How the Magnetic Field Works

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The existence of the magnetic field and the force it creates has been known for a long time, but just how this magnetic field works and what creates the forces that magnets exert has remained a complete mystery. This paper attempts to fully explain the origin and the physical mechanics behind the magnetic force as being mediated by an invisible positron/electron dipole sea which can be polarized as a magnetic field and can deflect electrons which are passing through it.

1. What mediates the magnetic field

When we put a nail near a magnet, we say that the nail is attracted to the "magnetic field". But just what is this magnetic field? It seems like the magnet creates a special area around the magnet where it exerts a force on other objects without touching them. What could this magnetic "field" be made out of? What is different between a region of space which has a magnetic field and one that doesn't?

If you were a farmer, you might think of a "field" like a field of corn, which is made out of individual stalks and these are what fills the space in the farm. So, this is one way to think of a "field" which an area which is filled with identical objects. So, you might also think of a "magnetic" field as being an area that is filled with some kind of object. Suppose we filled a field full of flags instead of corn. If we have the wind blow through the field, all the flags will align in the same direction. So now we have a field which can have the characteristic that it can "point" in a particular direction. So instead of the flags being randomly oriented, we can say there is a "field" where all the flags are pointed in the same direction. This analogy is the key to understanding how the magnetic field works.

I would assert there must absolutely be something physical, made out of real physical particles that act just like the flags in the wind analogy which form the magnetic field. When all of these particles "point" in the same direction, this is what we recognize as a "magnetic" field. So, we start out with a sea of randomly oriented particles that fills all of space. When those particles are aligned to point in a single direction, that is what I would call a magnetic field.

But what could possibly be this sea of flag-like particles that mediates the magnetic field? Whatever this sea is built out of must be extremely difficult to detect. This field is pervasive and must exist everywhere including the vacuum of space since magnetic fields can pass through a perfect vacuum. No "field" of physical particles has ever been detected in a vacuum. However, one of the most difficult particles to detect are "neutral" particles. These particles are a combination of positive and negative charge and on the whole, they don't have a net charge. These neutral particles interact very little with matter. They don't leave traces in our particle physics experiments because there is nothing to trigger a trace in a cloud chamber or to record the passage of a particle through a detector. These are invisible ghost particles. The most common neutral particle we know of is the neutron, but this decays in about 15 minutes, so we can't make the magnetic sea field out of this unstable particle.

2. The neutral poselectron particle

The simplest neutral particle that we could think of would consist of a single negative charge from an electron and a single positive charge from a proton. But this is known as simple hydrogen. A vacuum is not filled with hydrogen. But there is another hypothetical particle which is would be even simpler than a hydrogen atom. This particle would consist of a 'positron' and an electron. This will be called a 'poselectron' in this paper since it is made out of a positron and an electron. The positron is the anti-matter equivalent of the electron. It is identical to the electron in every way except that it has the opposite positive charge. It should not be confused with the much more complex proton which is nearly 2000 times more massive.

However, since the positron is the anti-matter partner of the electron, when you bring them together, they annihilate themselves and are converted into gamma rays. Conventional wisdom says that the particles were "converted" into energy and there is nothing left of the "particles". This concept that matter has been converted into energy has been pounded into everyone's brain since birth and the evidence that the energy follows E=mc^2 is used to assert that the mass must have been destroyed. So theoretically, the poselectron cannot exist in the minds of most people.

However, what is the real evidence that it didn't actually produce a neutral poselectron particle? If a neutral particle were to be formed out of a positron and electron, the result would be exceedingly difficult to detect. It would not show up on any of our detectors and would appear as nothing. So, the evidence that we don't "see" anything is not particularly good evidence that the positron and electron really disappeared into energy. We would fully expect that if a positron and electron did form a bond instead of being destroyed, that we wouldn't be able to easily detect the resulting particle. This would be especially true if the particle disappeared into a sea of identical dipole particles.

This would be similar to watching 2 hydrogen atoms and an oxygen atom combine in a sea of water. You would see energy coming from the reaction and then the hydrogen and oxygen atom would apparently disappear because you can't tell the difference between the newly formed water molecule and all the existing water molecules surrounding it. It is completely hidden from view. Remember that this is the same logic used to say that matter was destroyed because we saw the creation of energy. There is no difference in the logic, but we know that the oxygen and hydrogen were not destroyed, so why do we think the positron and electron were destroyed?

How could we determine if the positron and electron still existed? One way would be to break up the positron/electron dipole particle and then we would see a free positron and electron sprout out of nowhere. This is exactly what happens in "pair-production". We see gamma rays causing positrons and electrons to appear out of nowhere. We also see positrons and electrons sprouting out of empty space in massive quantities in high energy accelerator experiments. These particles are often considered "junk" reactions and are totally ignored, but it is these "junk" reactions that is telling you that space is made out of poselectrons.

What we have now is that the poselectron has found the ultimate hiding place in the universe. Nobody has found the poselectron yet, because everyone thinks it cannot exist. It is the perfect crime – hiding in plain sight in the one place we think it cannot exist. However, we should be able to detect the presence of these particles if we take off our blinders and actually perform experiments to confirm or deny their existence. I am reminded of a quote from Einstein's critics that if you don't believe me, then do the experiments, you will find it to be true.

