

Message from the SUN

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Abstract: The Northern and Southern Lights are caused by the solar IMF. Gill's Electronic Theory of Magnetism (1964) shows how the solar IMF on approaching the magnetosphere of the Earth splits into its negative and positive electric energy components which head for the opposite magnetic poles of the Earth to cause the equally bright Aurora Borealis and Aurora Australis.

Why these Northern and Southern lights don't reach all the way to the magnetic poles of the Earth and why they are brighter on the night side will be illustrated. Kristian Birkeland's (1900-1916) "terrella" experiments are also further explained.

The great 1859 spectral auroral event affecting the Earth which also showed the link between the magnetic effect and the electrical effect is explained (*Message from the SUN.*)

The solar source of the essential electrical seeding of the magnetic poles of the Earth for the functioning of the geomagnetic dynamo of the Earth to create its magnetosphere is shown

Some applications to harness this solar electrical energy are presented and some dot product equations are presented to support these applications.

Gill's electronic theory of magnetism (1964) explains all of the above and is better than Maxwell's pre-existing dipole theory of magnetism (1873).

INTRODUCTION

The Northern and Southern lights also called the Aurora Borealis and Auroral Australis are a natural light display in the sky particularly in the high latitude (Arctic and Antarctic) regions known to be close to the magnetic poles of the Earth. Named after the Roman goddess of dawn, Aurora and the north wind, Boreas, the ancient Greek explorers Pytheas, Hiorter and Celsius in 1741 all described evidence of magnetic control.

Most aurorae occur in an auroral zone which is typically 3° to 6° in latitudinal extent and at all local times or longitudes. It had been established by Elias Loomis (1860), Hermann Fritz (1881) and S. Tromholt (1882) that the aurora appeared in the "auroral zone", a ring-shaped region with radius of 2500 km around the Earth's magnetic pole. During a geomagnetic storm, the auroral zone expands to lower latitudes as happened in 1859.

Kristian Birkeland (1900-1916) in his terrella experiments passed electric current through rarefied atmospheric nitrogen and oxygen around a magnetized sphere to cause colored rings near the magnetic poles of the sphere just like the auroras in the sky. Neither he nor his associate Carl Stormer (who calculated such paths) could figure out why the actual auroras did not reach the poles themselves. Gill's electronic theory of magnetism (1964) and this article help explain why these colored rings do not reach all the way to the magnetic poles.

Gill's electronic theory of magnetism (1964) has been applied to the SUN and the Earth. The solar IMF (a combination of proton dependant positive electrical field lines from the south magnetic pole of the SUN and the electron dependant negative electrical field lines from the north magnetic pole of the SUN) on approaching another magnet (Earth) splits with the negative electric field lines heading for the positive magnetic south pole of the Earth and the positive electric field lines heading for the negative magnetic north pole of the Earth. Diagrams will show the increase in electrical charge density to about 40,000 volts (number from satellite experiments) at 80kms above the ground in the Earth's rarefied atmosphere to cause the colorful Aurora Borealis and Aurora Australis.

Extra solar activity resulted in the great spectral event of 1859 on planet Earth as the extra electrical energy reached and disrupted the telegraph system of the time.

An ever diminishing electrical component does reach the Earth's auroral zones and lower latitudes by atmospheric dispersal. Some outlines/applications will be presented on how to tap this component of solar energy supported by dot product calculations.

Seeding source of the geo-magnetic dynamo of the Earth's magnetosphere will be explained.

METHOD

First, Gill's electronic theory of magnetism (1964) along with a simple experiment to show that the magnetic force is a combination of electron and proton dependant forces will be summarized. Next, it will be explained that as a magnetic force from the magnetic SUN approaches the magnetic Earth, its positive and negative components will split. Guided by the magnetosphere of the Earth, the positive electrical field lines from the proton dependant south magnetic pole of the SUN will head for the negative or inner electron dependant north magnetic pole of the magnetic Earth and the negative electrical field lines from the north magnetic pole of the SUN will head for the positive or proton dependant south magnetic pole of the Earth. Next, a diagram will show a component of the solar IMF approaching the Earth on the day side and a much larger component of the solar IMF going down the sides of the Earth to later turn around and affect the night side to cause a brighter light effect on the night side, while heading towards its magnetic poles. Calculations will show the increased electrical charge density at 80kms above the ground encountering the atmospheric gases to cause the auroras near the magnetic poles of the Earth and a diminished electrical charge does reach the magnetic poles of the Earth as the essential seeding for the geo-magnetic dynamo of the Earth and the ground.

Gill's electronic theory of magnetism (1964) explains how the positively charged protons and the negatively charged electrons are responsible for both magnetism and electrical forces.

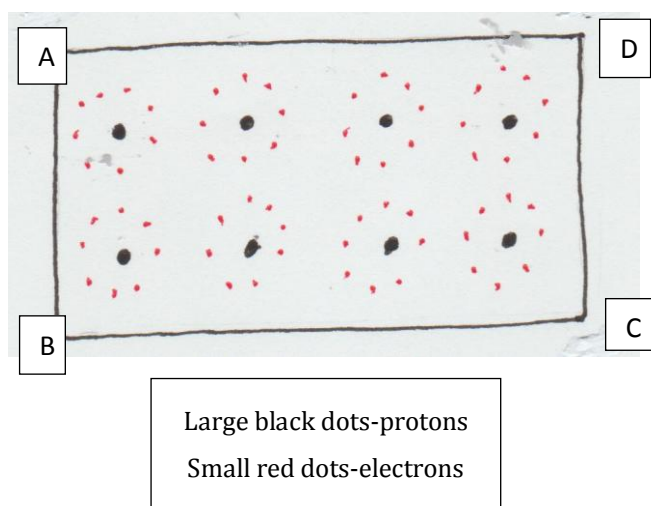


Fig1(a). above shows neutral iron atoms in an un-magnetized state.

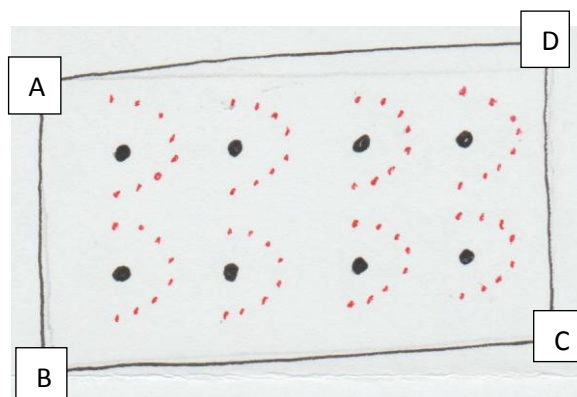


Fig1(b). above shows the change in position of the inner electrons on magnetization.

When this electromagnetic force approaches another magnet, its positive component will be attracted towards the negative or N-pole of the second magnet and repelled by the positive S-pole of the second magnet and its negative component will be attracted towards the positive S-pole of the second magnet and repelled by the negative N-pole of the same.

I am adding an experiment to show that the magnetic force is a combination of positive and negative forces.

Experiment: A physicist showed me the following experiment in 1965. On a wooden table, spread some coarse iron filings and in the middle of the iron filings, place a magnet.

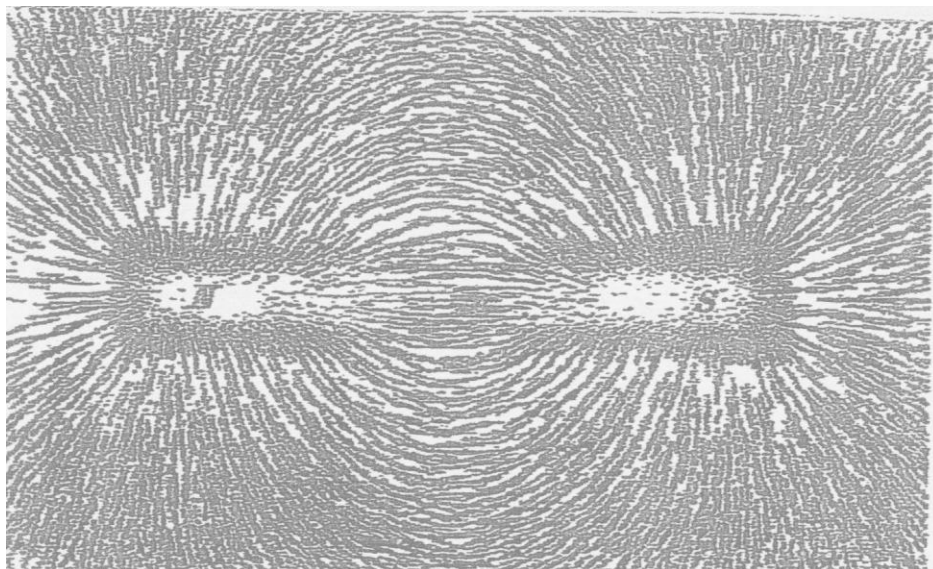


Fig2(a). shows a bar magnet with iron filings arranged along magnetic field lines

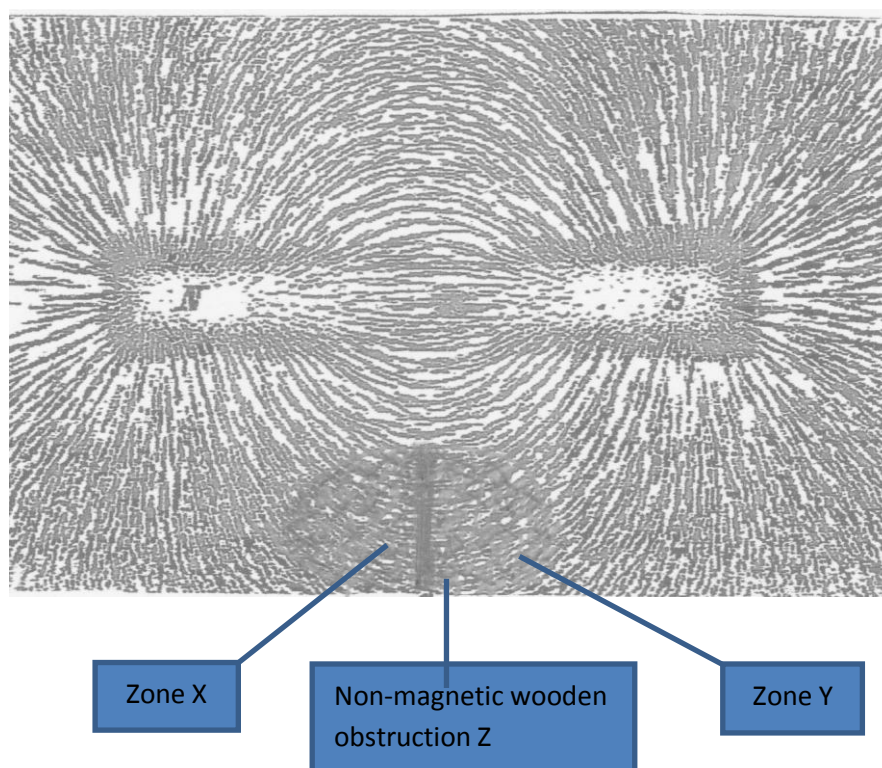


Fig2(b). a wooden non-magnetic obstruction Z is placed on one side on the iron filings

