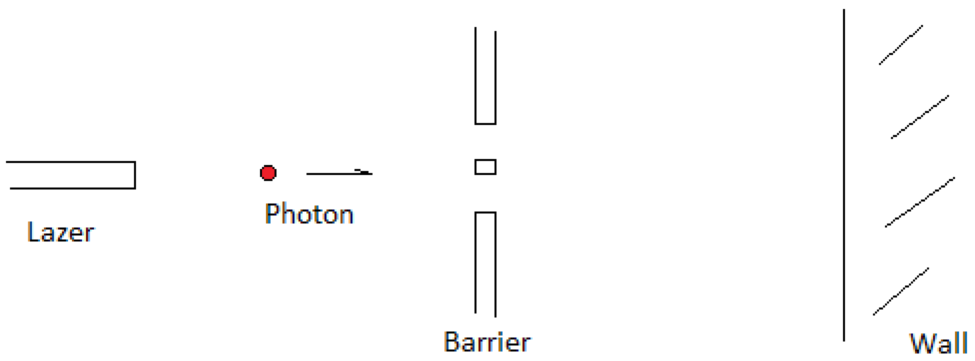
- Energetic particles take less direct paths through the aether because they are constantly knocked about by the interfering aether.
- Particles in the aether are pushed to the side by larger, more energetic, particles.

This allows for a pilot wave to build up around energetic particles. This pilot wave is comprised of low energy photons and neutrinos that travel along straighter paths than their more energetic counter parts. A wave front develops, similar to that in front of a ship moving through water.

Pilot waves are at their most intense in near vicinity of their host particle and diminish into nothing at a distance. This means that a host particle is never very far from the extremities of its pilot wave. However, relative to the tiny size of the host particle, pilot waves cover vast distances. This can be deduced from analysing the double slit experiment in light of this model.

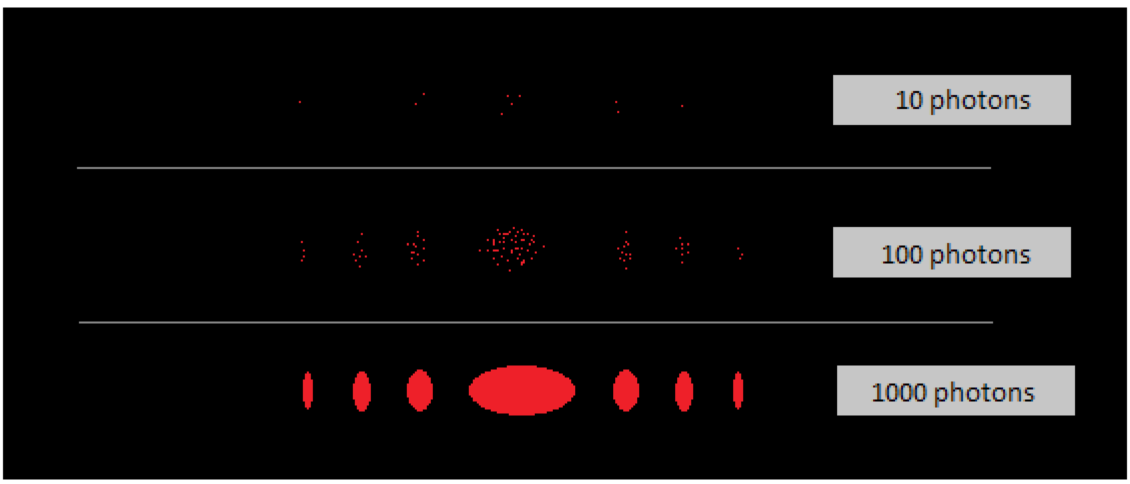
The double slit experiment

Consider the set-up of the double slit experiment:



Set-up of the double slit experiment

Now, consider what is registered on the light sensitive far wall as we pass one photon at the time through the barrier:



Building up an interference pattern

Each photon leaves a mark on the light sensitive wall, proving that photons manifest themselves as particles. At first, little can be seen of the interference pattern. However, for each additional photon passed through the barrier the pattern becomes more defined until it finally becomes a clear and undeniable wave pattern. Each photon must therefore have interfered with itself in some way.

Our explanation for this is that the pilot wave associated with each photon produces an interference pattern at the far side of the barrier as it cuts through both openings. This interference pattern alters the path of the photon in such a way that it can only reach certain areas of the far wall.

This is similar to what would happen if a boat were to pass through one of two adjacent openings into a bay. While the boat passes through only one of the openings, its pilot wave passes through both, creating an interference pattern in the waters inside the bay. The boat will thus experience self-interference similar to that experienced by a photon passing though a double slit barrier. Furthermore, a small boat will be more affected by self-interference than a big boat. This corresponds nicely to the difference in interference patterns produced by red and blue light. Red photons have less energy than blue photons. They are therefore smaller than blue photons. Hence, they are more affected by self-interference than blue photons. That's why red photons produce wider interference patterns than blue ones.

Keeping in mind that the two slits in the barrier of the double slit experiment can be far enough apart for us to be seen as separate lines with our naked eyes, it is clear that pilot waves are truly enormous relative to the particles that cause them. Photons are generally believed to be smaller than electrons, which are so small that we have never been able to see them, even with the most powerful microscope. The difference in size between particle and associated pilot wave is therefore in the orders of millions, if not more.

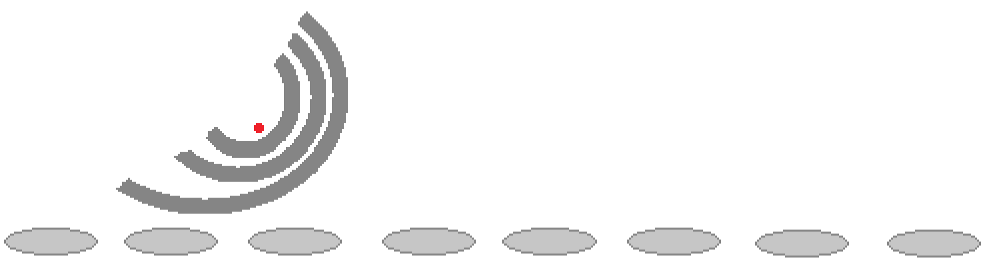
Optics

We have now reached a point where we can explain phenomena of optics in terms of our theory. The phenomena we will look into are reflection, polarization, refraction and diffraction:

Reflection

In one of his crime novels, Henry Berg makes the observation that there is something profoundly strange about mirrors. How is it that a surface made up of atoms can perfectly reflect photons that are smaller than even an electron? From the perspective of a photon, an atom is like a mountain. The surface of a mirror is anything but flat. Yet, all photons striking the mirror will leave at an equal and opposite angle, with no energy lost.

Using the physics laid out in this book, the answer to this riddle is that photons never strike the mirror. The pilot wave that accompanies every photon acts like a cushion, and it is off of this cushion that the photon bounces.



Photon with pilot wave striking a reflective surface of atoms

While photons are tiny, the pilot waves surrounding photons are much bigger than atoms. They can easily even out a tolerably smooth surface without upsetting their host particle. In this way, each photon sees a perfectly smooth cushion. It bounces off of this, unaffected by any underlying irregularity in the surface of the mirror.

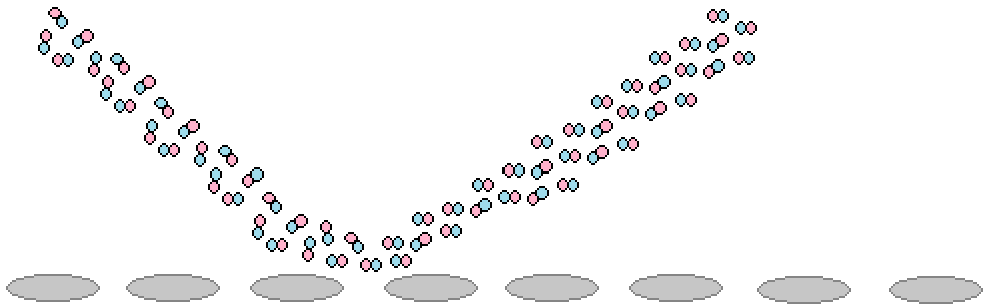
The phenomenon of reflection can in this way be seen as supporting evidence for the existence of pilot waves.

Polarization through reflection

Light reflecting off a mirror at an angle will end up polarized. This means that every photon must have some sort of axis along which it is oriented. Otherwise, no polarization is possible.

Combining this fact with what we have so far concluded about photons, we must further conclude that the pilot wave has the ability to orient photons when compressed against a reflecting surface.

The simplest possible explanation for this is that photons are like little sticks. When hit against the compressed cushions of their pilot waves, they end up aligning in parallel with the underlying surface.



Photons, passing from left to right, being polarized on reflection

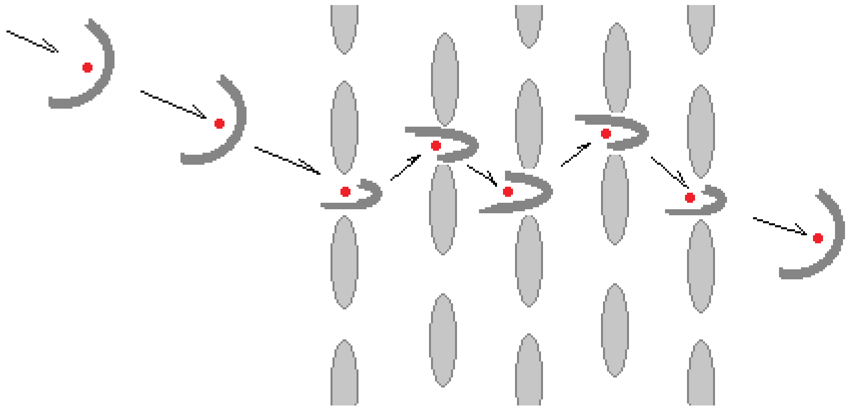
Note that the orientation of the aligned photons is random when polarized in this way. On average, there are just as many photons oriented left to right as right to left.