3. The magnetic field of poselectrons

If we take space as being made out of a sea of poselectrons, the mystery of the magnetic field can be solved. One characteristic of the magnetic field is that it has a "direction" for the magnetic field lines. This is like the direction that the flags are pointed in a field of flags. The poselectron is a "dipole" particle which means that it has a positive and a negative side. Therefore, it can "point" its positive end towards a particular direction. The poselectron particles would tend to align themselves so that negative/positive charges point at each other. However, it would not be likely that all of the dipoles would be aligned in the same direction. Smaller domains might be aligned, but overall, they would be pointing in random directions. If these domains could be aligned, then this would provide a "direction" or linear polarization for the magnetic field. An alignment of the poselectron sea could represent a "magnetic field". The orientation of the dipoles form a directional vector which shows which way the magnetic field is pointing.

It is also known that magnetic fields form in the presence of electrons in motion. If an electron were to move through the poselectron sea, what would it do to the alignment of the sea? As an electron passes by a dipole pair, the positive ends of the dipoles would tend to be pointed at the electron because the positive charge of the dipole is attracted to the retreating electron charge. As more electrons go in the same direction, it will "comb" the poselectron field to point in the same direction. This is shown in Fig. 1.

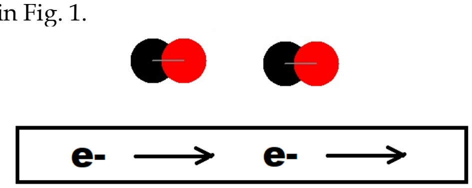

Fig. 1. Electrons flowing to the right, comb the field

This is like the wind combing a field of flags to all point in the same direction. This is also very similar to taking a line of compasses and then passing one end of a magnet past the line of compasses. This will cause them to all point in the same direction as the magnet is stroked in one direction. If you stroke the magnet the opposite direction, the compasses will all turn the other direction. This is demonstrated in this video:

https://www.youtube.com/watch?v=bECxYjeZeJU

Similarly, if the direction of the electrons were reversed to flow from left to right, then the positive ends of the dipole would flip to point to the left. This is why moving electric charges are intimately associated with creating a magnetic field. The moving electrons are taking the randomly oriented poselectron dipole sea and re-ordering it to all point in the same direction.

A region of this combed and aligned poselectron sea will influence the surrounding sea and cause it to be aligned as well and the degree of alignment will drop off with distance from the electrons which are causing the alignment. Once the electrons stop combing the field, random thermal energy will return the poselectron sea back to its random orientation. The poselectron sea can therefore provide a medium which can represent a vector direction for the magnetic field. The density or degree of alignment represent a vector magnitude. Therefore, the poselectron sea can represent the two most important aspects of a magnetic field which is a vector direction and magnitude.

4. How electrons deflect through a magnetic field

Now that we have established that a magnetic field consists of a combed poselectron dipole field, we can now explain why electrons are deflected in such a field. Fig. 2. shows dipoles which are aligned from left to right A magnetic field line consists of a chain of such aligned dipoles. The figure shows two such dipoles with an electron moving between them. If an electron cuts through the magnetic field line at a 90-degree angle, as it goes between the dipoles it will see a negative charge on the right side and a positive charge on the left side as the electron exits the magnetic field line.

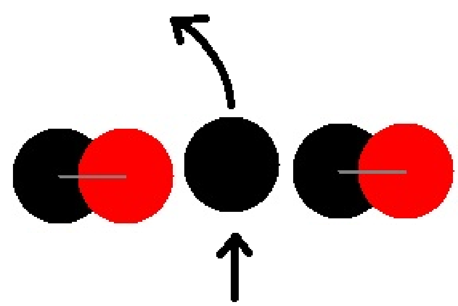

Fig. 2. Electron deflected towards the positive dipole

The electron will be attracted to the positive side and will deflect towards the left. This type of deflection of a moving object is demonstrated in this video:

https://www.youtube.com/watch?v=2BrYCFANLiY

If all of the dipoles are aligned in a similar manner, the electron will continue to be pulled to the positive side and the amount of force that gets applied will directly depend on the speed of the electron, since it gets a bump of force for every set of magnetic field lines that the electron cuts through. The faster it goes, the more bumps it gets. This is why the magnetic force depends on the velocity of the electron. The force exerted on a charge in a magnetic field is expressed by the Lorentz force law:

$$F = qv \times B$$

Where q is the charge and v is the velocity and B is the magnetic field. This formula says that if the charge is stationary, then no force is exerted by the magnetic field with v = 0. The reason for this is if the charge is not moving, then it is not cutting through the dipole layers which is what gives the charge a kick every time it goes past a layer of dipoles. This explains the mystery of why an electron experiences no force in a magnetic field if it is not moving.

However, another consequence of the Lorentz force law is that if the direction of the electron is reversed, the force direction is also reversed. This wouldn't happen in Fig. 2. The electron would always be deflected to the left whether the electron was going up or down. This is a very difficult problem to resolve. To help resolve it, we need to use another pair of dipoles which are complementary such that only opposite charges are facing each other. It would look like Fig. 3.