In Fig 2b, a wooden non-magnetic obstruction Z is placed on one side on the iron filings. The iron filings crumple on both sides of Z in zones X and Y. *If the magnetic force was a single force, the iron filings should have crumpled in Zone X or Zone Y only. Thus, the magnetic force is a combination of the positive force from the proton dependant south magnetic pole and the negative force from the inner electron dependant north magnetic pole of the magnet.*

Diagrams Explaining the Aurora Borealis and Aurora Australis

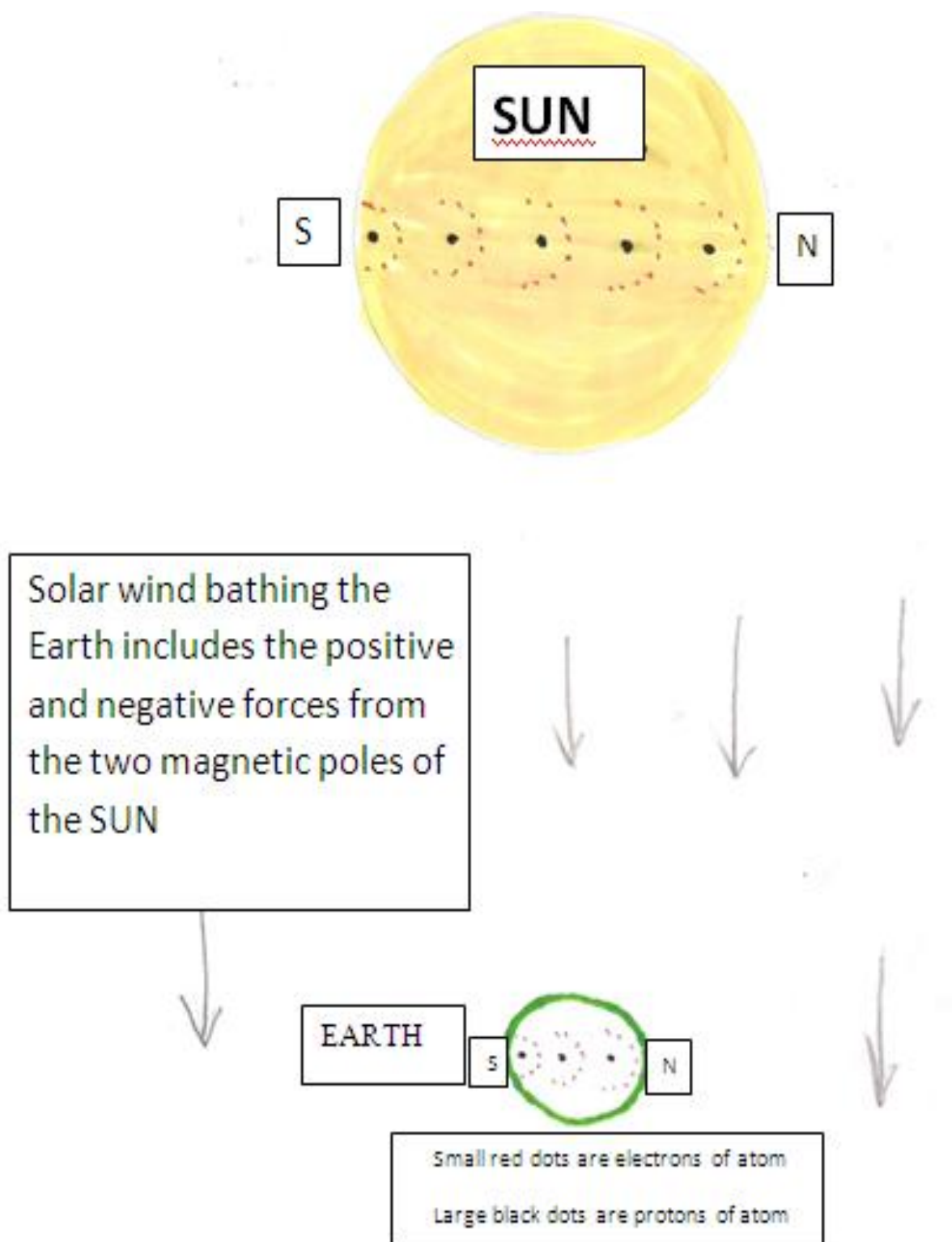


Fig3. Gill's electronic theory of magnetism (1964) applied to both the SUN and the Earth

Figure 3 above shows Gill's electronic theory of magnetism (1964) applied to both the SUN and the Earth. Please note that the south magnetic pole is near the geographic North Pole and the magnetic north pole is near the geographic south pole of the Earth. Same nomenclature is applied to the SUN. The IMF or interplanetary magnetic force is a part of the solar wind from the SUN.

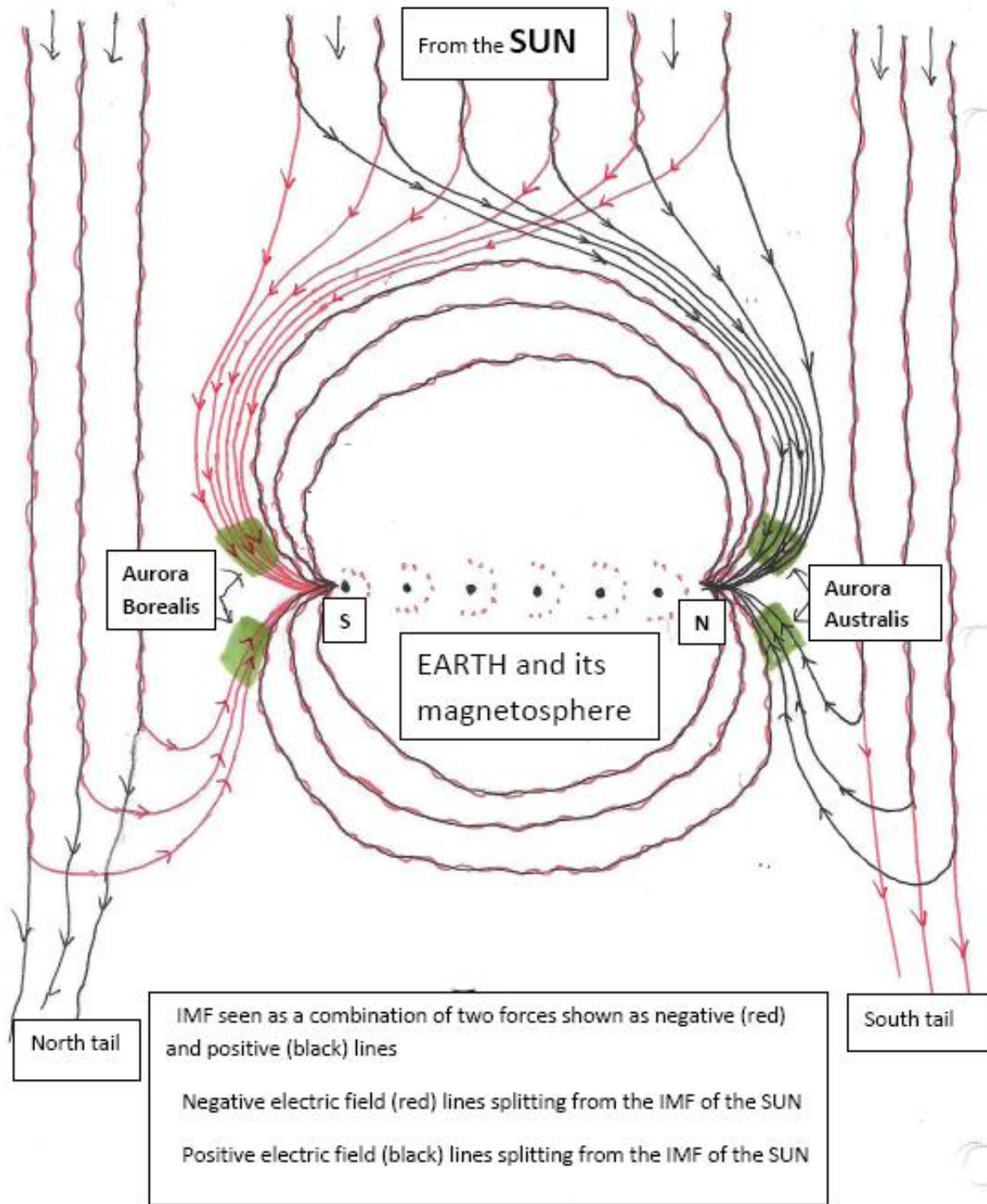


Fig4. The solar IMF which is a combination of proton dependant positive and electron dependant negative forces from the two magnetic poles of the SUN approaching the magnetic Earth at 400 kms/second.

The Earth has its magnetic N-pole as a non-moving negative charge consisting of exposed inner electrons (red dots represent the electrons) near the geographic South pole of the Earth and its magnetic S-pole is a positive charge seen as a large black dot which signifies the presence of exposed protons near the geographic North pole of the Earth. Between the magnetic N-pole and the magnetic S-pole inside the Earth is shown the arrangement of the ferromagnetic atoms inside the Earth according to Gill's electronic theory of magnetism (1964) and the magnetosphere of the Earth is shown as a combination of positive and negative forces from the two magnetic poles of the Earth.

As the solar IMF composed of the electron and proton based forces from the magnetic poles of the SUN approaches the Earth at a speed of 400 km/second, at a certain distance from the Earth of about 65,000 kilometers, the IMF of the SUN on encountering the magnetosphere of the Earth starts splitting into its positive and negative electrical field lines, which will head for the opposite magnetic poles of the Earth.

The above negative and positive electric field lines from the solar IMF are guided by the magnetosphere of the Earth towards the positive and negative poles of the Earth respectively.

As shown in the line diagrams, these electric field lines get pushed closer to each other resulting in an increased charge density (sigma σ) near the magnetic poles and satellites have observed a voltage of 40,000 volts at 80 kilometers above the surface of the Earth in these auroral zones.