This fits well with what we have thus far concluded about the photon, namely that it is an assembly corresponding to an electron and a positron. Assuming that the arrangement of particle quanta in electrons and positrons are directly reflected in photons, we end up with a two orb model of the photon, making them in essence tiny sticks.

Transparent media

Henry Berg's observations about mirrors, apply just as much to transparent media. Without the help of pilot waves to smooth things out, photons would crash into electrons and atomic nuclei on their way through glass and water. Even air would be impossible to navigate. Photons would scatter all over the place, and their energies would be absorbed. However, once we include pilot waves into our physics, things become a lot easier to explain.

The presence of a pilot wave around every photon helps smooth out minor irregularities that would otherwise lead to scatter. The pilot wave acts like a dynamic cushion around each photon, guiding them through the atomic lattice of the transparent medium.



Pilot wave guiding a photon through the atomic lattice of a transparent medium

This process greatly distorts the shape of the pilot wave. It goes from being a fairly flat wave-front to an elongated sock-like shape. This process requires photons to have a minimum of energy. They have to be big enough to do this. Very small photons are too much affected by their pilot waves to assert this kind of control over them. As a result, low energy photons get reflected by glass.

On the other hand, high energy photons are so big that their pilot waves have too little control over them to get them through. High energy photons crash into atoms. They scatter, and their energies get absorbed.

This explains why glass is only transparent to photons in a certain range of energies. Glass is opaque to photons outside the visible spectrum, both to the high and low energy side.

Another thing to note is that the photons that are in the right energy interval for glass to let them through, all travel the same path. However, the smaller photons which are the most influenced by their pilot waves, travel in a more direct path than larger photons. Large photons veer off to the sides, almost smashing into things as they go, while small photons stay safely in the middle of their pilot wave cushion.

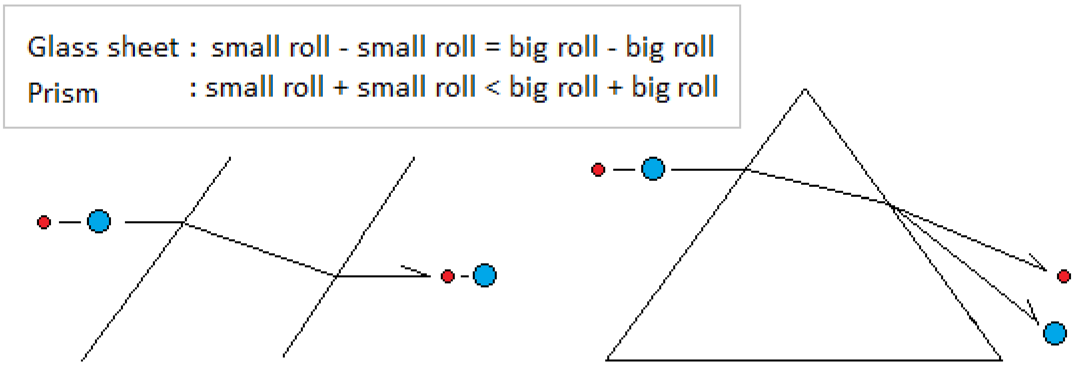
This is why small (red) photons get through transparent media in less time than large (blue) photons.

Finally, we should note that the path through the medium is in a different direction from the path through air. The density of atoms in the medium makes the overall path through it more acute than the path on entry and exit. This phenomenon is referred to as refraction, and the degree to which this happen is referred to as the refraction index.

To understand why a photon's angle of entry into a sheet of plane glass is exactly equal to its angle of exit, we must once again consider the pilot wave. In simple terms, we can say that the process of exit is an exact opposite of entry. Instead of being compressed, the pilot wave expands. The various parts that were compressed on entry expand in a complementary manner on exit.

However, this is only the case for plane glass, where entry and exit surfaces are in parallel with each other. In the case of a prism, where the surface met by the photon on entry has a different angle from the one met on exit, we get diffraction where photons not only change their direction, but do so to a lesser or greater degree depending on their energy.

While all photons refract to the exact same degree, red photons diffract less than blue photons because red photons make smaller rolls into glass, and hence smaller rolls out of glass than blue photons. This is of no consequence when the roll into glass is equal and opposite to the roll out of glass, as is the case with plane glass. However, when the roll into glass is anything but equal and opposite to the roll out of glass, we get a situation in which we have to add the initial roll to the final roll. All photons end up redirected, but with big photons redirected more than small photons.



Path of photons through a plane glass sheet compared to a prism

This does not only explain why prisms diffract white light into all its different colours while plane glass sheets don't diffract light in any way. It also explains the curious fact that diffraction of light happens in its entirety at exit from a prism. There is no diffraction going on inside the prism.

Inertial matter

Returning to our definition of the aether, we will now explain how inertial matter comes into existence, how this implies some fundamental limits to our ability to be precise, and how our notion of time and distances are inextricably linked to this stuff that we are made of.

Electron-positron pair production and the aether

Large energetic photons are not easily controlled by their pilot waves. As a consequence, they have a tendency to smash into things. Instead of meandering through atomic lattices or veering off in reflection, high energy photons move like bullets. If they hit something, they lose energy. If not, they pass through unaffected. This is how x-ray photography works, and why such photography is dangerous to our health when performed too often.

Most collisions end up in a transfer of energy from the high energy photon to whatever barrier it hits. However, in some cases this does not happen. The energy stays with the photon. Energy may even be added to it.

All of this is of no consequence as long as the photon continues to move at the speed prescribed by the aether. The photon remains a photon as long as it is able to do this. However, in cases where the photon is unable to fulfil this requirement something very dramatic happens. The photon is stopped dead in its trajectory, and popped into an electron-positron pair.

This transformation has some notable aspects:

- There is a dramatic slow down in speed
- Non-inertial matter is turned into inertial matter that can move at variable speeds
- Big difference in size between photon and resulting matter
- No known intermediary state (its an either or situation)

Leaving the issue of inertia and what that is for later, we will now proceed to explain the above list in terms of our theory:

First of all, we must keep in mind that the aether is extremely dense. It is impossible for a photon to move at an independent speed due to this fact. Anything that is of the same kind as the aether must move at the speed dictated by the aether. Unable to move at the prescribed speed, a photon has to become something other than a photon.

The only way something can move freely within the constraints of the aether is by letting the aether travel freely trough itself. There is no intermediate state in this. Either the aether moves freely through a thing, or the thing in question moves as prescribed by the aether. It follows from this that inertial matter moves freely because it lets the aether move freely through itself.

This explains the difference in size between photons and inertial matter. Particles of inertial matter are necessarily balloon-like nets relative to photons and neutrinos. Particle quanta must therefore have the ability to expand into relatively huge nets if required. It seems then, that our particle quanta may in fact be little bundles of strings.

Finally, we can explain the dramatic slow down in speed as a consequence of the transformation process. Photons move at a fixed speed due to the surrounding aether, which will hammer against any photon or neutrino that deviate from the prescribed speed. However, once the aether's margin of tolerance is breached, what used to spur particles on becomes a wall of resistance. The disobedient particle is bombarded from all sides. It becomes completely locked into position, and it is only on completion of its transition from a compact particle into a pair of net-like balloons that things are again allowed to move.

This explains why photons must pop when stopped by a barrier. They cannot remain in an in-between state. They must either be photons, moving at the speed of light as they pass through the aether, or become electrons and positrons through which the aether can move unhindered.

Minimum sizes and uncertainties

Before we go on to explain the phenomenon of inertia, let us first relate our theoretical framework concerning distances and time to the real world we live in.

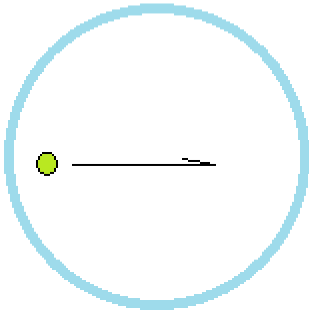
The first thing to note is that we, and everything we directly interact with, are made up of inertial matter. This has consequences when it comes to how we measure things, not because of any technological shortcomings, but because of real world limits.

Suppose we want to measure distance. To do this, we will need a ruler. Such a ruler must naturally be made of inertial matter. Otherwise, it would be flying about at the speed of light. The smallest possible bit of stable inertial matter that we can use as a ruler, at least in theory, is therefore the electron. Noting that the electron is a balloon-like net, it does not have a stable cross-section, even if well inflated. The most reliable measure we can use is therefore its circumference.

To measure time as precisely as theoretically possible, we take the electron, and define a tick of our super-precise clock as the time it takes a photon to traverse its circumference. The reason we cannot arbitrarily choose a shorter distance is that our clock must necessarily register the tick. Something physical has to happen to the electron. It has to go from one state to another. For this to happen, energy has to be moved into or out of the electron. Either way, the process involves photons and the entirety of the electron.

We now have our real world unit length and unit time, corresponding to the theoretical unit length and unit time described in the introduction. No distance shorter than 1 unit length can ever be measured with certainty. Similarly, no time shorter than 1 unit time can ever be pinned down. Our unit distance and unit time are:

- 1 unit distance = the circumference of an electron
- 1 unit time = 1 unit distance / speed of light



Photon traversing the circumference of an electron

In our physical existence, there is a limit to how precise we can be. There is therefore an inescapable uncertainty related to everything. Since we have no way of pinning down exactly where and when things happen, we cannot make any predictions with absolute precision.

Furthermore, things that happen faster than 1 unit time, cannot be registered in any way as being anything but instantaneous. No matter how we try to measure such super-fast events, we will end up with missing information about the state of things between each tick of our clock. Such events will appear as being one moment in one state and the other moment in a different state. This does not mean that nothing takes place in the intermediate time. It only means that whatever takes place cannot in any way be properly measured or registered. While it is possible to spot an intermediate state, quite by chance, such states cannot be reliably interpreted. They will be indistinguishable from random noise.

On a final note, we must at all times keep in mind that the unit length and unit time described here are real physical entities, with real physical implications. All forces and energies are implicated by this. When we later in this book start to investigate phenomena related to time and space, it is important to remember that there is no difference between measured time and physical time. If our unit time speeds up or slows down relative to other clocks in other locations, we're dealing with different realities, all adhering to the same physical laws, but observably different from one vantage-point to another.

