BISOLENOID MODEL OF STARS

By Paul D. Thomas Ed. D.

Introduction

This paper gives a detailed consideration of three different divisions of stars:

I. Protostars

II. Main sequence stars like the sun

III. Collapsed stars

A discussion of the authors three articles:

A. Two Cone Model of a Pulsar

B. Two Cone Model of a Bipolar Protostar

C. Bisolenoidal Model of Stars

will be considered as applies to each of the previously mentioned categories of stars.

The ATwo Cone Model of a Pulsar@ was written by the author in the 1990s, but has not previously been published. A copyright was obtained in 2000. It is included as Appendix A. It is essential that the reader become familiar with that article before continuing with this paper.

The author=s paper entitled ATwo Cone Model of a Bipolar Protostar@ was written in 2005. A copyright was obtained in 2005, but has not been previously published. It is included as Appendix B and the reader should also become familiar with that article before continuing with this paper.

HYPOTHESES

Hypothesis I - The bipolar flows of radiation from objects that are, either collapsing or already collapsed, results from the effects of the combination of the following:

1. Light House Model
2. Two Cone Model involving:
   A. Synchrotron Cone
   B. Exit cone/Dwarf Exit Cone
3. Bisolenoidal Model of Stars - involving the wrapping of magnetic lines of force about stellar cores resulting in two solenoids with like magnetic poles held adjacent to each other at stellar centers.
4. Flux Tubes of magnetic lines of force produced by a stellar bisolenoid where current is flowing north to south. The flux lines of force point toward the poles due to the direction of flow of the bisolenoid current.

Hypothesis II - Equatorial area multiflows of radiation from stellar objects, that are either collapsing or already collapsed, are produced in the same manner as bipolar flows of Hypothesis I with the following exceptions.

1. The current is flowing through the bisolenoid magnetic line wrappings from south to north.
2. The bisolenoidal magnetic polarization is therefore reversed from conditions in Hypothesis I.
3. The Flux Tubes in each hemisphere point toward the stellar center.

4. Because of the compacted magnetic field due to adjacent like magnetic poles, the larger flux tubes within the bisolenoid break into multiple smaller flux tubes, flux sheets, or flux disks that bend upward, each surfacing vertically through lower latitudes near the stellar equator.
5. These smaller flux tubes produce multiple vertical radiation equatorial flows from multiple exit troughs that surround the star at low latitudes.

HYPOTHESIS III - The equatorial area multiflows indicate that millipulsars may not rotate as rapidly as the number of pulses seem to indicate when all pulsars were believed to be due to bipolar flows. That is, the millipulsars may be rotastars rather than millirotastars.

HYPOTHESIS IV - The equatorial multiflows may solve the mystery of what produces the beats heard when observing some pulsars.

HYPOTHESIS V - Relativistic, charged, radiating particle may possess a dwarf exit cone cousin to the exit cone of a neutron star. This results because acceleration forces mimics gravitational forces.

HYPOTHESIS VI - The relativistic, charged, radiating particle may also be surrounded by a dwarf photon sphere, cousin to the photon sphere around a neutron star, where radiation is held captured, circling the particle eternally.

HYPOTHESIS VII - When a relativistic particle with a dwarf photon sphere is suddenly stopped, the dwarf photon sphere releases its captured radiation.

HYPOTHESIS VIII - When relativistic particles strike a screen, such as at particle accelerators, the released light from the photon spheres contribute to the resulting glow seen on the screen.

HYPOTHESIS IX - When relativistic particles are funneled from above the earth, toward the earth=s magnetic poles, they penetrate the atmosphere to produce the auroras. If these particles have dwarf photon spheres and are decelerated to zero velocity by striking the atmosphere, they should release the captured light from their dwarf photon spheres, where it contributes to exciting the atmosphere which produces the auroral displays.

*HYPOTHESIS X - The stellar bisolenoid magnetic field lines may produce a stellar size capacitor at the center of stars by creating a resistance that slows down the flow of electrons near the stellar center creating a pile up of electrons. Positively charged particles then pile up on the other side of the center with the compacted magnetic lines of force, acting as the dielectric for the stellar capacitor.

*HYPOTHESIS XI - The stellar size capacitor becomes over charged causing it to discharge by reversing the direction of flow of the current through the solenoidal magnetic line wrappings which results in:

1. The reversal of the polarity of the solenoid in each hemisphere.
2. The reversal of the direction of the compacted lines of force in the flux tube in each hemisphere.
3. The change from bipolar flow to multiequatorial flow is determined by the polarity reversal of the stellar bisolenoid.
4. In the case of main sequence stars, the end to an old sunspot cycle and the beginning of a new cycle, may result from the stellar bisolenoidal polarity reversal.