As seen in Figure 4, and supported by **Kristian Birkeland's (1900-1908)** "terrella" experiments, this voltage is enough to cause the Aurora Borealis and Aurora Australis due to interaction of the positive and negative electric components of the solar IMF with the Earth's rarefied atmospheric oxygen and nitrogen as they head for the opposite magnetic poles of the Earth.

Passing down the side of the magnetic *S-pole* of the Earth (which is close to the geographic North pole of the Earth), the negative electric field lines head for the magnetic *S-pole* and its positive component is repelled which goes on to become the *N-tail* or *N-lobe*.

Also, passing down the side of magnetic *N-pole* of the Earth (which is close to the geographic South pole of the Earth), the positive electric field lines are pulled towards the magnetic *N-pole* of the Earth and here the negative component is repelled to become the *S-tail* or *S-lobe*.

THE AURORA AUSTRALIS AND THE AURORA BOREALIS VIEWED ALONG THE MAGNETIC N-S AXIS OF THE EARTH

In Fig 5a, Fig 5b and Fig 5c, we are looking at the Aurora Australis and the Aurora Borealis along the X-axis which is the magnetic N-S axis of the Earth.

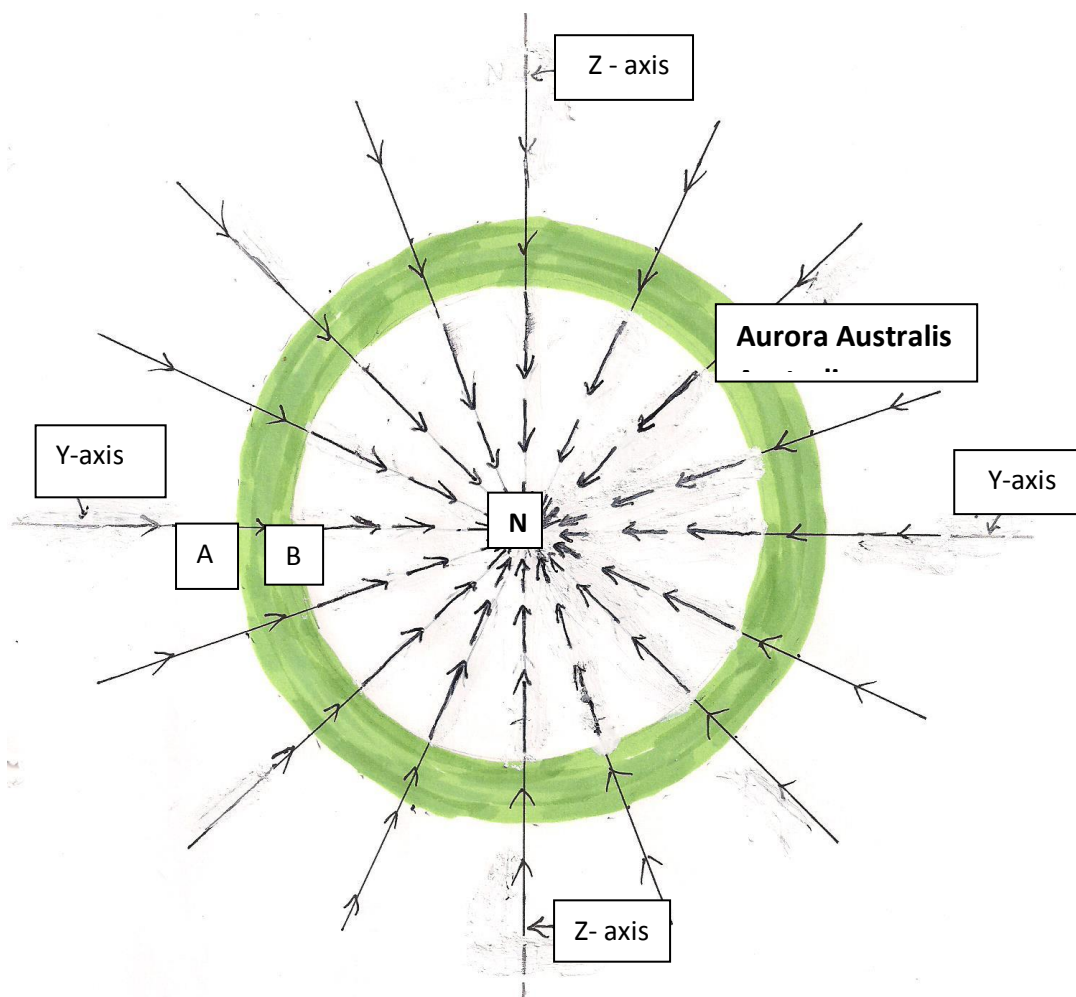


Fig5(a)

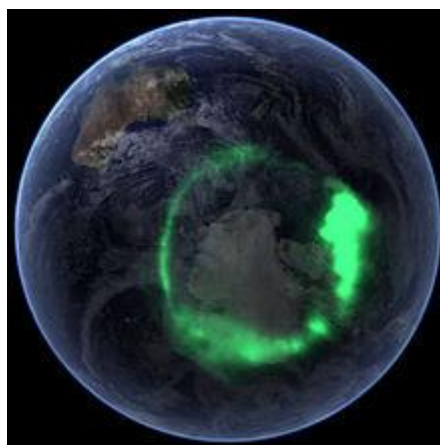


Fig5(b). *Aurora Australis captured by NASA satellite in 2005*

In above Figure 5a, we are looking at the magnetic N pole near the geographic south pole of the Earth along the N-S magnetic axis of the Earth. Figure 5b is a NASA satellite photograph.

In Figure 5a, the positive electric field lines from the solar IMF are shown headed for N, the magnetic N-pole of the Earth from all directions. The positive electric field lines are getting closer and closer to each other and when distance A-S is about 80 kilometers, the increased charge density σ or the electric current is strong enough to interact with the rarefied atmospheric gases like nitrogen and oxygen to cause the greenish Aurora Australis from point A to point B.

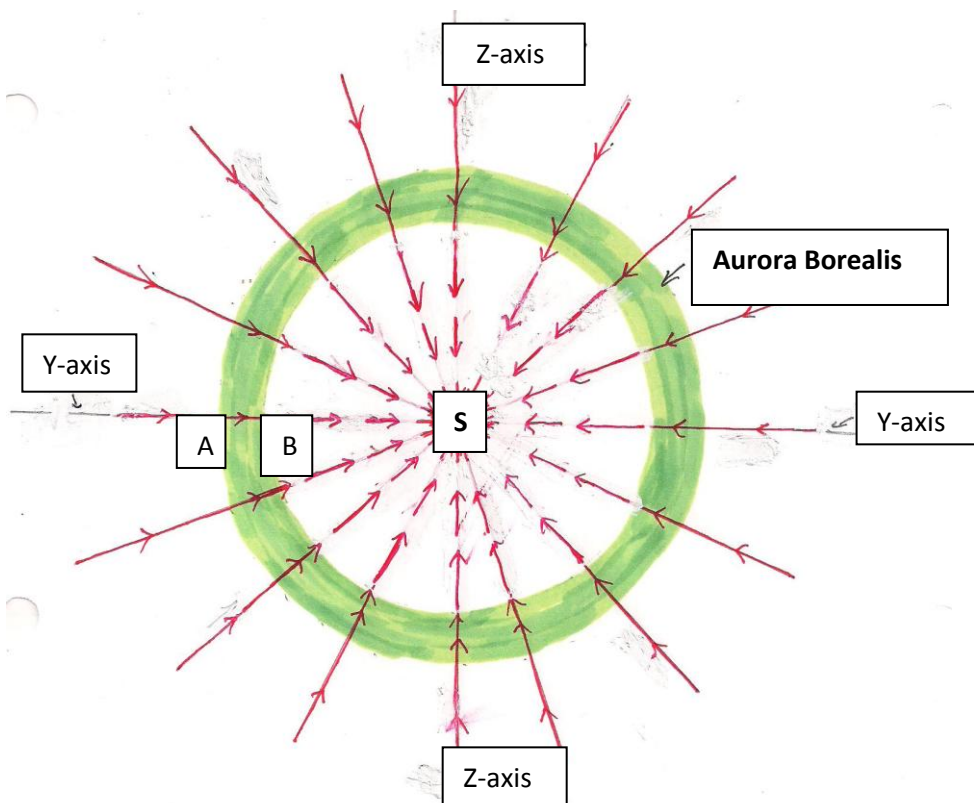


Fig5(c)

In Figure 5c, we are looking at the magnetic S pole near the geographic north pole of the Earth from Figure 3 in the Y-Z plane along the X-axis which is the N-S magnetic axis of the Earth.

Message from the Sun

The negative electric component of the Sun's IMF which is equal and opposite to the positive component is shown headed for S, the magnetic S-pole of the Earth from all directions. The negative electric forces are getting closer and closer to each other and when distance AN is about 80 kilometers, the electric current density is strong enough (about 40,000 volts) to interact with the atmospheric gases like oxygen and nitrogen to cause the greenish Aurora Borealis.

From point A to point B, we have the Aurora Borealis but some of the electric energy has been used up due to interaction with atmospheric gases to cause it.

The electric energy has diminished at point B so that between point B and point N there is an ever-diminishing electric current density which is not enough to cause the Northern Lights all the way to the Earth. *The human body does not feel electric current less than 5 mA.*

The electric current whether it is positive positron dependant electric current in Figure 5a and Figure 5b or the negative electron dependant electric current in Figure 5c will interact with the rarefied atmospheric nitrogen and oxygen to cause equally bright Northern and Southern lights.