Kinetics

The laws of motion have been well defined ever since Newton wrote his book on physics almost 400 years ago. Very little was left to describe after that. However, Newton never proposed a physical model for what was going on. His physics is entirely mathematical. No underlying mechanics is explained. He left this intentionally for others to explore.

Taking up Newton's challenge, we will now investigate various phenomena related to motion and relate them back to our model. To do this, we will address the electron as our fundamental particle of inertial mass. Our macro world analogy for the electron will be the steel ball. Since we have as one of our premises that what's going on at the subatomic is a direct reflection of what's going on at the macro level, our steel ball analogy should be a very good fit for the electron.

With this in mind, let's investigate the laws of motion in light of our model where everything has to be explained in terms of particles with 3 dimensions, size and texture:

Pressures, tensions and impulses

Starting with our steel ball, we note that it does not move if we put it carefully on a plane tabletop. To make it move, we have to apply force to it, and the force has to be applied unevenly. There has to be a net direction to the force. If evenly applied, there's pressure or tension in the ball, but no motion. Any energy passed onto the ball is immediately lost when force is evenly released after first having been evenly applied. However, when applied unevenly, the results is both linear motion and an increase in energy.

From observations, we reach two conclusions:

- Force has to be unevenly applied for an object to absorb energy.
- Motion caused in this manner is always in the direction of force.

This can be explained in terms of our theory as follows:

1. An impulse applied to a steel ball will result in a pressure wave, progressing through the ball.
2. When the pressure wave reaches the far end of the steel ball, the ball expands by a tiny bit.
3. The pressure wave returns to restore the shape of the ball.
4. The shape is restored, but not its size.
5. The new centre of mass is a tiny bit to the far end of the ball.
6. To restore its shape, the ball moves in the direction of the new centre of mass.
7. Without any new impulse, the ball continues in its new state, slightly larger and moving in the direction of the impulse that set it going.

This explanation is based on the idea that all particles will by their nature return to their original shape. We offer no explanation for this tendency. However, we can point out that the optimal ratio between surface area and volume is a sphere. There is therefore a good mathematical explanation for our axiom.

Time and inertia

Bringing this argument down to the electron, we note that the complete process of adding energy to the electron involves a pressure wave that has to first traverse its surface from one end to the other, and then return back to the point of the original impulse in order to restore its shape.

Assuming that the pressure wave moves at the speed of light, we note that it takes one half unit time to make the forward journey. The return journey takes another half unit time. This means that it always takes one unit time to complete an energy transfer onto or off of an electron. Our unit time is in other words something more than mere convention. It is tied directly to energy transfers in the real world. Measured time and physical time is one and the same thing.

Inertia can also be explained. It is the time-delay between impulse and completed energy transfer. This time-delay is very small for an electron, and very little energy is required. However, for a steel ball the process has to involve all its constituent particles in order to complete. This requires more time. More energy is also required because there are more particles over which to distribute the energy. Inertia is more noticeable. In the case of trucks, ships and air-crafts, inertia becomes very noticeable.

Inertia is generally thought of as exclusively confined to inertial matter because photons and neutrinos never change their speed. However, photons and neutrinos can and do change their direction, and we have already concluded that this happens reluctantly. Large photons veer off to the side on their meandering trajectory through glass. This is for the exact same reason that steel balls do so when rolling down a curvy slide. We can therefore conclude that inertia is not strictly confined to inertial matter. Rather, inertial matter exhibit this phenomenon more fully due to its ability to move freely and unhindered by the aether. Since a change in direction can happen without any energy being added or subtracted, we note that inertia is not only a matter of energy transfers.

There is something else going on as well.

Pilot waves as memory

Returning to the steel ball that we have just set in motion with an impulse, we see that it is again in a rest state. It is slightly larger as it moves at a steady speed in the direction of the impulse. It has more energy. To speed it up further, another impulse has to be given in the same direction as the first one. To slow it down, stop it, or reverse the direction of motion, an impulse must be given in the other direction. But how does the ball know whether the next impulse is adding to or subtracting from its energy? Where is the memory of the prior impulse stored?

The answer to this is that the local reference frame, in combination with pilot waves, constitute memory. Every particle in the ball has a pilot wave associated with it which directly reflects the direction of motion. When an impulse is in the direction of the associated pilot waves, it adds energy. When an impulse is in the opposite direction, it subtracts. If sufficiently forceful, the impulse stops the ball, or reverses its direction.

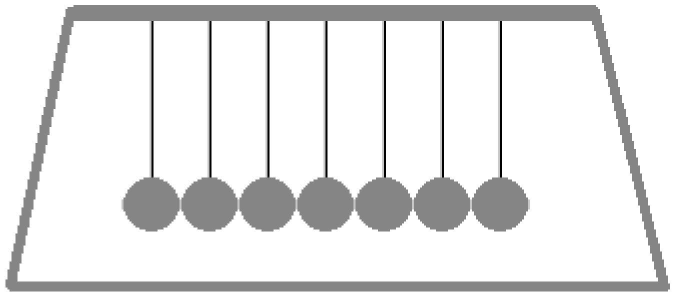
If the second impulse is of identical force and of opposite direction to the first one, we get the following sequence of events:

1. The impulse result in a pressure wave, progressing through the ball in the opposite direction of motion.
2. When the pressure wave reaches the far end of the steel ball, the ball expands by a tiny bit.
3. The pressure wave returns to restore the shape of the ball.
4. The shape is restored, but not its size. The associated pilot waves have compressed the ball.
5. The new centre of mass is a tiny bit to the far end of the ball, opposite to the direction of motion.
6. To restore its shape, the ball moves in the direction of the new centre of mass. This motion cancels out the motion caused by the first impulse.
7. Without any new impulse, the ball continues in its new state, at rest and restored to its original size.

If the second impulse is less than the first one, the ball slows down without stopping. If greater than the first impulse, the ball reverses direction. The mechanism is the same in all cases. The differences in outcomes depend on the degree to which the impulses influence the ball and associated pilot waves.

Newton's cradle

We can now explain Newton's cradle in terms of our theory:



Newton's cradle

In this set-up, we have seven steel balls suspended by strings from a steel frame. The balls are in contact with each other, but just barely.

If we swing the left ball up to the left and let it go, it swings down. When it knocks into the second ball, the rightmost ball swings up before coming down again. When the rightmost ball knocks into its neighbour, the leftmost ball swings up. The five balls between the outer left and outer right balls don't move.

If we move the two leftmost balls up to repeat the experiment, but with two balls instead of one, we see that the two rightmost balls move up in response to the collision. The three balls in the middle remain stationary. Doing the experiment with three balls ends up with only the middle one remaining stationary.

In all three cases, we have a situation in which the balls acts as if they were a single pendulum. However, there is a tiny delay between the moment of impact and the response at the other side of the set-up. The bigger and heavier the balls, the more noticeable is the delay.

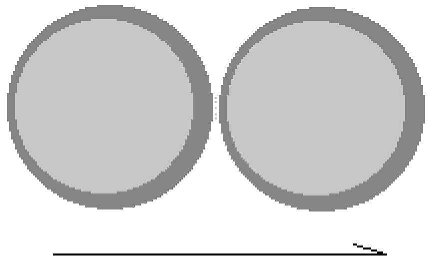
From our theory, this time-delay is inertia. Energy is propagated through the set-up, and this takes time.

As for the transfer of motion from one ball to the other, we have the following explanation:

The incoming ball is a tiny bit bigger than the other balls. It has more energy. When it hits its immediate neighbour, the effect is twofold:

- The ball in motion receives an impulse from the stationary ball. This impulse is in the opposite direction of its motion. From our theory, we have that it becomes smaller, with a shift of its centre of mass opposite to its motion.
- The stationary ball receives an equal and opposite impulse from the ball in motion. It becomes slightly larger, with a shift of its centre of mass in the direction of the impulse received.

The differences in sizes are too small to be measured. However, this happens so quickly that it has the effect of stopping the moving ball and starting the stationary ball. We have the following picture, grossly exaggerated for the purpose of illustration:



Left ball hitting the right ball

Before impact, the left ball is in motion. It has the full size of both shades of grey. The right ball is stationary. It is only the size of the light grey shade. After impact, the right ball has the full size, while the left ball is reduced to the size of its light grey area. The left ball has its centre of mass moved sufficiently to the left to make it stop. The right ball has its centre of mass moved sufficiently to the right to take on all the energy and motion of the left ball.

This transfer of size progresses through the train of balls like a pressure wave until the final ball is reached. This final ball progresses in the direction of impact, swings up to the right before coming back down to repeat the process from the opposite direction.

For two or three balls, the same logic applies. However, there is in these cases a train of energetic balls that send a train of shock waves through the set-up. When this train reaches the other end, two or three balls are set moving, depending on how many were swung in from the other side.

It should be noted that Newton's cradle is an idealized system in which every ball is equal to every other ball. This set-up allows for perfect energy transfers. All the energy of an incoming ball is yielded to the next. In all other cases, less than all energy is yielded. In cases where there is a great difference in mass between elastic objects, hardly any energy is transferred between them.

Massive objects will continue to move, despite crashing into a multitude of smaller objects. Small objects will bounce off big ones, with hardly any change to their energy as they do so. This explains why a bullet can be shot through air with very little loss of energy, despite displacing volumes of air that add up to many times the weight of the bullet itself.

This too is due to inertia. Small elastic objects are simply too quick. They bounce off of bigger objects before much of any energy has been transferred. Conversely, large elastic objects are too slow to yield much of any energy to smaller objects that they knock into.