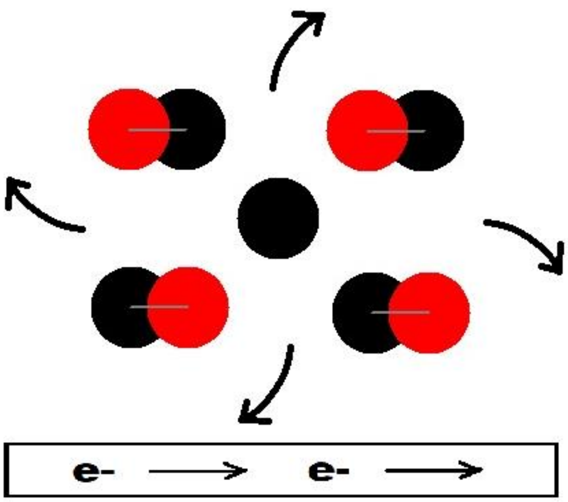

Fig. 3 Electron deflected between aligned 4 dipoles

In this Fig. 3, we see the original dipoles of Fig. 2 plus another pair of dipoles lined up above it. This set of dipoles is arranged in the opposite direction to the dipoles which were originally combed by the electrons going towards the right. This may seem counterintuitive that the dipoles are pointing in the opposite direction than you might expect, but this may be due to the attraction of the original dipoles causes the nearby dipoles to align so that only opposite charges face each other.

The electron is seen going in 4 different directions and when it exits, it can be seen that reversing the direction either up or down or left or right causes the direction of the force to also reverse. Now we see the correct behavior that if the electron between the particles is going "up", the last thing it will see is the attractive positive charge dragging it to the right. If the electron is going "down", then the last thing it will see when exiting between the 2 charge particles is the positive charge which will cause it to curve left in the opposite direction. You can also see that if the electron were to be heading right, that it would curve down and if it were heading left, it would curve up. This mechanical arrangement of charges also explains why the force is always at 90 degree angles to the velocity of the electron. The force is only exerted as the electron "cuts" through the line of charges at 90 degrees and the force is always exerted along the line of charges.

These four dipoles together make up the basic "magnetic unit" or "M-unit". The electron should be thought of as only being able to move between these 4 dipoles and the electron is only deflected upon exiting the M-unit. Furthermore, these M-units will be spaced relatively far apart so that if an electron moves between the m-units, no deflection will occur. These rules and dipole arrangements may seem somewhat arbitrary, but they are the only ones which will satisfy the basic Lorentz force law that opposite directions result in opposite forces. Many different dipole arrangements were considered and like the row of aligned dipoles of Fig. 2, these were unsatisfactory in describing how electrons are deflected in a magnetic field if the field consists of poselectron dipoles which are postulated to constitute all of space.

The four dipoles also create a "flat" plane which contains the dipoles. In Fig. 3, the plane is the same one formed by the flat page of this paper. The orientation of this plane is significant because it represents the conventional B magnetic field vector direction. For Fig. 3, the field shown is being generated by a wire below the figure where the electrons flow from left to right which leaves the closest dipoles to the wire with the positive ends on the right. If we use the right and rules and point our thumb towards the right to follow the current flow, then the B field points up. So a vector pointing up from the page represents the conventional B field. If we were to reverse the electron flow direction as is shown in Fig. 4, we would get a subtle but very significant difference in the B field direction and reversing all of the forces seen in Fig. 4. Now the B field direction is pointing into the page.

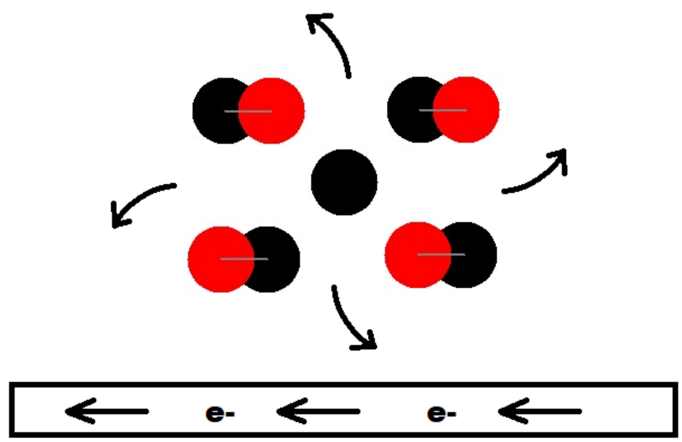

Fig. 4 Flipping force direction by flipping electron flow

This may seem to be a very minor difference of the charges switching places, but it absolutely makes all the difference in the world to defining difference between the direction of the forces on a moving charge.

Now, one can more easily see why an electron in a uniform magnetic field would take on the shape of a circle if it were to encounter a field of M-units. Fig. 5 shows a random arrangement of M-units which are shown in gray ovals. We can see that an electron heading up, would encounter a rightward force until it was only going right at which point it would encounter a downward force until it was only going down at which point it would encounter a leftward force until it was only going left at which point it would encounter an upward force until it was only going up. We can follow the path of the electron through the field and the force it gets every time it goes through an M-unit. And round and round we go in a very simple explanation.