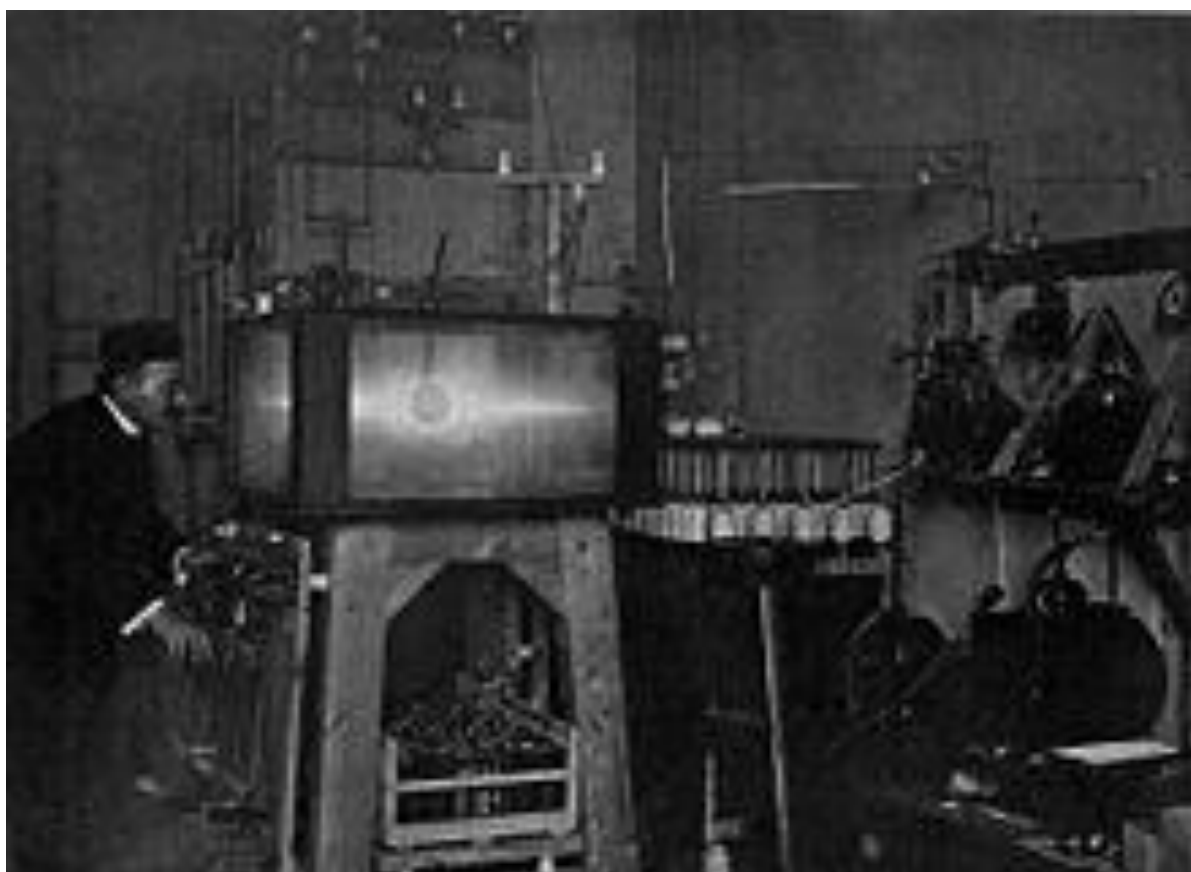


Fig6

In Figure 6 above, **Kristian Birkeland** (1900-1908), a Norwegian physicist simulated the auroral effect using a 'terrella', a magnetized sphere in a vacuum tank. He directed beams of cathode rays and found they indeed produced a glow in regions around the magnetic poles of the terrella because of residual gas in the chamber. The glow also outlined the path of the particles. *Neither he nor his associate Carl Stormer (who calculated such paths) could explain why the actual aurora avoided the area directly above the poles themselves as they had probably applied Maxwell's dipole theory of magnetism (1873) to the "terrella".*

If we apply Gill's electronic theory of magnetism (1964) to the above experiment, the electrons and positrons coming out of the cathode tube head for the opposite magnetic poles of the "terrella" and as explained in this article, we know that the electrons and positrons are significantly used to cause those lighted rings and the reduced energy heading for the magnetic poles is not enough to cause the lighted rings to reach all the way the magnetic poles.

Solar IMF Less on the Daylight Side and Much More Down the Sides of the Earth

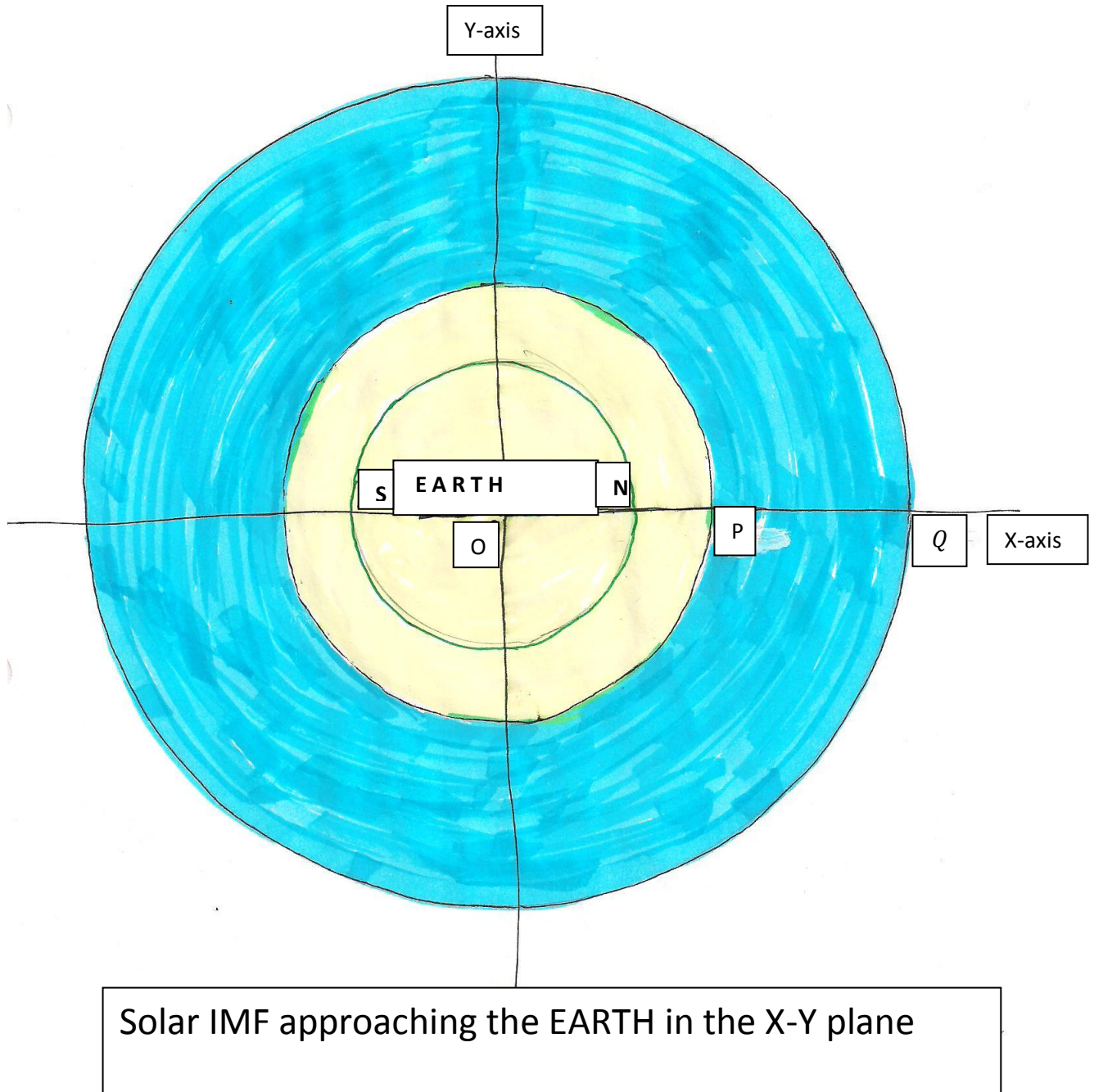


Fig7

Figure 7 shows the solar IMF approaching the Earth and its atmosphere from O to P on the daylight side and a much larger part of the solar IMF goes down the sides of the Earth from P to Q (blue area).

$ON = \text{radius of Earth}$; $NP = \text{atmosphere of Earth}$; $ON + NP = r$; PQ represents beyond = OP

The solar IMF runs into the Earth plus its atmosphere on its daylight side for a total area of πr^2 . The solar IMF going down the sides of the Earth is $\pi(2r)^2 - \pi r^2 = 3\pi r^2$. Actually, $PQ \approx \text{infinity}$. Thus, a much larger part of the solar IMF goes down the sides of the Earth (blue area) some of which will curve back later on the night side of the Earth towards its magnetic poles guided by the magnetic tail of the Earth. It has been observed that the auroras are brighter on the night side and the above reasoning explains the same.

Kristian Birkeland (1900-1916) pointed out that the solar wind is a combination of negative electrons ($-e$) and positively charged ions represented by ($+e$). This solar wind is headed for the Earth at 400kms/second and is squishing the magnetosphere of the Earth and at 65,000 kms above the Earth, the solar wind has $5 \text{ ions/cm}^3 = 5 \times 10^6 \text{ ions/m}^3$ and an equal number of negative electrons.

Thus, the total negative charge (in combination with an equal positive charge) headed for the daylight side of the Earth in one second is $= \pi r^2 h \times \text{charge}/m^3$

$$r = OP = \text{radius of Earth} + \text{atmosphere} = 6371\text{kms} + 100\text{kms} = 6.471 \times 10^6\text{m}.$$

$$h = 400\text{kms} = 4 \times 10^5\text{m}.$$

$$\text{charge } (c) = 5(-e)/cm^3 = 5 \times 10^6(-e)/m^3.$$

Thus, total negative charge on daylight side headed for the Earth in one second is

$$\pi r^2 h(c) = \frac{22}{7} \cdot (6.471 \times 10^6\text{m})^2 \cdot (4 \times 10^5\text{m} \cdot 5 \times 10^6(-e)/m^3) = 2.632 \times 10^{26}(-e).$$

As $-e = -1.6 \times 10^{-19}\text{C}$ (coulombs), applying this to the above calculation, we have

$$\pi r^2 h(c) = 2.632 \times 10^{26}(-1.6 \times 10^{-19}\text{C}) = -4.2 \times 10^7\text{C}/\text{sec}.$$

There is also an equal number of positive ions alongside the negative electrons, and we also have total positive charge on daylight side of the Earth $+4.2 \times 10^7\text{C}/\text{sec}$.

From Figure 5, we see that the solar IMF going down the sides of the Earth is *at least* three times.

Thus, total negative charge moving down the sides of the earth is $-12.6 \times 10^7\text{C}/\text{sec}$.

And the total positive charge moving down the sides of the Earth is $+12.6 \times 10^7\text{C}/\text{sec}$.

So, we have a solar IMF consisting of a negative electric current of $-4.2 \times 10^7\text{C}/\text{sec}$ combined with a positive electric force of $+4.2 \times 10^7\text{C}/\text{sec}$ headed for the daylight side of the Earth.

Also, we have a solar IMF consisting of a negative electric current of $-12.6 \times 10^7\text{C}/\text{sec}$ along with a positive electric current of $+12.6 \times 10^7\text{C}/\text{sec}$ going down the sides of the Earth.