*HYPOTHESIS XII - Eddy currents are produced in the bisolenoid that may result in the production of sunspots.

*HYPOTHESIS XIII - These eddy currents have a ring of circulating electrons that produce magnetic flux lines that oppose the magnetic flux that produces the eddy currents. The author believes the eddy currents escape from the flux tube at the Aeffective end of the flux tube@ where they spin up to the photosphere to produce sunspots.

*HYPOTHESIS XIV - The eddy currents increase in strength as the sunspot cycle progresses, which result in:

1. The migration of the Aeffective ends of the flux tubes@ to lower latitude.
2. The migration of the sunspots toward the lower latitudes as the sunspot cycle grows older.
3. The end of the sunspot cycle when the eddy currents are strong enough for the induced EMF to overcome the Bisolenoidal EMF.

*HYPOTHESIS XV - The residual induced magnetism exists long enough to reverse the flow of the current to trigger the oppositely polarised bisolenoid which start the next sunspot cycle.

HYPOTHESIS XVI - The reversals of the earth=s magnetic field polarity may have occurred because the core of the earth may have been rotating faster in the past, producing a bisolenoid that reversed on average about every half a million years. The present polarity of the earth is far overdue from that average. This may be due to a slow down in rotation of the core. It is still rotating faster than the mantle and crust but may be slower than in the past.

*Hypotheses X and XI describe one model for sunspots and sunspot cycles. Hypotheses XII, XIII, XIV and XV describe a second model for sunspots and sunspot cycles. The author favors the second model.

BISOLENOID MODEL OF STARS

All stars undergo collapsing stages during their stellar evolution. The protostars collapse from enormous gas and dust clouds in interstellar space. Their rate of spin increases drastically in response to the principle of conservation of angular momentum.

As these protostars collapse, their magnetic field strengths grow stronger. When they become main sequence stars, they are no longer contracting and their magnetic fields will weaken with time.

The magnetic fields will be affected by magnetic rotational stability. That is, the strength of the fields are strong enough to wrap the magnetic lines of force about the star=s cores without the lines of force breaking. See diagram A of the Appendix III for an understanding of the above described magnetic rotational stability.

If one considers that current flows, along the magnetic lines wrapped around the cores, from the rotational north pole to the rotational south pole, it is evident that three will be two stellar solenoids created. One in the northern hemisphere and one in the southern hemisphere.

If the left hand rule is applied, the direction of the magnetic fields will point toward the north rotational poles for the stellar solenoids in the northern hemispheres. They will point toward the rotational south poles for the stellar solenoids in the southern hemispheres.

If the currents flow from the southern rotational poles toward the northern rotational poles, the left hand rule shows that the magnetic fields point toward the centers of the stars for the stellar solenoids in the southern hemispheres. The left hand rule for the stellar solenoids in the northern hemispheres show that the magnetic fields also point toward the centers of the stars.

No matter which way the currents flow, there will be like stellar solenoidal poles pushing against each other at the centers of the stars. This can be visualized by remembering the elementary science demonstration where two like magnetic poles on bar magnets are forced together. When iron fillings are sprinkled on a sheet of paper over the magnets, one sees the effects of the magnetic field on the iron fillings. Please refer to diagram B of Appendix III to see these effects.

One can think of diagram B of Appendix III placed at the center of stars, rotated in increments around the stars for 360 degrees, to visualize the magnetic field where the two stellar solenoids are held together, end to end, by the gravity of the stars. Since most of the gas in stars is lighter, positively charged hydrogen, all one has to do is visualize the bipolar flows of stellar objects, is to consider that the two solenoids are pushing material outward at the magnetic poles.

This outward flow depends on the direction of the flow of current that produced the solenoids, to get this result. Once the material is above the stellar solenoid, the photon pressure along with the author=s Two Cone Model takes over to keep the bipolar flows focused.

What would happen if one reversed the flow of current? The answer is that the bipolar flows would cease, but there would be equatorial flows that would be disk shaped around the equator.

PROTOSTARS

Protostars form from the contraction of large interstellar gas and dust clouds. As the clouds contract, their velocity of rotation increases due to the principle of conservation of angular momentum. Their magnetic field strengths increase greatly as compared to any possible, weak magnetic field that may have existed during their interstellar gas and dust cloud states.

The combination of strong magnetic fields plus rapid angular velocities began to wrap the magnetic lines of force around the cores of the stars. The author believes this results in the production of bisolenoidal conditions in the protostars.

When the current flows from the north rotational pole, as previously discussed, the left hand rule shows that in the northern hemisphere, the solenoids=s magnetic field is pointed toward the north pole. The southern hemisphere solenoid=s magnetic field is pointed toward the south rotational pole.