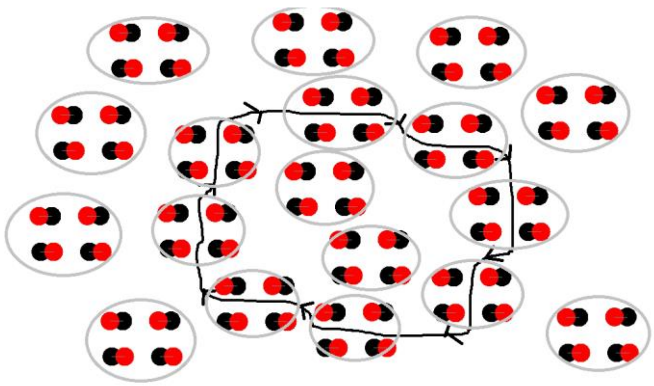

Fig. 5. Electron deflected in a circle in a m-unit field

5. The magnetic field created by a current carrying wire

Let's consider the case of a single current carrying wire. If you fire an electron perpendicularly towards a current carrying wire, the magnetic force will cause the electron to deflect in the opposite direction as the real physical current flow. If you check the definition of the magnetic field direction and apply the right-hand rule and apply it to electrons (be careful the right-hand rule normally applies to positive charges and the physical current flow is opposite of what is shown for conventional current).

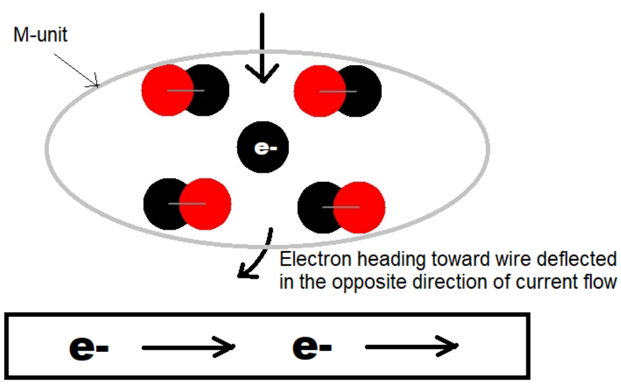

Fig. 6. Electron deflected by wire

So why does the wire induce a force on an electron which is in the opposite direction of the electron flow? If we consider figure 6, this is the orientation of the poselectron particles for a current where the electrons are moving to the right. This leaves the positive ends pointing right, which are like flags blown to the right by a wind. We can see in the diagram that an electron approaching downward perpendicular to this field is deflected towards the left since the electron wants to move towards the positive side of the dipole as it exits the M-unit. Therefore, we can see that the electron will be deflected in the opposite direction as the current which creates the magnetic field.

This behavior of creating an induced electron flow which is in an opposite direction as the electrons which created the original magnetic field is seen in many magnetic phenomena and it is anti-intuitive why it should do that. This is usually stated as "a magnetic field inducing a current which opposes the original magnetic field". The reason for this is that the original magnetic field combs the field such that any electrons entering it are deflected in the opposite direction which creates an opposing magnetic force.

6. The magnetic force on an electron running parallel to the current.

We have considered what happens if an electron enters a magnetic field created by a wire in a perpendicular fashion. What happens if it enters the field in a parallel fashion?

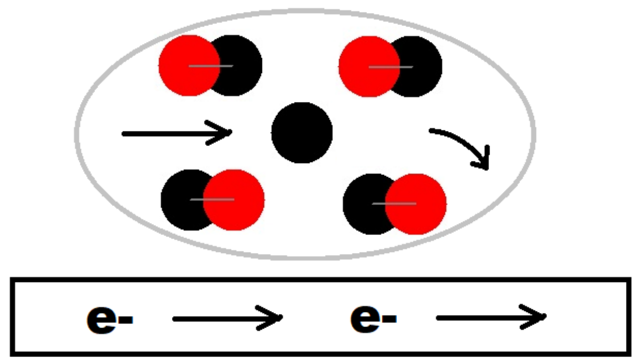

Fig. 7. Electron deflected towards the wire

This situation is shown in Fig. 7. An electron going the same direction as the current would be deflected towards the wire. If the electron were to go in the opposite direction, it would be deflected away from the wire.

7. The magnetic field between parallel wires

Let us consider the magnetic force exerted by two parallel wires which have the current flowing through them in the same direction The magnetic force causes the two wires to attract if the current is flowing in the same direction and causes a repelling force if the current is flowing in the opposite direction. Why does this happen?