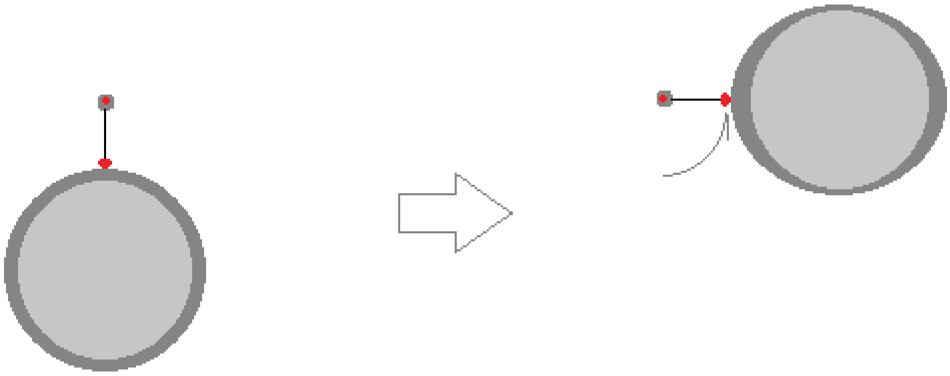
Angular acceleration

Our examples so far have pertained to impulses. We have seen that changes in motion have been accompanied by changes in energy. However, not all changes in motion correspond to changes in energy. An example of this is angular acceleration.

Unlike linear acceleration, angular acceleration requires no supply of energy. Why this is so is not self evident, because both types of acceleration include applied pressure or tension over time. However, by consulting our initial analysis of how pressure and tensions act to transfer energy onto an object, we find the explanation for the difference.

In the case of angular acceleration, force is applied evenly. This is in contrast to linear acceleration, where force is applied unevenly. From prior analysis, we know that transfer of energy requires uneven application of force. Therefore, no energy can be transferred through angular acceleration. We get tension or pressure, but no change in energy.

This can be illustrated as follows, again grossly exaggerated for the purpose of illustration:

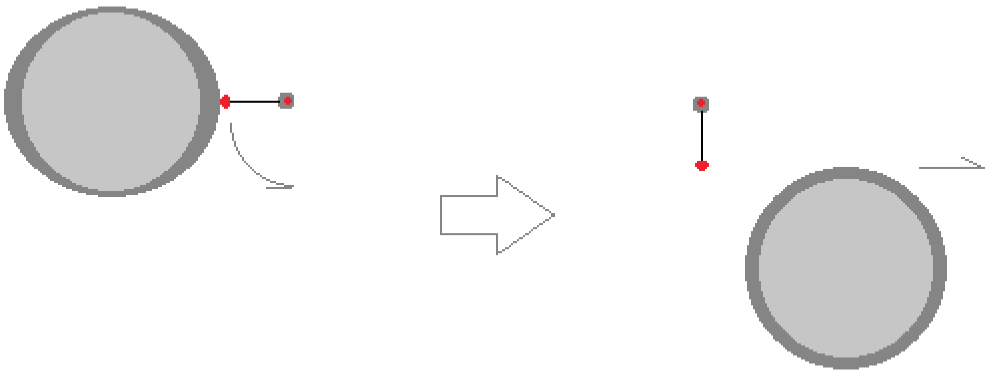


Angular acceleration

1. A steel ball moves from left to right with no force applied to it, until an anchor connected to a frictionless pivot, is attached to it.
2. This induces an evenly distributed tension throughout the ball.
3. Unless released from the pivot, and with no friction anywhere, the ball spins around the pivot point in a permanently tense state.

Angular acceleration requires a continuous redirection of associated pilot waves. This requires no energy, only tension. Hence the permanently tense state with no transfer of energy. Note that this too takes time. This too is inertia.

If we subsequently cut the wire, the tension is relieved as evenly as it was induced. Again, there's no transfer of energy. The body continues in a straight line perpendicular to the prior anchor point:



Continued forward motion after cutting the wire

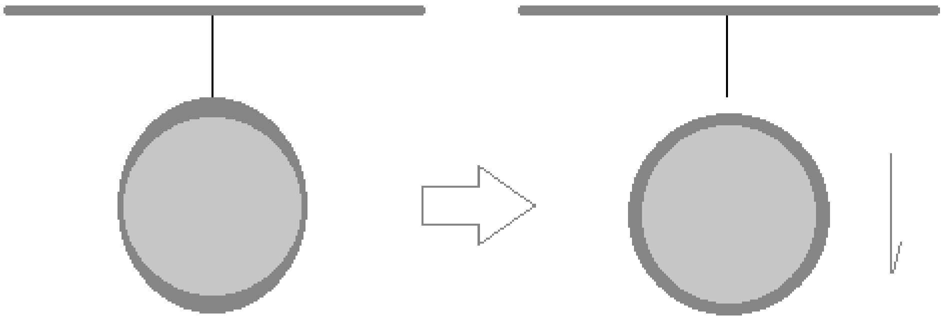
Note that the dual bulging during rotation is equivalent to what Earth experiences under the influence of gravity from the Sun and the Moon. The joint forces of the Sun and the Moon induce angular momentum that manifests itself as two tidal bulges, one on each side of our planet. This is no coincidence. This dual bulging in response to angular acceleration happens at all levels, from the cosmic, and right down to the subatomic.

Free-falling objects

Free-falling objects represent another example of acceleration with no accompanying change in energy. This can best be understood in terms of an example:

Let us first consider a steel ball at rest on a floor of wet sand. To suspend it from a beam directly above this floor, we push the ball up. This process involves uneven pressure and therefore some distortion to the ball. Energy is transferred from us to the ball.

When we attach the ball by wire to the beam, we get a situation as follows, again grossly exaggerated for the purpose of illustration:



Suspended steel ball before and after the wire is cut

There is tension in the ball as it hangs from the beam. However, the tension is equally distributed. No energy is being transferred. Things are merely distorted.

The energy we added to the ball as we lifted it up is illustrated as a dark grey area. This energy equals the potential difference between the situation on the floor and the situation when the ball hangs above the floor. In the real world, of course, there's no segregation between this potential energy and the rest of the ball. Energy does not come in different flavours. All energy is size. When we talk about the difference between potential and kinetic energy it is purely for calculation purposes. The fact that we can calculate the exact amount of energy that can and will be transferred to the wet sand once we cut the wire does not mean that reality operates with different types of energies.

When the wire is cut, there's no longer any tension in the ball. The release happens evenly. There's no transfer of energy. The ball is not in any way distorted as it falls, so no energy can be passed onto or off of it in the process.

Energy in the ball remains constant until it hits the floor. The entirety of the energy we pushed into the ball in order to attach it to the beam is released as a displacement of the wet sand.

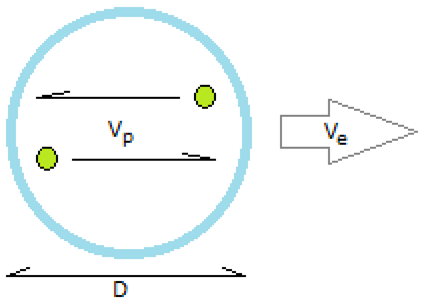
It should be noted that this logic applies to all field forces, be it electrical, gravitational or magnetic. In cases where acceleration happens without distortion, no energy is added or removed. What exactly causes this type of acceleration will be explained later in this book.

Speed limit of inertial matter

Sustained forward acceleration by impulse requires a sustained force. The object under acceleration must be continuously distorted in such a way that its centre of mass is continuously moved forward relative to its former self. It grows over time. However, it will never grow by much. It will hit quite a different problem long before it becomes significantly bigger than its original self.

As an object speeds up, the forward pressure wave of an energy impulse slows down. When an object is close to the speed of light, the forward impulse is reduced to almost a standstill. This is because the pressure wave moves with the aether. The forward motion of the object must be subtracted from the speed of the aether to arrive at the speed of the pressure wave. This is the same calculation that we do in order to calculate the speed of the aether inside the object.

At speeds very close to the speed of light, the time required to transport energy onto the object under acceleration goes to infinity. No matter how hard we push, the object never reaches light speed, because the final energy transfer required will never complete. This can be calculated as follows:



D = dimension of particle

V_p = speed of photon

V_e = speed of particle

$$T = \frac{D}{V_p + V_e} + \frac{D}{V_p - V_e}$$

T = Time required for a photon to traverse a particle

Time required to push energy onto a particle

The time required to push energy onto a particle is the sum of the time required to produce the forward pressure wave and the time required to produce the returning pressure wave. Only when this whole process is completed do we have a complete transfer of energy.

This process involves the speed of the aether relative to the particle, which is calculated by subtracting the speed of the particle for the forward pressure wave, and adding the speed of the particle to the return pressure wave. The time required for the forward pressure wave to complete will tend towards infinity as the speed of the particle gets closer to light speed.

This applies to all particles of inertial matter, including the electron. Observed from outside, the unit time of a speeding electron is more sluggish than our local time. Furthermore, time inside the electron is equally slow.

Scaling this up to a spaceship moving close to the speed of light relative to its outside reference frame, we will notice a dramatic slow down of all activities inside the spaceship as we look in. However, astronauts on the inside see no change in anything. When they check their clocks and rulers, everything is as it has always been. One unit time is still the time it takes a photon to move around the circumference of an electron. What they cannot in any way detect inside their spaceship is the fact that the aether has slowed down. It is only when they look out into the surrounding space that they see that something dramatic has happened. Everything outside their local reference frame moves about at a frantic pace.

Relative motion and light

The clocks onboard the spaceship move slower than outside. All energy transfers happen at a slower rate. Time itself has slowed down. However, it's not only the speed of things that are different inside and outside the spaceship. The astronauts onboard the spaceship notice that light from all directions is bluer than normal, except for light coming into their spaceship directly from behind.

Outside observers, on the other hand, see all light emanating from the spaceship as redder than normal, with the only exception being light coming directly from the front of the spaceship.

Using our heat analogy mentioned earlier, we can say that the aether inside the spaceship is cold relative to the aether outside. A photon coming into the spaceship from the front comes in hot. It has to slow down in order to conform to the much colder aether inside.

This applies to all photons coming into the spaceship from outside, with the sole exception being photons coming in from behind. Photons coming in from that direction require no slowing down to adapt to the cold aether. This is because the speed of the aether outside the spaceship is exactly equal to the speed of the spaceship plus the speed of the aether inside the spaceship. When a photon comes in from behind, we have to subtract the speed of the spaceship to get its new speed inside the spaceship. This new speed, is exactly the same speed as the aether inside, so no slowing down is required.

Conversely, viewed from outside, it is only photons coming out of the spaceship to the front that require no speeding up. In all other directions, photons have to speed up in order to conform to the hotter aether on the outside. Photons coming out of the spaceship comes out cold relative to the outside aether.