As $\frac{\text{Coulomb}}{\text{sec}} = \text{Amperes}(A)$, the path of the electric field lines in Figure 3 show that the total positive charge of $+4.2 \times 10^7 A$ or has come close to each other in the auroral zone on daylight side along with a total positive charge of $+12.6 \times 10^7 A$ on the night side heading for the north magnetic pole of the Earth. This results in an increased charge density (**40,000 volts** by satellite experiments at **80 kms** above the ground) which causes the Aurora Australis.

The path of electric field lines in Figure 3 shows that the total negative charge of $-4.2 \times 10^7 A$ has come close to each other in the auroral zone on daylight side along with a total negative charge of $-12.6 \times 10^7 A$ on the night side heading for the south magnetic pole of the Earth resulting in an increased charge density (**40,000 volts** at **80 kms** above the ground corroborated by astrophysicist Joan Feynman's(1970) data collected by the Explorer 33 spacecraft and also seen by other satellite experiments) which causes the Aurora Borealis.

DISCUSSION

The solar IMF which starts from a temperature of 2 million degree Celsius on the surface of the SUN is the finest example of negative electrical energy converting to electrons and positive electrical energy converting to protons or positrons and vice versa. So, the above electric field lines could be in the shape of energy or corresponding charged particles.

It has been observed that Aurora Borealis Aurora Australis are of equal intensity at any given time and brighter on the night side. The above discussion and application of Gill's electronic theory of magnetism (1964) corroborates this finding.

The large gathering of negative electric field lines from the Sun near the magnetic S-pole of the Earth which is near the geographic North pole causes an "Aurora Borealis" and the large gathering of positive electric field lines from the Sun near the magnetic N-pole which is close to the geographic south pole causes "Aurora Australis" as these separated components of the Sun's electromagnetic force traverse the atmospheric gases and head for the magnetic S-pole and the magnetic N-pole respectively. *These electric components are getting partly used up in causing the aurorae and hence not able to cause an aurora all the way to the magnetic poles of the Earth.*

The magnetic forces of the Earth's magnetosphere have minimal direct role in causing the Aurora Borealis or the Aurora Australis, but do help in directing the solar positive and negative electric field lines towards the opposite magnetic poles of the Earth.

Kristian Birkeland (1900 – 1916) with his terrella experiments showed the color due to electric current passing through rarefied nitrogen and oxygen gases around a magnetic sphere and correctly pointed out the electrical nature of the Auroras. The Auroras result from emission of photons in the Earth's upper atmosphere at about 80kms above the surface of the Earth, from ionized nitrogen atoms regaining an electron, and oxygen and nitrogen atoms returning from an excited state to a ground state. The 40,000 voltage is enough to cause the colorful interaction between the solar electrical forces and the nitrogen and oxygen atoms of the atmosphere which exist as a part of the Earth's atmosphere at 80 kilometers above the surface. Oxygen results in green or orange-red emissions and nitrogen results in blue or red emissions.

Elias Loomis (1860) and later in more detail Hermann Fritz (1881) and S. Tromholt (1882) established that the aurora appeared mainly in the "auroral zone", a ring-shaped region with a radius of approximately 2500 km around Earth's magnetic pole. It was hardly ever seen near the geographic pole, which is about 2000 km away from the magnetic pole indicating a link with magnetism.

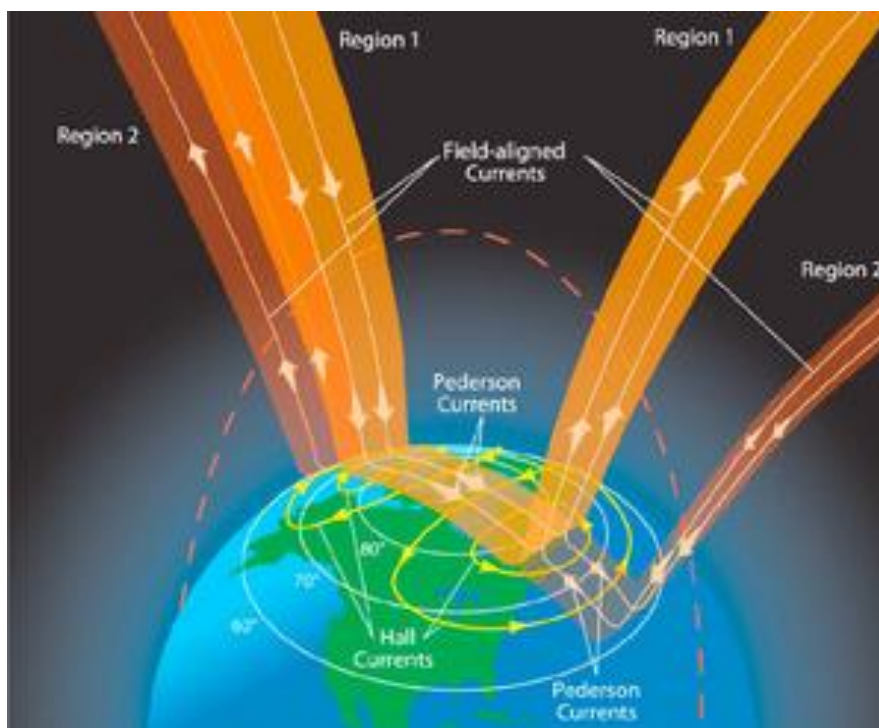


Fig8

Kristian Birkeland (1900-1916) did not trace the diminishing electric current all the way from the SUN to the magnetic poles of the Earth but made it travel in the atmosphere from region 1 to region 2 as shown in above Figure 8. He deduced that the currents flowed in the east-west directions along the auroral arc, and such currents flowing from the dayside toward (approximately) midnight were later named "auroral electrojets".

The authors projection diagrams aided by the application of Gill's electronic theory of magnetism (1964) explains how the solar positive and negative electric charges (both components of the solar IMF) flow towards the opposite magnetic poles of the Earth from all directions and cause the ring-shaped aurora lights in the auroral zone and not in the east-west direction as previously stated by Kristian Birkeland. The flow of electric charge in the East to West direction is an *erroneous* conclusion although it might appear like that from the ground.

In 1741, **Benjamin Franklin** theorized that the "mystery of the Northern Lights" was caused by a concentration of electrical charges in the polar regions intensified by the snow and other moisture. Intensification of electrical charges in the polar region due to the snow and other moisture is not the primary reason for increased charge density of 40,000 volts at 80kms above the ground.

The concentration of the electrical charges is because these electrical field lines are all headed for the magnetic poles of the Earth (shown diagrammatically) and come closer to each other aided by the Earth's magnetosphere with the SUN being the primary source causing the auroras.

Some of the diminished electrical forces do reach the magnetic poles of the Earth and are the *essential seeding source* for the geomagnetic dynamo of the Earth which causes the magnetosphere of the Earth.

Message from the Sun

The component of the charge that reaches the ground is *less than 5 mille amperes* or may even be in microamperes and is thus not felt by the human body. This diminished charge is more near the magnetic poles but extends in a diminishing manner up to the equator.

MESSAGE FROM THE SUN

The intense coronal ejections which resulted in the most spectacular auroras on 28th August and 2nd September 1859 and which affected the telegraph system of the time will be explained and later, some devices which could amplify or multiply even the mild solar electrical energy normally present near the surface will be presented.

It is also notable for the fact that it was the first time where the phenomena of auroral activity and electricity and magnetism were unambiguously linked. This insight was made possible not only due to scientific magnetometer measurements of the era, but also as a result of a significant portion of the 125,000 miles (201,000 km) of telegraph lines then in service being significantly disrupted for many hours throughout the storm.

The following conversation occurred between two operators of the American Telegraph Line between Boston and Portland, Maine, on the night of 2 September 1859 and reported in the *Boston Traveler*:

Boston Operator (to Portland Operator): "Please cut off your battery [power source] entirely for fifteen minutes."

Portland Operator: "Will do so. It is now disconnected."

Boston: "Mine is disconnected, and we are working with the auroral current. How do you receive my writing?"

Portland: "Better than with our batteries on. Current comes and goes gradually."

Boston: "My current is very strong at times, and we can work better without the batteries, as the aurora seems to neutralize and augment our batteries alternately, making current too strong at times for our relay magnets. Suppose we work without batteries while we are affected by this trouble."

Portland: "Very well. Shall I go ahead with business?"

Boston: "Yes. Go ahead." The conversation was carried on for around two hours using no battery power at all and working solely with the current induced by the aurora, and it was said that this was the first time on record that more than a word or two was transmitted in such manner.

Explanation: *During the great geomagnetic storm of 1859, owing to extra coronal ejection from the SUN, we had a larger solar IMF resulting in its larger electrical components making it all the way to the ground and the telegraph operators experienced this "Message from the SUN" as an interruption or support of their telegraph system.*

Harnessing the Mild Solar Electric Current On or Near the Ground

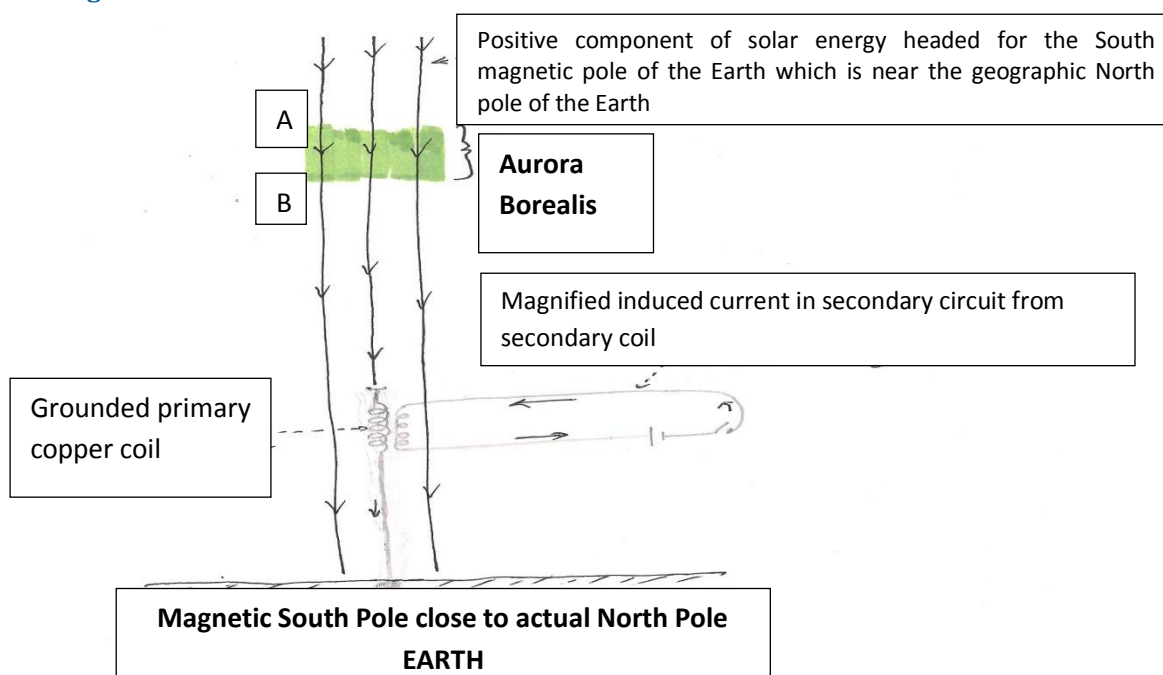


Fig9

In Figure 9, from point A to point B, we have the solar IMF's positive electric component at 80 kilometers above the magnetic N-pole of the Earth causing Aurora Borealis. Between B to N, the solar electric component has diminished so that it is not strong enough to cause the light effect and continues to diminish as it traverses the atmosphere to a few mille-amperes or even less on reaching the ground.