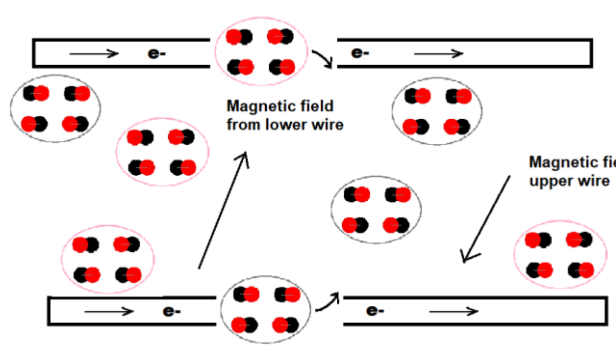

Fig. 8. Electrons deflected towards the other wire

Fig. 8. shows two wires with the current running in the same direction. The lower wire is creating M-units which are shown with the red ovals and the upper wire is creating M-units with the gray ovals. Notice that since the dipoles closest to the wire have to align with the current, this causes oppositely aligned M-

units to be created between the wires. These M-units extend out into space until the intercept the other wire. We see that when the field from the lower wire in red gets into the upper wire, the electrons are deflected downward toward the other wire. We see the opposite happening where the field from the upper wire is now causing electrons in the lower wire to deflect upward towards the other wire.

So as the electrons flow through the wire, they see this force between the wires and the electrons deflect towards the center. But since the electrons cannot escape the wire, they press upon their container which is the physical wire and causes a force which literally pushes the wire closer to the other wire. So, the force we feel on the wire is actually the force of all the electrons trying to move towards the center of the two wires.

You can think of this like we have a box full of electrons, then those electrons decide to go left and hit the left wall. They will drag the entire box to the left and if we try to stop the box from moving left, we will actually feel a pushing force coming from the box. This is the pushing force that we feel when dealing with magnets. This fundamental cause of the pushing force we feel from the magnetic field is described in this video:

https://www.youtube.com/watch?v=sF8xrPAa5bg

If we then reverse the currents. in the top wire, this reverses the alignment of the gray M-units so that they are aligned in the same way as the bottom wire. Since the direction reversed in the top wire, this causes the electron to be deflected upwards and away from the other wire. The bottom wire sees the reversed M-unit from the top wire and also deflects to the bottom away from the top wire. This causes the electrons to pull the wires apart when the current flows in the opposite direction. This is shown in Fig. 9.

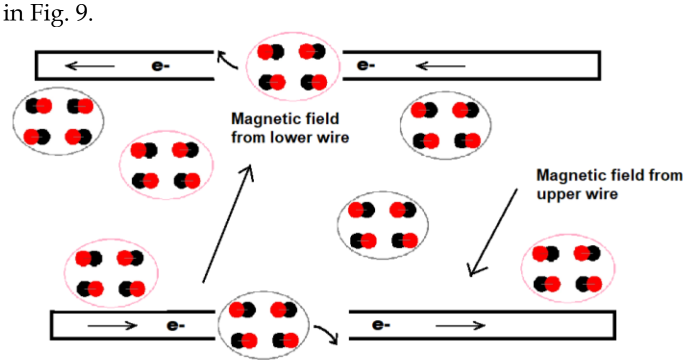

Fig. 9. Currents in opposite directions repel

8. How do electromagnets work?

If we take two coils of wire and pass a current through them such that the electrons are flowing in the same direction, we find that these coils attract each other. This is what we feel as the fundamental physical magnetic force. We can feel the force between the two coils with our hands. If we switch the wires around so that the current is flowing in opposite directions, we find they repel each other. Why does this happen? The answer is very simple. If you consider a short segment of a coil, it is basically a straight wire with current running through it. If you just consider two parallel segments from each of the coils, this is just two parallel wires. Then we just apply our knowledge that two parallel wires which have the current moving in the same direction attract. So every segment of the coil attracts the same segment in the other coil and it is easy to see that the coils as a whole will attract each other like two parallel wires attract each other. Another way to see this is that the coil is just two parallel wires that have been twisted into a circle.

It is also important to consider what happens on the other side of a current carrying wire. Because the dipole facing the wire must always be combed in the direction of the current, this causes the M-units on the other side of the wire to take the opposite alignment. This is seen in Fig. 10. So on the top of wire, we see the M-unit alignment where the lower right most charge is positive. This constitutes what we think of as the "North" pole and magnets emanating this alignment are said to have the North pole. On the bottom of the wire, it is seen that the lower right most charge is negative and so this represents the "South" pole.

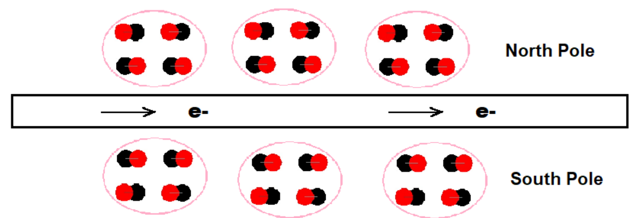

Fig. 10. How M-units arrange around the wire to create poles.

If we were to stack two of these wires on top of each other, we would see the North pole face the South pole when the current is in the same direction. We call this the attractive magnetic force. If the current was in the opposite direction, we would see a North pole facing another North pole and this is what we call the repelling magnetic force. This is also why we can never have a true magnetic monopole. A wire or a current of a finite dimension must have a top and a bottom which will create the North and South pole. So just as a coin must have a top and bottom, magnetic fields must be generated in linked pairs.