Now, we have to propose a rule in order to progress with our analysis. We're not yet in a position to explain this rule so we have to consider it one of our axioms for now. This rule goes as follows:

- When photons have to slow down, they become correspondingly bluer.
- When photons have to speed up, they become correspondingly redder.

This means that our astronauts see light entering their spaceship from the front as bluer than normal. Turning towards the back of their ship, they see outside light progressively less blue until all blue-shift disappears straight out to the back.

Conversely, outside observers see no red-shift in light coming out from the front of the spaceship. However, light coming out of it is increasingly red-shifted as we shift our vantage point towards the back of the spaceship.

We can conclude that relative motions cause red-shifts and blue-shifts. This conforms to Einstein's conclusion, but not in the same way. Our interpretation is based on motion relative to an outside reference frame that can be viewed as static. Einstein doesn't do this. Using Einstein's solution, we get red-shift as something exclusively associated with receding objects. This is different from our solution, which yields red-shift for any object moving faster than the observer relative to a common outside reference frame. Red-shifts are in our case signs of relative speeds. All speeding objects become red-shifted as long as they're not moving right at the observer.

This has some interesting cosmological consequences. The relative abundance of red-shift we observe in the universe may not be a sign of expansion. It may simply mean that we live on a planet that is at relative rest compared to our external reference frame. Most other objects around us are moving faster than us. Only those moving slower come with blue-shifted light.

Electron orbits

We are now in a position to propose an alternative to the accepted idea that electrons hover mysteriously above atomic nuclei. In our physics, where everything happens through direct kinetic interaction, we suggest that electrons do not hover. They bounce:

The bouncing electron

Returning to the phenomenon of free neutron decay, we can make some further observations and interpretations. First of all, we can make the educated guess that the neutrino accompanying the electron comes from within the proton. A proton is a large bloated net. There is aether inside of it.

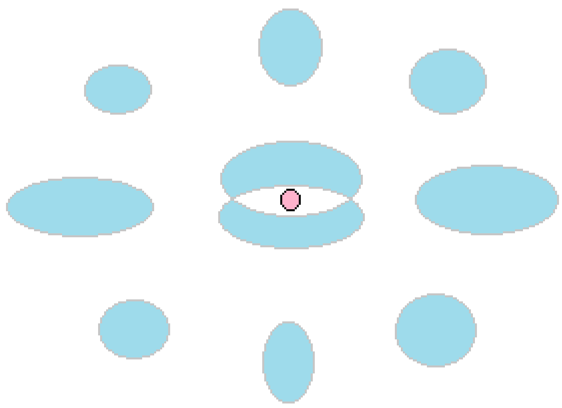
A neutron is a proton with an electron stuck to it due to natural affinity. The mostly abrasive texture of protons stick to the mostly woolly texture of electrons. To free the electron from the proton, a random high energy neutrino has to knock the electron loose from the proton. To do so successfully, it is best if this happens from inside the proton rather than at an angle.

From this we can further conclude that the affinity between protons and electrons is relatively weak. A proton cannot hold onto an electron for very long, and it's close to impossible to attach an electron to a proton. If a stray electron bumps into a proton, it will bounce rather than stick. If the bounce is energetic enough, the stray electron continues its journey, leaving the proton behind. However, if the bounce is too weak to escape the electric field of the proton, the electron comes down again for a second bounce. Unable to escape the electric field, and equally unable to stick to the proton, the stray electron becomes a captive of the proton. Without any added energy, it is stuck bouncing up and down on the proton. This logic goes for all atomic nuclei because all atomic nuclei carry positive charge. They are all largely abrasive.

Keeping in mind that protons are like inflated balloons, and atomic nuclei are known to be assemblies of such balloons, we get that every atomic nuclei has a resonant frequency. This means that any electron captured by an atomic nucleus must bounce at harmonics corresponding to the nucleus' resonant frequency. Any deviation will be forced back into harmony. Electrons at their lowest energy, bounce at the resonant frequency of the atomic nucleus. For every vibration of the nucleus, the electron makes a bounce. The next energy level is at the next harmonic, allowing the nucleus to vibrate twice for every bounce. Then we have the next level, where the nucleus vibrates three times for each bounce, and so on until we reach escape velocity.

This explains the fact that captured electrons come in discrete energy levels, and why these energy levels are different for different atomic nuclei. It also explains why captured electrons are more likely to be found in certain regions of space relative to the nucleus than other regions.

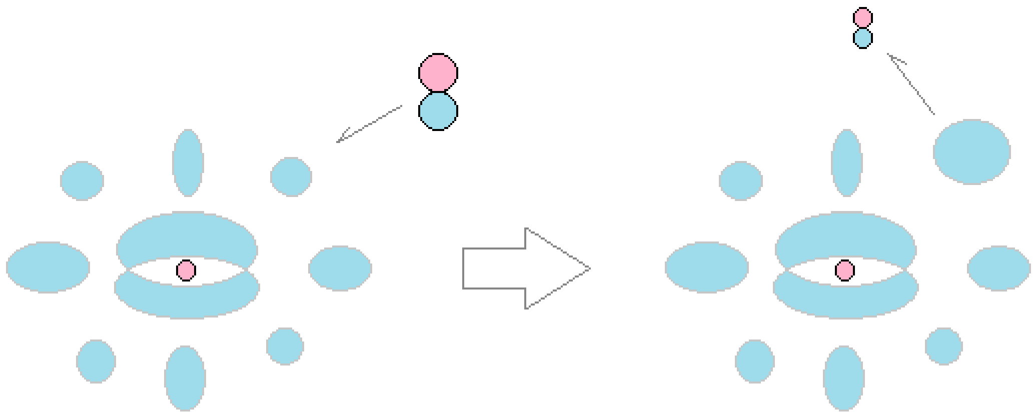
For atoms with more than two protons in their nuclei, there is not enough room for all of the electrons to bounce directly off the nucleus. Only two electrons can do this. Additional electrons bounce off of the repelling electric field that exist between electrons. These electrons are attracted by the nucleus, but repelled by their fellow electrons. What we get is an atomic nucleus with electrons neatly spaced out in various regions so that every electron is as close as possible to the atomic nucleus and at the same time as far as possible away from their fellow electrons.



Atomic nucleus with net charge of 10, surrounded by 10 bouncing electrons = Neon

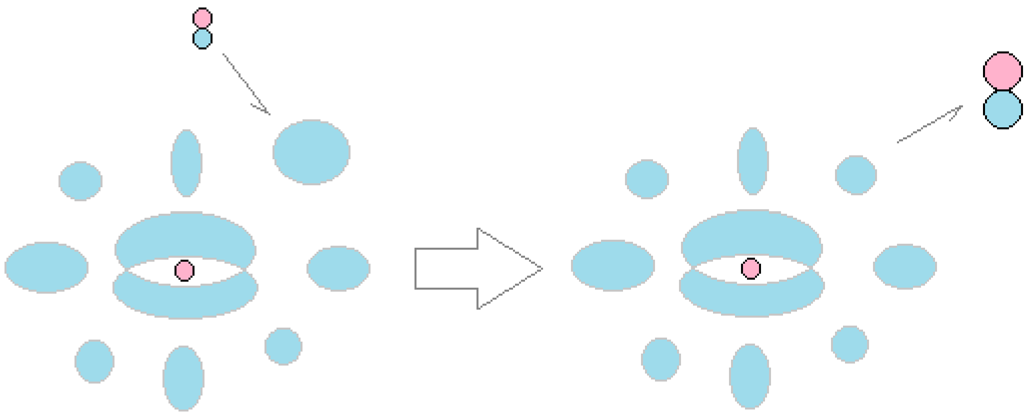
Every electron bounces about with a frequency dictated by the atomic nucleus. The inner two electrons bounce directly off of the nucleus. The outer electrons bounce off the electric fields of the electrons closer to the nucleus. Together, this forms a perfectly harmonic structure, capable of absorbing end releasing energy in discrete quanta.

A high energy particle that crashes into one of the bouncing electrons will transmit energy to the electron. If the energy transmitted is a little too much, the stray jacket of allowed harmonics will force the superfluous energy into the nucleus and aether. The electron will go up any number of energy levels, depending on how much energy is transferred from the particle to the electron.



Neon absorbing energy from an energetic photon

When the energetic electron at some later time knocks into a low energy photon, everywhere available in the aether, the opposite happens.



Neon yielding energy to a low energy photon, thus producing light

The photon is kicked up in energy by the energetic electron, which then returns to its low energy state.

This is how neon lighting works. However, this is not the only way light can be produced. White light is produced differently. White light contains all sorts of energies. Electrons producing white light are therefore randomly yielding energy to photons. This is very different from pure neon light, which only comes in very narrow and well defined energy spectra.

All of this fits well with the pure particle model proposed in this book. However, it leaves us with one burning question. What on earth is this electric force that makes it possible for atomic nuclei to pull on electrons at a distance?

The electric force

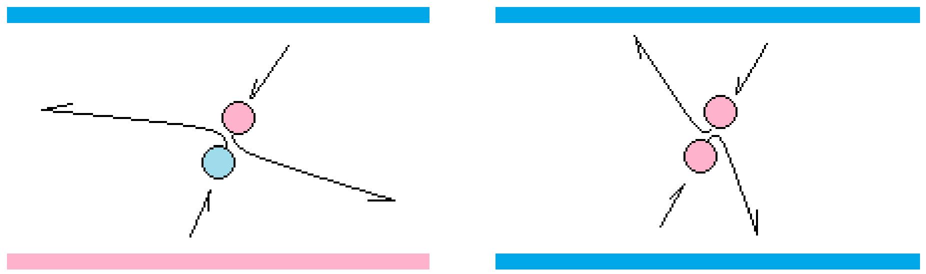
To understand the electric force, gravity and magnetism, we must return to our definition of the aether, because it is the aether that makes action at a distance possible.