Just above the ground near the magnetic pole region in the auroral zone and even beyond, we place an electricity conducting coil which has its free end upwards towards B and the other end is grounded. Owing to the induction coil effect, the magnified useful electric current in the secondary coil will make usable electric energy available.

This alternate solar energy, although it heads for the magnetic poles of the Earth, also gets dispersed well beyond the auroral zone owing to interference by atmospheric atoms on its way down. Hence, we have this mild electric energy almost up to the equator although it will be strongest near the magnetic poles of the Earth and weakest at the equator. It will be more at night and the colder the temperature, the more the superconducting effect on the metallic coils and the more the electrical energy.

Self-Charging Cell Phone Battery

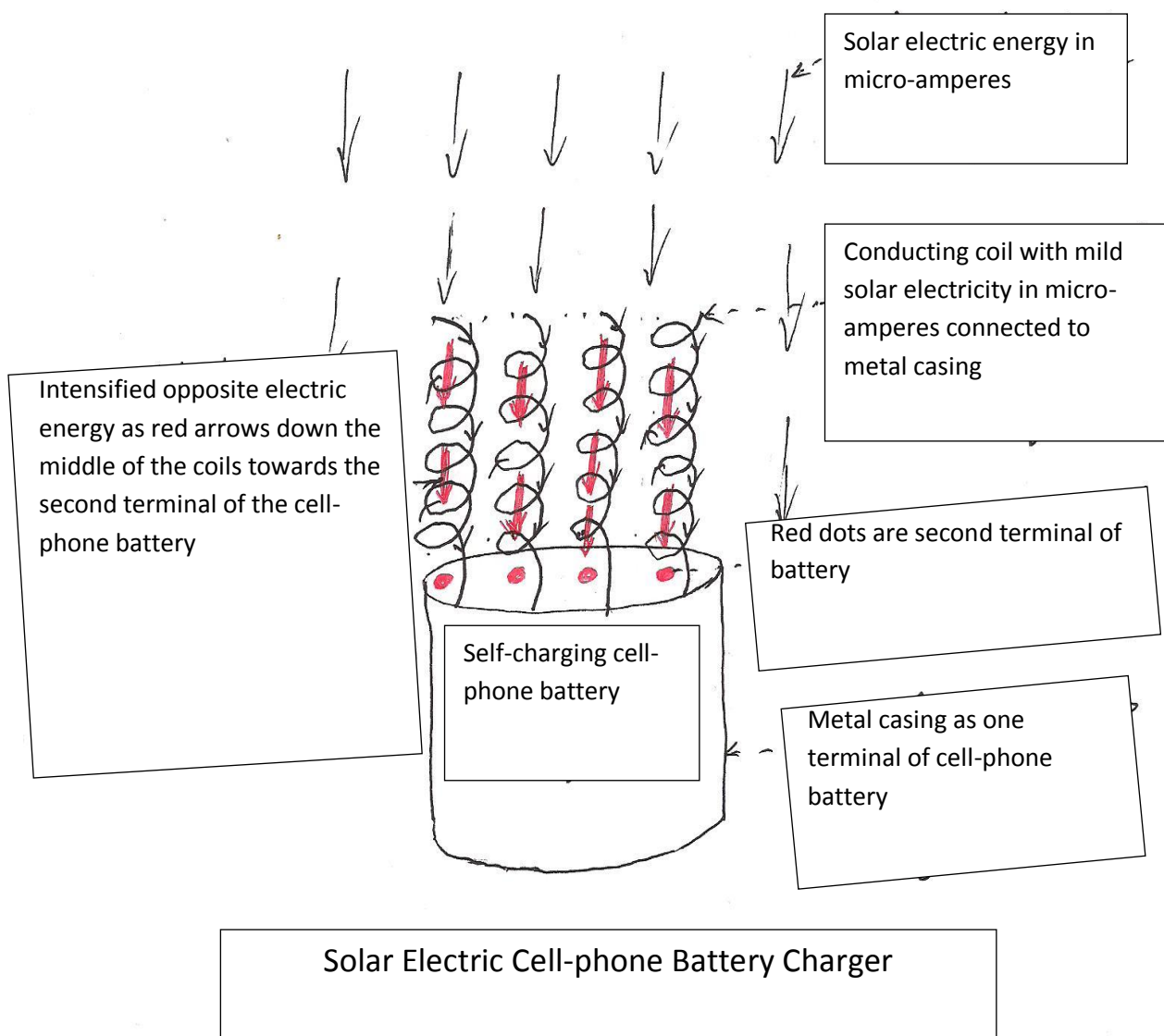


Fig10

Figure 10 is an outline of self-charging cell-phone battery. For very simple functions, this cell-phone could work without a battery although grounding will be needed.

A Modified Windmill

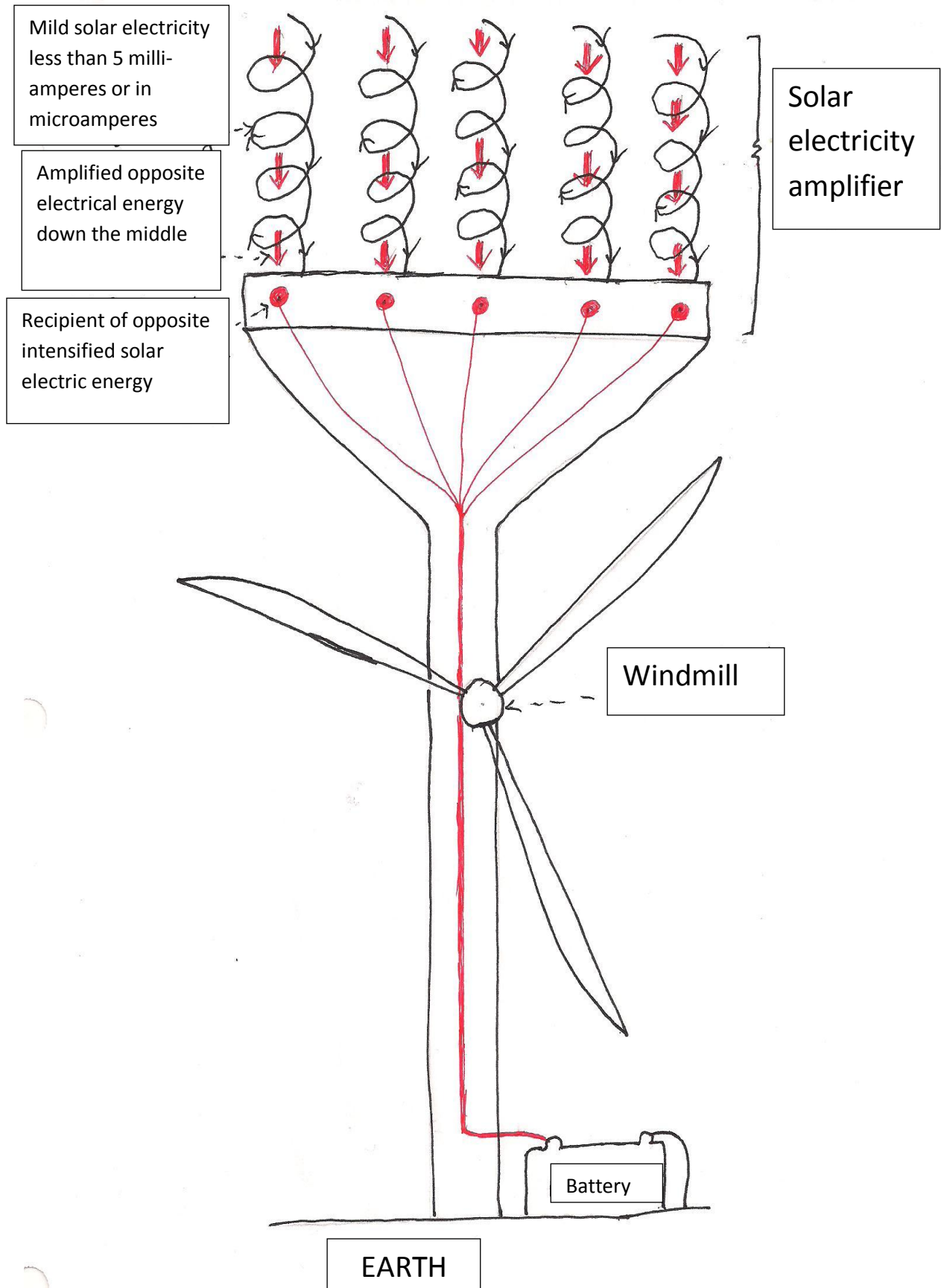


Fig11

Figure 11 is Solar electric amplifier atop a windmill making electricity more economical.