9. How do permanent magnets work?

If we understand how an electromagnet works, then how does a permanent magnet work? This doesn't have any coils or electrical source. How can it emit the same force that is created by an electrified coil? To answer this, we have to make some logical speculations. If magnetic fields can be created by a current carrying coil, then there must be something like a current carrying coil within the permanent magnet. But what could that be and how would that work? It has been suggested that the electrons orbiting the atom create this current ring, but experiments have shown that this is not the case and even if it were, there are other atoms which have electrons shells similar to the ferromagnetic elements, but these are not magnetic. Furthermore, our best permanent magnets are made out of rare earth elements like boron and neodymium which are non-magnetic.

I believe that the magnetic properties are determined at a much larger scale than the atoms. The properties must come about at the crystal level. The crystals in a permanent magnet material may have the property that they can form a small superconducting current loop within them. We see these regions as magnetic grains within the material. The ability to form this loop probably strongly depends upon the shape and size of the crystal structure to allow what amounts to a room temperature super conductor. This is why compounds of non-magnetic material can create strongly magnetic materials. It would be a major prediction and confirmation of this theory, if it could be proven that such superconducting loops exist in permanent magnets. If we could understand how these superconducting regions work, we might be able to exploit them to create large room temperate superconducting wires.

The presence of billions of these tiny superconducting loops would explain how a permanent magnet can exhibit the same properties as a current carrying wire loop. Initially, there is no current flowing through these pathways or the current loops are randomly oriented. But when exposed to a strong magnetic field, the electrons start to flow and find a path through the crystal so it forms a current loop. Once this current loop starts, it keeps going as a room temperature superconductor. Then each of the individual current loops re-enforce each other until they form a field which looks something like the coil of wire, although there are still some significant differences. Each tiny current loop can be thought of as interacting with another tiny current loop and together, they work in concert to create an overall attraction or repelling force.

10. Solving Faraday's Paradox

An area that cannot be easily explained by mainstream electromagnetic theory is unipolar induction. The problem seems to be best stated by this wiki page of the Faraday Paradox:

http://en.wikipedia.org/wiki/Faraday_paradox

Here, we have a rotating disk in a magnetic field and the disk generates a current from the axis to the outer edge of the disk. This all works perfectly fine with the Lorentz Force Law as you can see the electrons driven to the center. This is mentioned as case 1. What's weird is that if you hold the disk and spin the magnets around, it generates no current. It would seem that the moving magnetic field is still cutting through the disk, so why isn't a current generated? Even weirder than that, if you spin both the disk and the magnets together so that there is no relative motion between them, this generates a current. How can it do this if there is no relative movement?

For case 1, the easiest way to view the homopolar generator is as a spinning disk between the poles of a magnet as is shown below in Fig. 11. The disk is directly and completely centered between the poles of a magnet.:

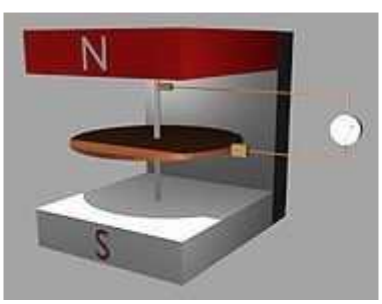

Fig. 11. The homopolar generator

According to my magnetic model, the actual real magnetic field lines follow the direction of current that creates the magnetic field. Since a magnet can be seen as an electromagnet with loops around the poles of the magnet, this is how the real magnetic field lines should be imagined. It will look like Fig. 12.

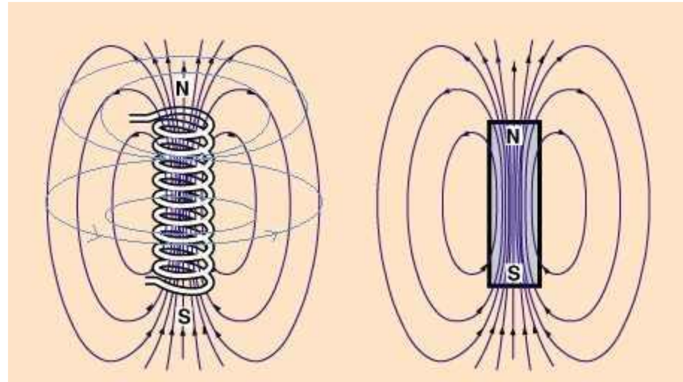

Fig. 12. True magnetic lines should be see as circling the poles

The magnetic lines should not be considered to be going through the poles as is shown on the right. Iron filings may line up this way around a magnet, but the actual physical elements which make up the true magnetic field is following the current that is looping around which is shown in light blue spiraling around the poles. The conventional B field which is going through the poles is actually just representing the orientation of the planes which contains the M-units which is perpendicular to the plane. The actual shape of the magnetic field lines will be in concentric circles through the disk.