We have to keep in mind that the aether is so dense that every particle in it is in physical contact with every neighbouring particle. This means that if we can manipulate the aether between two surfaces in such a way that some of its particles leave this field, we get tension, forcing the surfaces together. Conversely, if we can manipulate the aether in such a way that particles get sucked into this field, there will be pressure, forcing the surfaces apart. Unless we re-establish equilibrium, there will be tension or pressure, depending on the situation.

Let us further consider what we have said about textures of particles, and the fact that neutrinos are of mixed texture. Neutrinos receive footprints of whatever surface they were last in contact with. This is information that neutrinos take with them as they return back into the field.

Now, consider what happens when a neutrino with a woolly footprint comes in contact with a neutrino with an abrasive footprint. There is a degree of affinity between the two neutrinos. They latch on to each other. On the other hand, if two neutrinos of identical texture collide, there is no affinity. This means that collisions between equally charged neutrinos are different from collisions of differently charged neutrinos. In fact, we can make the following claim based on observation:

Neutrinos of opposite charge collide in such a way that they have a tendency to leave the field, while neutrinos of identical charge collide in such a way that they have a tendency to stay in the field.



Collision of differently charged neutrinos compared to collision of equally charged neutrinos

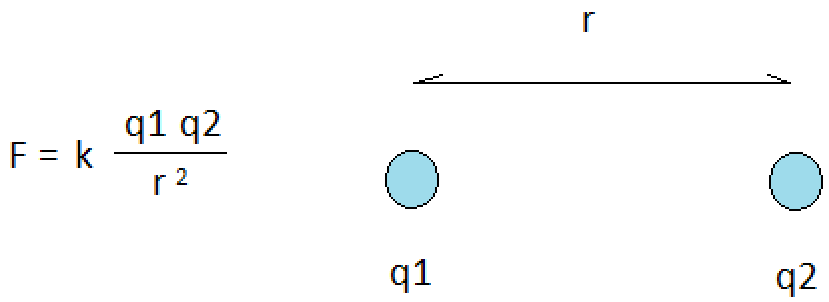
With this model, we have an explanation for why surfaces of opposite charge attract each other, while surfaces of same charge repel each other. It all boils down to the neutrinos in the aether and how they tend to leave the field when differently charged, and stay in the field when equally charged.

A consequence of this is that there must be electric pressure inside electrons and protons. The walls inside electrons are predominantly negatively charged, and the walls inside protons are predominantly positively charged. In both cases we have a situation in which neutrinos will tend to stay inside. This makes electrons and protons more like inflated balls than saggy balloons. It makes them bouncy, as required for the bouncing electron hypothesis.

On a final note, the relationship between the aether and what we call space should not be forgotten. Space is a void filled with aether. When we manipulate the aether, we are in fact manipulating space itself.

Coulomb's law as availability, probability and geometry

Let us now consider Coulomb's law to see if we can arrive at this ourselves by simply applying what we have discussed so far.



Coulomb's law

Coulomb's law states that the force of attraction or repulsion between two point charges, q1 and q2, can be calculated from the strength of the charges themselves, the distance separating them, r, and a constant k. The formula states that the force F equals k multiplied by the product of q1 and q2, divided by the square of r.

This can be related to our theory as follows:

1. Let k represent the general availability of neutrinos in the aether.
2. Let q1 and q2 represent the probability of collisions between charged neutrinos.
3. Let r represent the diminishing chance of collisions with distance.

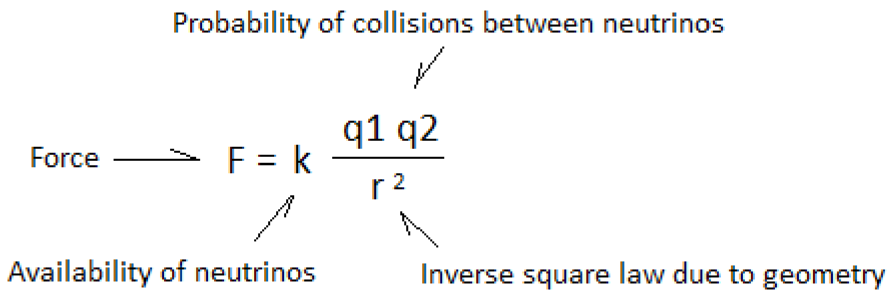
While point 1 requires no further explanation, we need to explain point 2 and 3. It is not immediately clear why q1 should be multiplied by q2, nor why r should be squared.

When it comes to q1 and q2, we have to keep in mind that footprints left on neutrinos are directly related to the charge on the point charges. Q1 and q2 are therefore proxy values for how full the aether is of charged neutrinos.

Furthermore, we have to recognize that collisions are probabilistic events. Such events are calculated using multiplication. When we are talking about very large numbers of collisions, the way we calculate the grand total is also by multiplication. Q1 must therefore be multiplied by q2 in order to give us a value reflecting the overall total of collisions.

When it comes to the distance r, we have to recognize that charged neutrinos are more densely distributed close to the point charges, and that this distribution tapers off by the square of the distance. This is the inverse square law, which can be derived directly from geometry.

From this, we can now calculate the overall number of neutrino collisions by multiplying k with the product of q1 and q2, divided by the square of r. Keeping in mind that it is neutrino collisions that produce force by pumping aether into or out of the field between charges, we have arrived at Coulomb's law:



Coulomb's law explained

From this it is clear that it is possible to see Coulomb's law as an expression related to the aether and the probability of collisions happening in it.

We can also conclude that Coulomb's law must break down at extremely short distances, such as those found inside atoms. This is because this law relates to collisions in the aether. When the distance between two point charges goes to zero, the number of neutrinos between them go to zero as well.

This explains why electrons are only loosely attracted to atomic nuclei when they are in physical contact. With no aether to provide an electric force between the two particles, there's only their respective textures that keep them together.

For Coulomb's law to work according to formula, charges must be separated by a minimum distance, and it is this fact that allows an electron at rest on an atomic nucleus to move sufficiently high to start bouncing. The electric force at the surface of a charged particle is not infinite or close to infinite, it's zero. Very close to the surface it's near zero. Then the force quickly peeks before tapering off with distance according to the inverse square law. Only then does things behave fully according to Coulomb's law.

In a pure particle model where everything, including space comes in discrete quanta, conventional formulas tend to break down at extremely small scales. This is because most formulas model reality as a continuous whole, while pure particle models see reality as something composed of discrete quanta.

Gravity

On closer inspection of our theory of the electric force, we discover that there are in fact more than two types of collisions taking place between neutrinos in the aether. We have:

1. Abrasive with woolly collisions
2. Abrasive with abrasive collisions
3. Woolly with woolly collisions

The effect of the two last types are almost identical. However, there is a tiny difference due to the fact that abrasive surfaces interact ever so slightly with other abrasive surfaces.

A consequence of this is that the repelling force between two positively charged surfaces is a tiny bit stronger than the repelling force between negatively charged surfaces. (Remember, neutrinos carry footprints of opposite charge to what they have last interacted with.)

When we add up all the different types of collisions between two neutral bodies, we get that repulsion comes out a tiny bit less strong than attraction. We end up with a tiny attracting force.

Since neutrinos are so small that they easily pass through entire planets and stars, they carry information, not only from their surfaces, but from their entire bodies. The grand total of information-carrying neutrinos from such bodies is truly gigantic, so even a tiny discrepancy between attraction and repulsion adds up to a considerable force.

This force, which we have arrived at purely on basis of theory, is what we call gravity. Gravity is due to a tiny imbalance in the electric force, and that's why Newton's universal law of gravity looks so much like Coulomb's law:

Net charge

$$F = k \frac{q1\ q2}{r^2}$$

Coulomb's Law

Total charge

$$F = G \frac{M1\ M2}{r^2}$$

Newton's Universal Law of gravity

Coulomb's law compared to Newton's law

Coulomb's law ignores the tiny discrepancy between electric attraction and electric repulsion, and for good reasons. The discrepancy is in the order of a trillionth of a trillionth. Newton's law, on the other hand, is all about the discrepancy. Inertial mass is Newton's proxy value for the total number of positive and negative charge quanta in a body, and G is a proxy for k.

Finally, it should be noted that the logic used here to explain gravity is the same that was used to explain the enormous size of protons relative to electrons. Both phenomena are due to the difference between woolly on woolly and abrasive on abrasive interaction. Two seemingly unrelated phenomena have thus been explained by a single principle of theory.

Gravity and light

According to our theory, gravity is a force that operates on neutral particles made up of dielectric matter. Also according to our theory, photons are compact assemblies of 3 positive and 3 negative particle quanta. This makes them a special type of dielectric matter, and hence sensitive to gravity. A photon travelling past a massive body will experience a tug. There will be a tiny angular acceleration. This will have no impact on the energy of the photon, nor will it have any impact on its speed. It will simply make the photon curve around the object.

From theory, we can also note that photons moving in towards a massive body retain their energy, as do photons moving away from such a body. While massive bodies tug on incoming and outgoing photons, gravity does not change their energy. However, a local observer on the surface of a massive body will register the energy of photons as greater than what is reported for the same photons by an observer in space.

To understand this, we have to keep in mind that the aether is made up of a mix of neutrinos and photons. While photons are dielectric, neutrinos aren't, so gravity pulls on photons, but not on neutrinos. This makes the aether close to massive bodies richer in photons than the aether farther away.

With more photons in the aether, there must be correspondingly fewer neutrinos. The aether is so dense that no particle can be introduced without other particles being expelled. This in turn affects the electric force close to massive bodies. Observed from space, the electric force is reduced due to fewer available neutrinos.

With a reduced electric force, the size of electrons and protons goes down. The reduced number of neutrinos inside these particles reduce their internal pressure, and hence their diameters and circumferences.

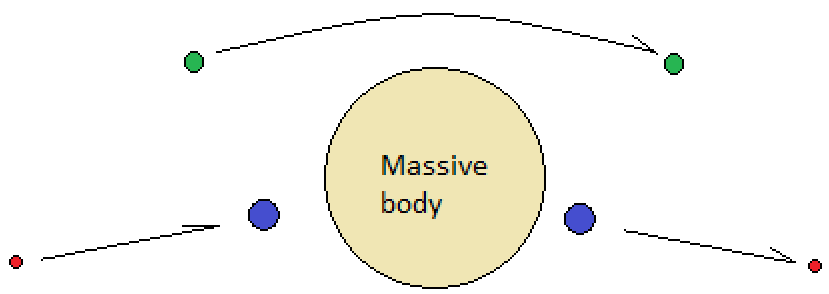
All of this can be detected by an observer in space. However, it cannot in any way be detected locally. This is because a reduced circumference of the electron corresponds to a reduction in the local unit length, and hence also a speeding up of local clocks.