Hybrid Airplane

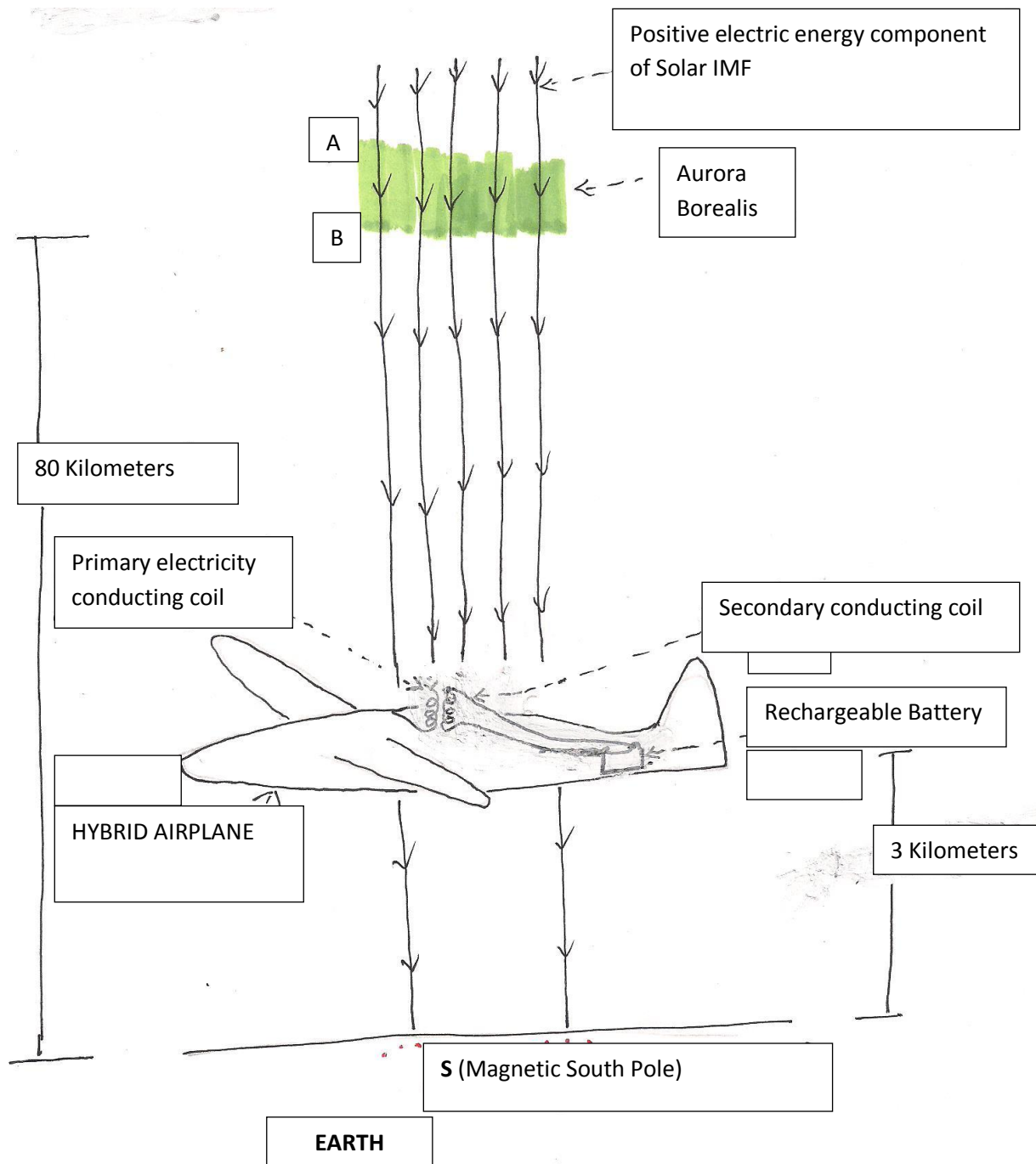


Fig12

Figure 12 shows how Airplanes flying in the auroral zone or even away from it could be similarly powered by this solar source of electricity once they are up in the air (**Hybrid airplanes**).

These planes could take off in a regular manner with gasoline, but once they are cruising at about 3 kilometers in the air, they could switch to running on continuously recharging batteries with the help of the positive or negative electric current (call it solar electric rain) coming towards the Earth from the Sun which has been suitably increased with the super-conducting induction coil method.

The temperature at the cruising altitude of airplanes is well below zero degree Celsius and that will help.

Also, the solar electric component at that height will be more than what reaches the ground.

These recharging batteries will run the turbines while the plane is in the air at a minimal cost.

The same thing can be done in the both auroral zones and even away from it.

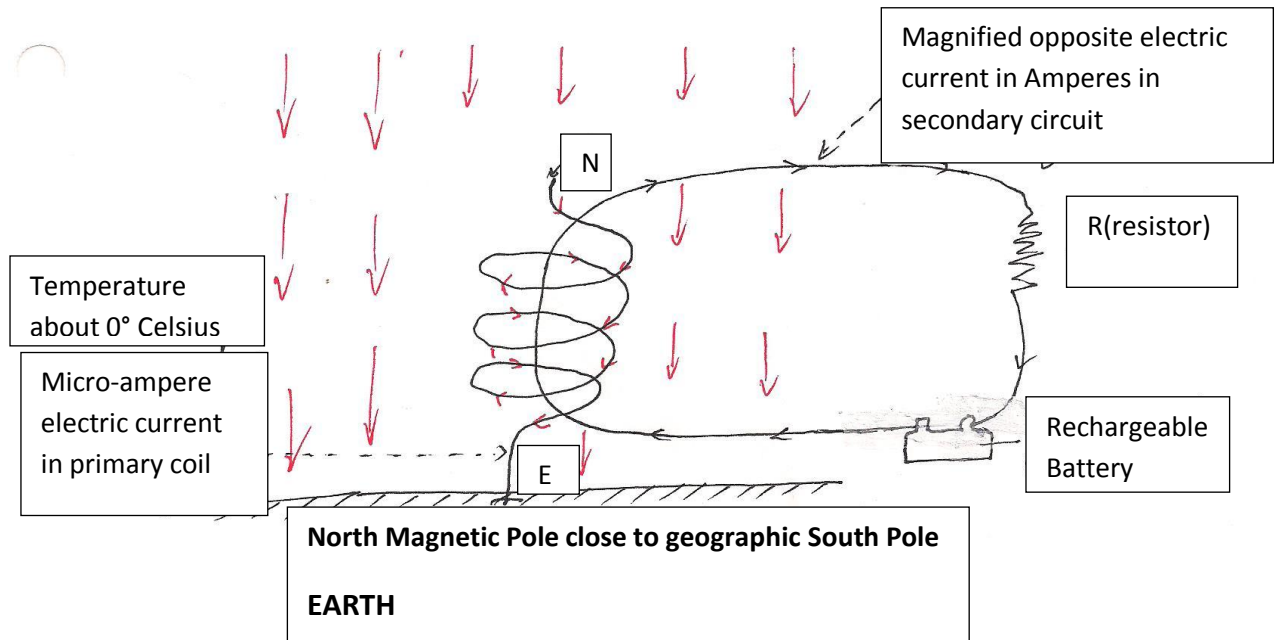


Fig13

In Figure 13, coil N-E behaves like a mini cyclotron and an electron or proton alone will move down the middle and now we have placed a wire in the middle of the coil S-E which will result in a greater flow of electric current in the secondary circuit. The lowered resistance because of the cold temperature will help in the flow of the greater induced direct electric current, originating from the Sun through the coil. Thus, N-E will behave like a small super-conductor. An electron or a proton placed in the middle of a super-conductor coil travels at great speed along the central length of the coil. We have now placed an electricity-conducting wire in the middle of this mini-cyclotron and the loose valence electrons in this central wire will flow through this central wire as an amplified electric current which is many times the small solar electric current flowing in the coil N-E.

Another Application: If we need a small amount of electrical energy, we could use the following method to harness solar electrical energy.

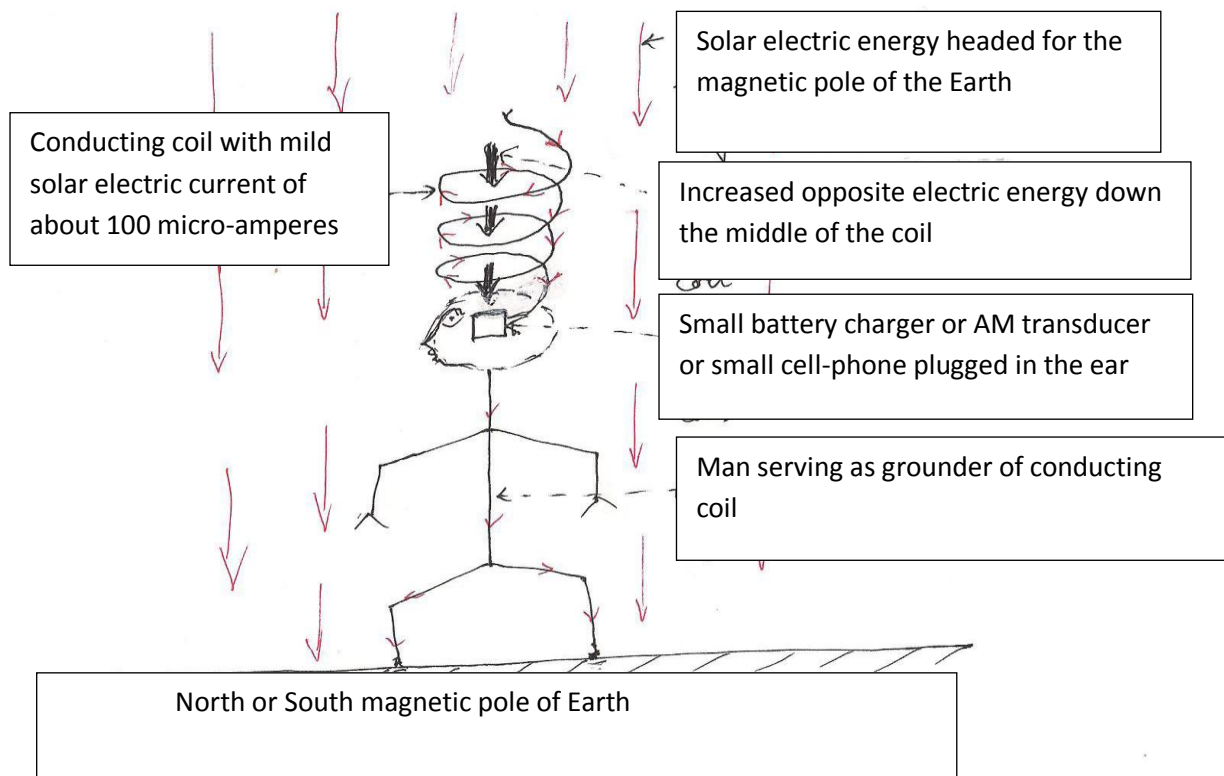


Fig14

In the above figure 14, we are using a small electricity conducting coil pointed upwards towards the sky. As per the previous discussion, we now have a situation where there is an increased opposite electric energy down the middle of this coil like a mini-cyclotron.

At the lower end of the coil we have connected a small cell-phone battery charger or an AM transducer plugged in a human ear which serves as a ground.