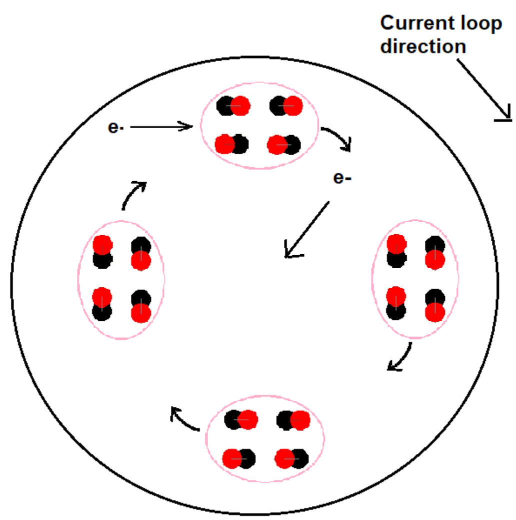

Fig. 13. Electrons driven to center of disk by M-units

Fig. 13. is showing a top down view of the homopolar generator. The black circle represents the current loop which is creating the magnetic field. The M-units are aligned to that current loop. This is the true form of the complex magnetic field between two magnets. It is not just a straight B field pointing from one magnet to the next. Instead it has this “circular” construction. It can be imagined that the conventional magnetic B field is point out of the page for all the M-units. But this really doesn’t tell you that the magnetic field is actually concentric.

If we imagine that we have a disk which contains free electrons and we rotate that disk clockwise, the electrons will start to move around like a merry go round. As they do so, they will encounter the M-units which are basically “stationary” and the alignment will always cause the electrons to be deflected towards the center. As they move towards the center, they generate a current which can be seen moving from the outside of the disk to the inside. If the disk were spun counterclockwise, the electrons would migrate outwards towards the rim and would cause a reverse current.

For case 2 the disk remains stationary, so the charges are not moving in any sense. What we do have is the magnet moving around the disk. This would be the equivalent of taking the current ring in Fig. 13 and rotating it. If you take a circle and you rotate it, it doesn't change because of symmetry. So, you can spin that loop that contains the current all you want, but it has absolutely no effect upon the M-units that have already been established. Nor is there any reason why the M-units should rotate with the rotating current loop. The M-units will remain basically stationary as before. The charges in the disk aren't moving and neither are the dipoles, so we would expect no current to be generated in this situation. This fully explains why spinning the magnet around the stationary disk produces no current.

For case 3 both the magnet and disk are spinning together. As I mentioned in case 2, the real magnetic field M-unit alignment doesn't change at all whether the magnet is moving or not. However, in this case, the charges in the disk really are moving and they are cutting past the M-units in the same was as in case 1, so in this case, we would also expect that a current will be generated.

To solve the paradox of the homopolar generator, one must recognize that the magnetic field doesn't change when you rotate the magnet around the axis since the real field lines are circular around the axis. So spinning about the axis makes no difference. Keeping the magnet stationary doesn't make any difference. The only thing that makes a difference is if the mobile charges in the disk are spinning and those are the cases where a current is generated.

The paradox only arises if you think of the field lines as arrows connecting between the N and S poles of a magnet which is how the conventional B magnetic field lines are defined. Then you will have a big conceptual problem because spinning will definitely lead to magnetic field lines cutting through the disk which should generate a current, but they do not.

In most cases, it doesn't matter that the magnetic field lines have been defined incorrectly. However, in the case of unipolar induction, it makes a great deal of difference. Redefining the magnetic field lines in this manner does not lead to a simple formula like the Lorenz force law, however, common electromagnetic interactions such as how 2 current carrying wires attract and repel and how unipolar induction really works can be more easily explained. Therefore, one needs to consider whether the and shape has been defined incorrectly.

11. How does induction work?

There is another significant phenomenon called "induction" whereby a moving magnetic field can generate a current in a wire. This is the basis for generating electrical power with spinning generators. Current is only generated while the magnetic field is changing in strength. How does this happen? The simplest case would be a magnetic field moving towards a wire which contain stationary electrons.

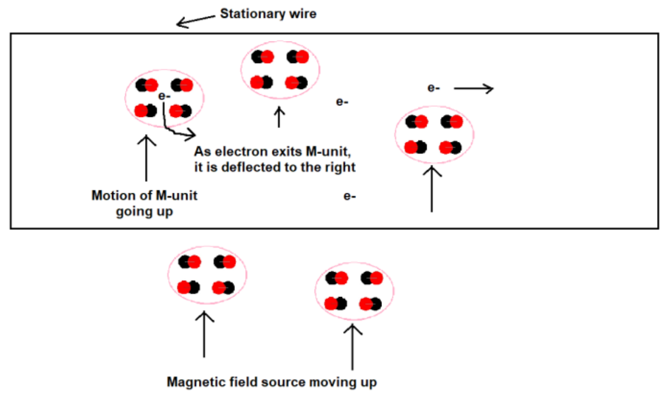

Fig. 14. Moving magnetic field causes current

Shown in Fig. 14 is a section of a wire represented by the rectangle which contains free electron charges. This wire is being approached by a South pole field consisting of M-units moving up towards the wire. As the do so, they pass over the stationary free electron charges and when they exit, they are given a boost to the right when they exit the M-unit since it is attracted to the positive end of the dipole on the right as it exits. As the M-units continue to march up, it will boost the electron again towards the right as they pass over the electron. This causes an overall current to the right to develop. This is the origin of what is known as the Electromotive Force or EMF. The electrons are not being urged to flow because of any kind of electric field developing across large portions of the wire. The are urged to flow due to the electrons exiting the M-units. This is the mirror operation of how electron is deflected when the electron is moving and the M-unit is stationary. It doesn't matter whether the electron or the M-units are moving, the result is the same. You could imagine that the M-units are stationary and it is the wire that is moving up. This would also cause the electron to deflect to the right. If the wire were to then move down, then the direction of the force would reverse and cause the electrons to flow towards the left. This is why when you move a wire towards a magnet, you get one polarity and when you withdraw the same wire, you get the opposite current polarity.