Since everything in our physics relates back to particle quanta with 3 dimensions, size and texture, all measurements related to speeds, distances, forces and energies remains constant when we try to measure them, regardless of whether me make our measurements in space or on the surface of a massive body. The laws of physics remain everywhere the same when measured locally.

The speed of light will be measured to have the exact same value everywhere. This is because the reduced size of our rulers on the surface of massive bodies are correspondingly matched with faster clocks. One unit time remains the time it takes a photon to traverse an electron, no matter what size the electron has. This in turn, affects processes of energy transfers in such a way that they too are locally measured to be unchanged.

A similar effect kicks in when we try to measure the electric force with a local set of measuring tools. The number of neutrinos in the local environment will always and everywhere affect unit length in such a way that the constant k remains constant. It is only when an outside observer looks at the measurements, using an outside ruler and outside clock that differences can be detected.

With two observers, one in space and one at the surface of a massive body, we can detect differences. If we beam in some light from space of a given energy intensity, it will be registered by a local observer as somewhat bluer on the surface than in space, not because any energy was accumulated on the way in from space, but because photons are measured to be bigger and more energetic by local rulers and clocks at the surface.



Photons measured by two observers, one in space and one at the surface

Photons are not hollow. They do not change in size in response to the composition of the aether. However, our unit length is the circumference of an electron, which does change in size depending on the composition of the aether. This makes photons appear bigger to an observer at the surface where neutrinos are fewer and rulers are shorter as a consequence.

Consequently a photon can do more work on Earth than in space. All inertial matter is smaller on the surface of planets, and hence easier to accelerate than out in space. While this effect is tiny in the vicinity of Earth, it is relatively easy to detect close to the Sun.

Mercury, located close to the Sun, makes its rounds around the Sun faster than expected when measured with a clock on Earth. This anomaly has been known for centuries. It was a great puzzle until Einstein came along with his suggestion that clocks run faster on Mercury than on Earth, and that the anomaly is only an anomaly because of this difference. Measured with a clock on Mercury, it's all the other planets that are moving a little too slow.

This is the same conclusion we arrive at from our independent line of reasoning. We have in other words discovered an alternative to Einstein's theory. Instead of curved space-time, we have an aether with a difference in composition close to massive bodies, relative to space.

Magnetism

We can now apply our theory to phenomena related to electric currents and their associated magnetic fields. From this we arrive at a complete model of the photon as well as an explanation for what magnetism is and how it works. We also find an explanation for why there's a twist to electric currents:

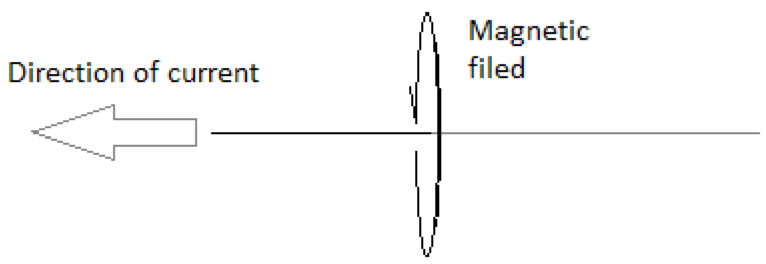
Electric currents

Electric currents can be defined as charges in motion. We can induce electric currents in wires by setting electrons moving. There are electric currents in our atmosphere, because our atmosphere has charge gradient as well as motion in the form of winds. For the same reason, we have electric currents in space. There are currents of charged particles everywhere.

An interesting feature of electric currents is that they always come with a circular magnetic field around them, and this circular field is in the same direction regardless of how the electric current is constituted. A positive ion moving from right to left produces the exact same magnetic field around it as when a negative ion of the same size and charge moves from left to right.

From this fact, we have established a convention in which the direction of current is defined as the direction a positive ion would have to travel in order to produce the observed magnetic field. As a consequence of this, all electric currents caused by electrons in motion are by definition in the opposite direction of the electron flow.

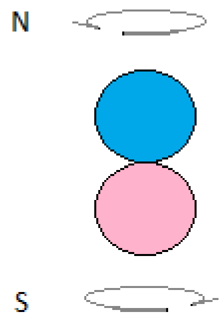
The established rule is that if we curve the fingers of our right hand in the direction of the magnetic field, our thumb points in the direction of the current. Conversely, if we point our right hand thumb in the direction of a current, our fingers curve in the direction of the magnetic field. This rule is called Ampère's right-hand grip rule in honour of its inventor.



Ampère's right-hand grip rule

Seen in context of our theory, the magnetic field must be a product of the aether, which is constituted of low energy photons and neutrinos. Furthermore, the complexity of the behaviour suggests that we are dealing with photons, rather than neutrinos.

Adding to our suspicions, we have the discovery by Michael Faraday in 1845 that magnetic fields polarize visible light. Magnetic fields are therefore demonstrably a phenomenon associated with the photon. We can even go so far as to suggest that magnetic fields are photons polarized in such a way that they all line up with their orbs pointing in the same direction, because if we apply this assumption to our theory, we get an explanation for Ampère's right-hand grip rule. All that's required is one more assumption about the photon. The two orbs of the photons must be connected in such a way that when one spins in one direction, the other one spins in the opposite direction:

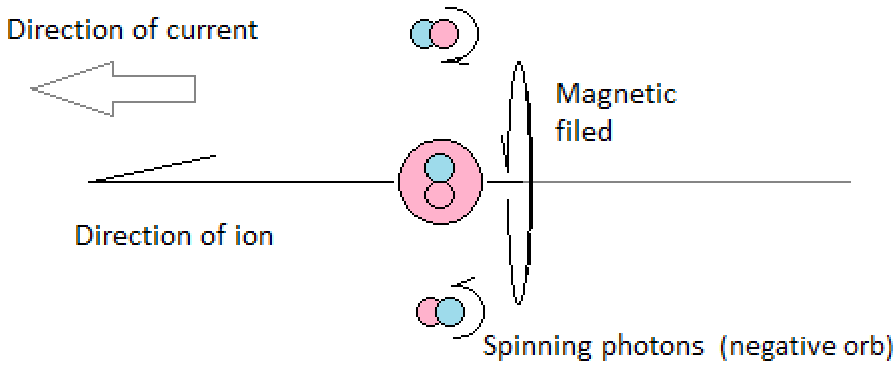


Proposed model of photon

With this in mind, it is now possible to arrive at Ampère's right-hand grip rule directly from our theory. To do this, let us first consider what happens when we move a positive ion from right to left through the aether, and then compare this to what happens when we move a negative ion from left to right.

The aether is so dense that every particle in it is always in direct contact with all its neighbours. This means that our positive ion will constantly brush into low energy photons as it travels from right to left.

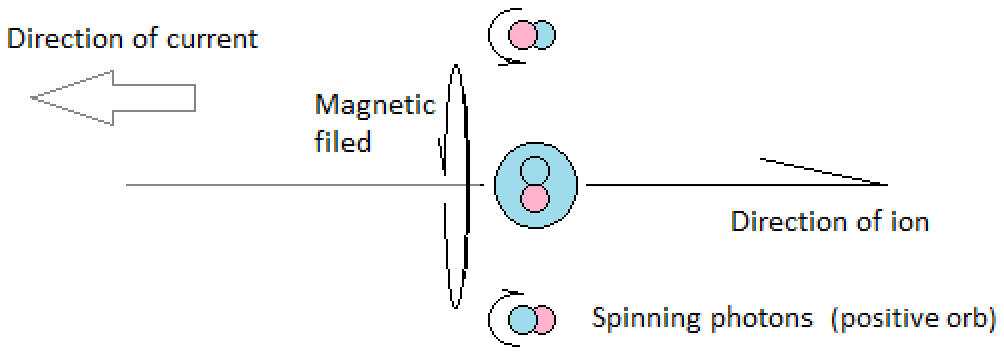
Our positive ion has a predominantly abrasive texture to it, so it tends to grab onto the woolly orb of photons, setting these orbs spinning while simultaneously aligning the photons in parallel with itself:



Effect of positive ion on photons in the aether as it moves from right to left

Negative orbs of photons are set spinning in such a way that if we look at them from above, they spin counter-clockwise.

Let us now compare this to a negative ion moving in the opposite direction:



Effect of negative ion on photons in the aether as it moves from left to right

In this case, it's the abrasive ends of photons that are set spinning. Seen from above the positive orbs, the spin is counter-clockwise. Since the spin of the negative orb is equal and opposite, we get that the spin of the negative orb, as seen from above the positive orb is clockwise. But if we flip our vantage point to be above the negative orb, we see the negative orb spinning counter-clockwise, exactly as was the case for our positive ion moving from right to left.

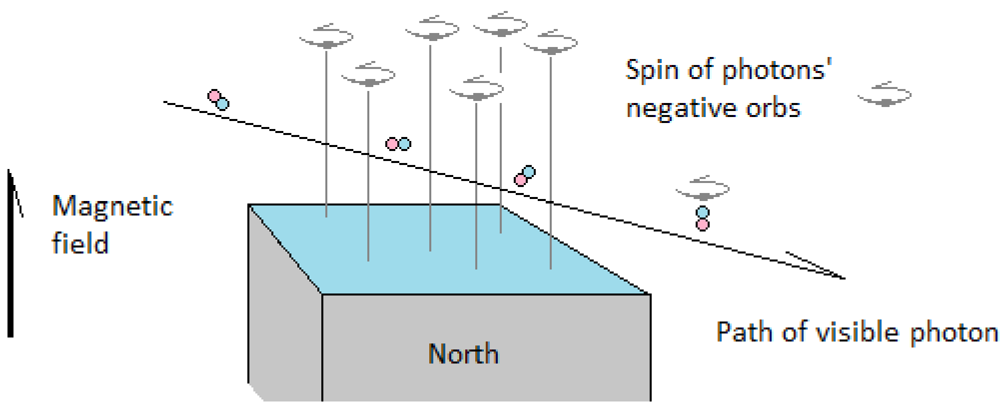
From theory, including our assumption about the photon, we have arrived at Ampère's right-hand grip rule. We can conclude that magnetism is polarized photons in the aether, with spin, orientation and alignment fully coordinated.