Thus, this simple grounded coil will charge the cell-phone or make an AM transducer audible when applied to the ear with the help of the opposite increased electric energy down the middle of the coil.

This coil will work better in cold weather and at night as per previous discussion. It will work better in the auroral zones but should work well beyond the auroral zone as the solar electric current headed for the magnetic poles of the Earth undergoes some dispersal by the atmosphere.

Electrical Force on a Valence Electron in the Central Copper Wire from the Conducting Coil

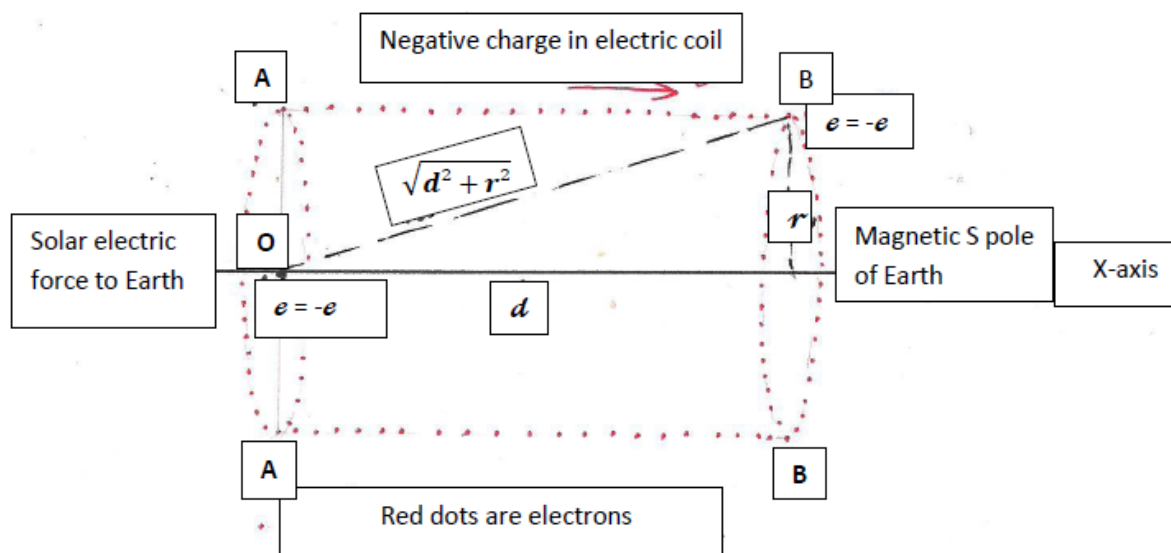


Fig15

AA to BB is a cylindrical conducting copper coil from point A to point B pointed towards the magnetic South pole of the Earth which is near the geographic North pole of the Earth. A copper wire has been placed in the center of the coil along the X-axis. At the point O of the central copper wire along the X-axis, we have placed a valence electron of an atom of the wire with a charge $e = -e$. As the mild solar electrical current is flowing through the coil, we have electrons flowing from $A \rightarrow B$ in the copper coil and we have an electron with a charge $-e$ at point B in the conducting copper coil. The distance $A \rightarrow B = d$ in meters and r is the radius of the coil in meters. Applying Pythagoras theorem, the distance $OB = \sqrt{d^2 + r^2}$. Using Coulomb's law, the force of repulsion between $e = -e$ at O and $-e$ at point B is

$$F = \frac{k(-e)(-e)}{(\sqrt{d^2+r^2})^2} = + \frac{ke^2}{d^2+r^2} \text{ (Newtons-the electrical force unit)}$$

Where k is the Coulomb's constant. The bold letter equations are vectors.

The plus sign indicating repulsion between the flowing negative electron at point B and the negative free valence electron of an atom of the central copper wire at point O.

θ is the angle between OB and the X-axis and the dot product vector of OB along the X-axis is

$$F \cos \theta = + \frac{ke^2}{d^2+r^2} \cos \theta = + \frac{ke^2}{(d^2+r^2)} \cdot \frac{d}{\sqrt{d^2+r^2}}$$

When d is very large compared to r , then r^2 is still smaller and can be ignored and the above vector along X-axis is

$$F \cos \theta = + \frac{ke^2}{d^2} \cdot \frac{d}{\sqrt{d^2}} = + \frac{ke^2}{d^2}$$

As the electrons move from A to B, d varies from $d = 0$ at A to $d = d$ at B and if d_x is an infinitesimally small distance along A-B, then the vector along the X-axis becomes

$$F = \frac{d}{0} + \frac{ke^2 dd_x}{d^2} = +ke^2 \int_0^d \frac{d_x}{d}$$

The derivative of $\log d = \frac{1}{d}$, so the anti-derivative of $\frac{1}{d} = \log d$ and integrating from 0 to d

$$F = +ke^2 [\log d]_0^d = +ke^2 (\log d - \log 0) = +ke^2 \cdot \log d \text{ Newtons.....Equation 1a}$$

As the number of electrons rotating in a circular manner in every coil is a at any particular time where in case of copper wire, each atom has one free valence electron, so a also represents the number of copper atoms in the circular coil, where a depends on radius r and the **total a** will depend on the number of coils at each level and the total vector from **equation 1a** along positive X-axis direction from $A \rightarrow B$ is

$$\text{Electrical force } F(\text{total}) = +kae^2 \log d \text{ newtons-----Equation 1b}$$

This increased central electrical force will manifest on loose valence electrons in the central wire. The increased positive force on the central wire is due to the *coil effect* where an otherwise moving electron in a straight line has become a significant multiple at each level and increasing the distance d of the coil as far as technically possible would also help.

Electric power is the rate at which electric energy is transferred by an electric circuit. The SI unit of power is the one joule per second called the watt.

$$\text{Work } (P) = \frac{\text{newton.meters}}{\text{sec}} = \frac{\text{joules}}{\text{second}} = +kae^2 \log d \frac{\text{newton.meters}}{\text{sec}} \text{ or watts.}$$

As the atoms in the central metallic wire are in a homogeneous medium, the calculations can be done from the central axis of the central wire for all the atoms in the central metallic wire.

Simply put, if we convert 100 meter of straight copper wire through which mild solar electric current of 5 milliamperes(mA) is flowing into a coil 1 meter long, we will have 500 mA of opposite electric energy flowing down the center of the coil. If we put 10 of these coils parallel to each other atop a windmill, we will have 5000 mA = 5 Amperes of opposite electrical energy going down the middle in Fig.11 or somewhat less in Fig.10. This could be used both directly or to store it in a battery.

The above calculations point to a significant multiplication of the available solar electrical energy with the help of the *coil effect*. Thus, the positive force on the central wire causing a positive electric current in the same direction as the negative electric current in the coil is a significant multiple of the mild negative electric current in the coil.

The electric current I is inversely proportional to the absolute temperature T ($I \propto \frac{1}{T}$). The electric current I is also inversely proportional to the wire resistance R ($I \propto \frac{1}{R}$). Absolute temperature T is directly proportional to the resistance of the wire ($T \propto R$).

Although Fig.9 to Fig.14 will function all the way to the equator, they will work best in:

- auroral zones (magnetic poles of Earth being the primary target of solar electric energy)
- better with colder temperature (superconducting effect)
- better at night (explained in this article)
- better at height (solar electric energy keeps on diminishing as it approaches the ground).

The aim would be to convert a milli-ampere into an ampere.

CONCLUSION

The solar IMF causing the Northern and Southern lights also known as Aurora Borealis and Aurora Australis is explained with the help of *Gill's electronic theory of magnetism (1964)*. It is explained how the solar IMF splits into its positive and negative electric components which flow towards the opposite magnetic poles of the Earth from both day and night sides and not in the east-west direction as previously stated. It is explained why both the aurorae are equally bright and brighter on the night side.

The reason for the light ring near the magnetic pole in Kristian Birkeland's (1900-1916) terrella experiment not reaching all the way to the magnetic pole is explained.

The *essential seeding* with solar electrical energy which is vital for the geo-magnetic dynamo of the Earth is also shown.

Message from the Sun

In 1859, how the *great geomagnetic storm* due to a temporary massive coronal ejection from the Sun resulted in extra solar electrical energy causing the telegraph lines during this episode being interrupted or kept going without any external battery is explained (*Message from the SUN*).

Harnessing of milder electrical energy by amplifying it to a useful level has been suggested with *some applications*. These applications are supported with *dot product calculations* towards the end of the article.

The *solar IMF* as being composed of positive and negative electrical energy has been explained with the application of Gill's electronic theory of magnetism (1964).

This article also helps in supporting Gill's electronic theory of magnetism (1964) as it simplifies the above explanations unlike Maxwell's dipole theory of magnetism (1873).

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Notes: Completed Orders by author for provisional patents for Figure 11 and Figure 10.

| ORDER NO. | DOCUMENT NAME | FOR | DATE PURCHASED | STATUS | |
|-----------|------------------------------------|--|----------------|--------|--|
| 38372066 | Provisional Application for Patent | Solar electric charger atop a Windmill or Windmill + Solar electric charger. | 03/20/2015 | | |
| 34803625 | Provisional Application for Patent | Solar electric energy cell-phone battery charger. | 04/20/2014 | | |

REFERENCES

Aurora – *The magnificent northern lights* -Ioannis Dagleis and Syun-Ichi Akasofu

Birkeland, Kristian (1908). *The Norwegian Aurora Polaris Expedition 1902-1903, New York: Christiania (Oslo): H. Aschehoug & Co.*

The Birkeland Terrella – Sphaera

Størmer, Carl (1946). "Frequency of 12,330 measured heights of aurora from southern Norway in the years 1911–1944". *Terrestrial Magnetism and Atmospheric Electricity*.

"Current Auroral Oval". *SpaceWeather*.

"NASA-THEMIS Satellites Discover What Triggers Eruptions of the Northern Lights", *Nasa.gov*. 2011.

"Simultaneous ground and satellite observations of an isolated proton arc at sub-aurora latitudes", *Journal of Geophysical Research*. 2007.

The Ingenious Dr Franklin, Philadelphia: University of Pennsylvania Press. Goodman, N. (ed.) (1931).

"How does the Earth's core generate a magnetic field" *USGS FAQs*. United States Geological Survey.

"The Geodynamo". *Glatzmaier, Gary*. University of California Santa Cruz. October 2013.

THE INTENSITY OF THE EARTH'S MAGNETIC FORCE REDUCED TO ABSOLUTE MEASUREMENT by Carl Friedrich Gauss; December 15, 1832

"The Exploration of the Earth's Magnetosphere", *Stern*, David P.; Peredo, Mauricio.

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