Another interesting situation occurs between two parallel wires where the current is switched on and off. This induces a pulse of current in the other wire. This setup is shown in Fig. 15.

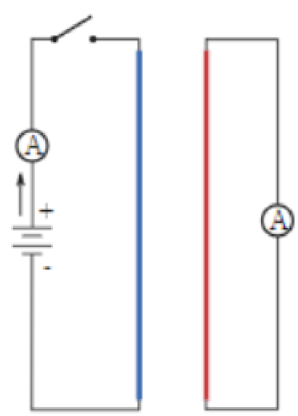

Fig. 15. Induction between two wires

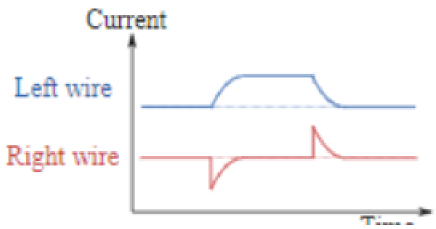

Fig. 16. Pulse induced on red wire

The pulse formed on the red wire is shown in Fig. 16 where a current in the opposite direction is formed as current starts flowing in the blue wire. It quickly stops when the blue wire reaches its full voltage and when the switch is opened and the current drops, a current pulse in the same direction as the blue wire is created. In this example, the magnetic field would not appear to be physically "moving" since it is affixed to the blue wire. What is clearly changing, is the magnetic intensity as the current rises in the blue wire.

In order to understand this type of induction, we really have to think of the magnetic field lines as being something "real". By this, I mean that they form a physical chain of particles that can be seen as an actual "line". That chain of particles moves out into space as the magnetic field expands. The magnetic field simply does not cause the existing dipoles to align with the current. It actually has to physically "capture" the poselectron dipole particles that make up the M-units and move them away from the wire as the magnetic field strength increases. As the current keeps on flowing, it captures more poselectron particles nearby the current and forces the existing magnetic field lines outwards. These magnetic field lines go marching towards the red wire until they hit it. When the magnetic field lines pass through the electrons in the wire, the electrons are deflected by the passing magnetic field line. So we have an M-unit which is really moving outward from the blue wire and hitting the stationary electron in the red wire and deflecting it in the opposite direction as the current in the blue wire. As the current stabilizes, no new magnetic field lines are marching past the electrons in the wire and the flow stops. When the current in the blue wire is turned off, we then see the reverse process where the magnetic field lines now start marching in the opposite direction to the left as the magnetic field collapses. Now, the electrons in the blue wire experiences the reverse force and this explains the current reversal in the red wire as the M-units march back to the blue wire. This fully explains the mysterious short and opposite pules observed on the red wire when the current is switched on an off on the blue wire.

One last induction phenomenon involves just the blue wire. When the switch is opened, you would expect the flow of electrons from the battery to just stop dead. But it doesn't do this, instead the electrons are driven forward by some mysterious force and this causes an electron traffic jam which cause a sudden voltage jump in the wire past the switch.

If we look back at Fig. 8, it showed that the wires were only affected by the magnetic fields created by the other wire. It seemed that the magnetic fields created by lower wire are "ignored" by the electrons in the lower wire. This is probably due to the fact that these electrons are creating the magnetic field lines. But what if the electrons were to stop moving, then the wire would still be surrounded by a magnetic field. The magnetic field would be collapsing, so the M-units would start to march back towards the wire. As they do so, then will then go past the electrons in the wire and cause them to move in the same direction as the current that was previously flowing. To see this, imagine the M-units in Fig. 10 to start moving into the wire from the top and bottom. You will see that as an electron in the wire exits the M-unit, the positive dipole will be on the right which urges the electron to the right. The bigger the magnetic field, the longer this reaction will last and this allows electronic components called "inductors" which consist of loops of wires to store energy just like a capacitor.

12. Conclusions

Initially, the magnetic force appears to a very mysterious phenomenon which almost no one is willing to explain. However, it is possible to explain how this force works if we give it a physical medium which is composed of positron/electron dipoles (poselectrons). An alignment or polarization of this sea of poselectrons is caused by a nearby flow of electrons that act as a kind of a wind that blows through the poselectron sea to align it. Once this poselectron sea is aligned, it can preferentially deflect electrons that are trying to pass through it. It is this deflection of the electrons that we 'feel' as a force when magnets interact with each other. Ultimately, the magnetic force is just a special case of the electrostatic force. So this is the unification of the magnetic force with the electrostatic force.

13. Additional references

This work on the magnetic field is part of my Theory of Everything which links virtually all the forces as being electrostatic and mediated by the poselectron sea.

http://franklinhu.com/theory.html

I welcome your comments. Please send them to

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