Magnetic force

When discussing magnets and magnetism, it's important to keep in mind that there is no net flow anywhere. What we have is coordinated spin, orientation and alignment of photons in the aether. Photons that happen to pass trough a magnet, come out polarized. This rubs off on neighbouring photons as they pass by. They in turn, rub off their polarization on other photons. The whole space around a magnet gets polarized in this way, with the strongest polarization above each pole of the magnet.

The entirety of the field does not come directly from the magnet, but by a relatively small number of photons rubbing off their polarization onto neighbouring photons after first having passed through the magnet. This is visibly evident in ferro-fluids, with their peaks and troughs.

The fact that photons do not have to pass through a magnet to be polarized has been known since Faraday performed his famous experiment:

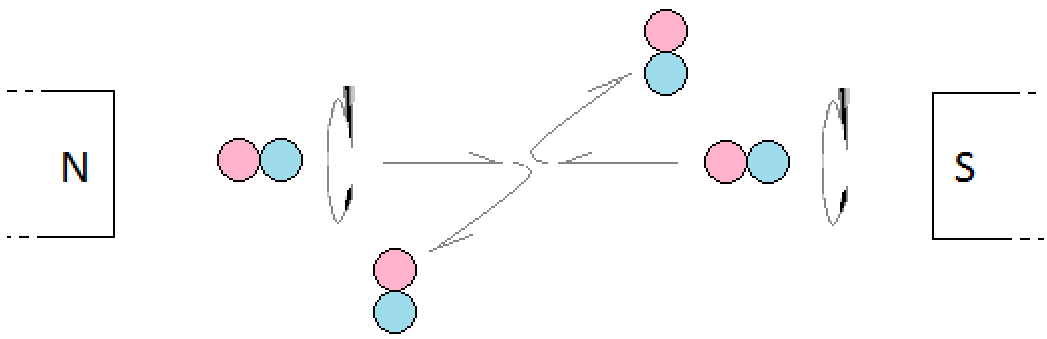


Visible light polarized by a magnetic field

Uncoordinated photons passing through a magnetic field comes out polarized. We propose that this happens to low energy photons present in the aether in the exact same way as it does for visible light.

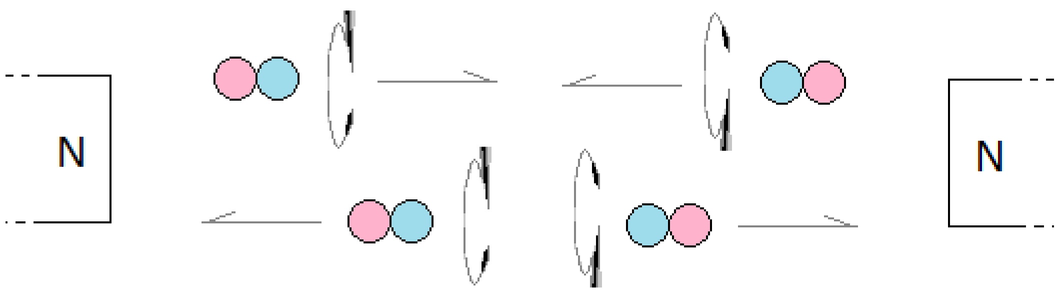
By introducing a second magnet, we can now play around with the magnetic force that arises between magnets. This force is also due to particle collisions. However, in this case we're talking about photons, not neutrinos as was the case for the electric force and gravity. But the general mechanism is the same.

Photons passing through magnets come out well coordinated and spinning. In the case of two magnets facing each other with opposite polarity, we get abrasive head on collisions. This has the overall tendency of pushing photons out of the field. The density of the aether between the magnets is reduced. This in turn draws the magnets together.



Magnetic attraction due to photons vacating the field

On the other hand, when two magnets face each other with same polarity, we get non-abrasive collisions. Photons will tend to stay in the field, building up pressure in the aether, which in turn pushes the magnets apart:



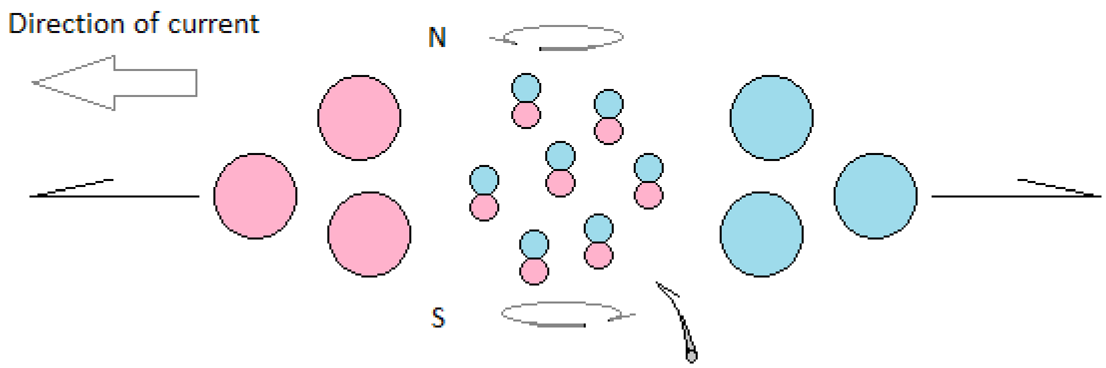
Magnetic repulsion due to photons staying in the field

Why electric currents come with a twist

Magnets can be used to induce currents into wires, and separate charges in gases. Conversely, charge separation results in electric currents, and electric currents induce magnetism. What we have is a fractal relationship between magnetism and electricity. Small currents, with correspondingly small magnetic fields, self organize into larger currents and fields. Grand currents with enormous electric fields fall apart into smaller currents with smaller electric fields. This is going on everywhere, from the minutest of cells and microbes to galaxies and galaxy clusters.

There is no top or bottom in this hierarchy. It's all part of one giant cosmic whole. However, there's a small imbalance in it. When magnetized photons separate charges, sending positive ions one way, and electrons and negative ions the other way, the tiny attraction between two abrasive textures comes into play. We find that the mechanism that explained the relative size difference between electrons and protons, and also the gravitational force, can be used to explain why electric currents twist.

To understand this, let us first apply our theory to the phenomenon of charge separation and induction of electric currents by the use of a magnet:



Charge separation by swiping a magnet forward

The photons in the illustration are oriented according to the north seeking pole of a magnet. When swiped away from us, into the paper, the photons' negative orbs drive positively charged particles to the left. Correspondingly, the photons' positive orbs drive negatively charged particles to the right. This is due to the combined effect of the photons' spin and the direction of the swipe. The resulting current is in this case to the left, as can be confirmed by applying Ampère's right hand grip rule.

All of this conforms precisely to reality, confirming that our theory is valid. However, positively charged particles will be pushed a tiny bit less hard to the left, compared to negatively charged particles to the right. This is because abrasive surfaces do not rub as smoothly against each other as woolly surfaces. The abrasive orbs of photons interfere destructively in the transfer of energy from the swipe to positively charged particles.

With no corresponding destructive interference in the transfer of energy onto negative particles, we get a tiny imbalance. To compensate for this, positively charged particles move in straighter lines than negatively charged particles, and it is this compensation that induces an overall twist.

Due to self-interference through magnetism, even electric currents constituted of electrons alone twist. The induced magnetic field around wires reflect back to the current of electrons, which in turn start to twist due to the tiny difference describe above.

Again, we are talking about a trillionth of a trillionth degree in difference. This isn’t something that is easily detected directly through measurements of force. However, it becomes visible on large scales.

Conclusion

The model proposed in my earlier book, Universe of Particles, has been demonstrated to hold under scrutiny. The attentive reader may have noticed a slight change in formulation and interpretation of certain phenomena. The biggest differences being our interpretation of gravity with respect to light, the specifics of the aether, and the influence of speed on time. In these cases, it is of course our latest interpretations that get precedence over earlier work. However, we did not come across anything that gives us any reason to give up on our model. On the contrary, our model conforms well to reality.

There are two paths forwards from here. One path leads towards mathematical formulas and a further nailing down of details. The other path leads to a wider analysis, broadening the scope of the theory.

The mathematically inclined may fine enjoyment in deriving the various well established formulas from the principles laid out in this book. In this respect, we have only scratched the surface in our analysis of Coulomb's law and gravity. There's no lack of formulas to analyse further in light of our theory.

Those with a more philosophical inclination can use our theory as a model for wider interpretations. The Universe of Particles book is in this respect a place to go for inspiration. There are no lack of strange and vaguely understood phenomena that call for our attention. There is also pure theoretical work that can be done. There are no doubt other ways to interpret physics from a strict particle perspective. The aether may be defined differently, with equal or better success than what has been achieved here. Comments and suggestions in this respect are always welcome.

In any event, I hope you have enjoyed this analysis, and found it entertaining to see that a strict particle model of physics can in fact be applied to reality. I hope you found it well worth your time, and that you will keep this theory in mind in your further explorations in the field of physics.

Acknowledgement

The work presented in this book would not have come about if it was not for my libertarian Facebook friend, Onar Åm, casually mentioning that Earth looks like it's expanding. A statement I found profoundly intriguing at the time, some five years ago. This sent me on a grand tour in search of an explanation, which ultimately led me to the work of Morton Spears and Halton Arp. Both strongly suggesting that reality is fundamentally made up of particles.

Combining this observation with input from Wallace Thornhill, Peter Woodhead, Andrew Johnson, Freddie Thornton and others, I arrived at the conclusion that the universe can in fact be explained in terms of particles.

A special thank goes to Onar Åm who not only set me going with his casual observation about our planet, but also helped me formulate my conclusions in a sensible and easy to understand manner.