The author believes the protostellar magnetic fields are strong enough that magnetic stability exist, allowing the magnetic lines of force to remain stretched about the solenoids without magnetic instability occurring. For this reason, where currents flow from north to south, along the magnetic lines of force, around the solenoids, there will be bipolar flows that astronomers often detect.

When the currents flow from south to north along these wrapped solenoidal lines of magnetic force, the bipolar flows will cease to exist. Instead there will be equatorial disk flows. These flows will be almost impossible to detect because of the remanent interstellar gas and dust clouds from which the protostars condensed.

The author ask, could this equatorial disk flow contribute to the creation of the flattened, rather than spherical, shape of solar like systems? Do these equatorial disk flows also contribute to the expulsion of the lighter gasses, to the outer realms of solar like systems, to form the Jovian like planets? If so, the heavier, metal material, would not be expelled as far out and would form the more solid inned planets comparable to the earth.

Another question is, why do the bending away from the equator toward the poles of the solenoidal, magnetically produced lines of force, not tend to spread the material back into spherical shaped, solar like systems? The answer is that the author=s Two Cone Model (dwarf exit cone and synchrotron cone) require that radiation produced can only escape where the direction of charge particle movement has the synchrotron cone pointing in the same direction as the individual relativistic particle exit cone, as described in ATwo Cone Model of a Bipolar Protostar@ (Appendix B).

In general, these two cones will always be aligned for relativistic particles, but should be more focused upward above the equators of protostars. This results because magnetic lines of force are squeezed together by the magnetic fields produced at the centers of stars by the pair of adjacent, like, stellar solenoidal poles. Photon pressure will exist, exiting from pairs of cones, above the equator, pushing gas and dust particles out into more flattened disks.

Where as, the charged, accelerating particles, moving about non-vertical magnetic lines of force, will not all be focused in the same direction as occurs above the equator. Each individual relativistic particle has its two cones aligned, but jointly all the individual particles are not focused.

If the author=s ABisolenoidal Model of Stars@ is correct, there should be, on average, an equal number of bipolar flow protostars as there are equatorial disk flow stars. The problem is that, at most, only a part of the bipolar flow protostars are detectable, with the rest hid by the gas and dust clouds from which protostars originate or because the magnetic axis does not point toward the earth. Virtually, all of the equatorial disk flow protostars may be hidden by the gas clouds.

MAIN SEQUENCE STARS LIKE THE SUN

Main sequence stars tend to rotate slower than they did as protostars because much of the material expelled by bipolar flows and equatorial disk flows carried with it a considerable amount of angular momentum, having lost this angular momentum the main sequence stars are slow rotators.

With time these stars also develop weaker stellar magnetic fields. As a results of the weaker magnetic fields, it is easier for magnetic instabilities to occur along the solenodial magnetic wrappings. These magnetic instabilities may produce the sun spots and associated phenomenon.

The flow of the current along the bisolenodial magnetic line wrappings may begin to pile up electrons near the center of the star where the like polar ends of the bisolenodial core are held together by the star=s gravity. This compares somewhat to the pile up of water flowing in a stream that is almost blocked.

When this current blockages become enough, the current actually changes direction and begin to flow in the opposite direction. This marks the point in time when magnetic field reversing occurs. In the case of our sun, it happens about every eleven years on average.

If one could travel along one solenoid of the stellar bisolenodial axis, one would get nearer the stellar surface as the latitude increases. This may explain why sunspots occur at higher latitudes when a new sunspot cycle begins.

As the pile up of electrons begins there should be fewer, weaker magnetic instabilities occurring. The weaker magnetic instabilities dissipate before reaching the surface at lower latitudes, but make it to the surface at higher latitudes. As the cycle grows older, the pile up of electrons become greater below lower surface latitudes. This produces stronger magnetic instabilities which result in producing sunspots at low latitudes during the maximum sunspot period. The end of the sunspot period occurs when the pile up of electrons reverse the current flow.

This explanation at first glance seems to only result in the production of magnetic instabilities and sunspots in one hemisphere because electrons are blocked from flowing through the center into the other hemisphere. As the buildup of electrons on one stellar solenoid occurs near the center, positive charges will flow along the magnetic wrapping on the other solenoid and pileup near the equator on the opposite side of the stellar capacitor blockage. The like poles have produced a stellar size capacitor or condenser by blocking the flow from one of the bisolenoidal components to the other. The author believes this may result in the reverse polarization of spot pairs in the two hemispheres of the sun.

Eventually the build up of electrons on one side of the center results in the reverse flow of the electrons around the solenodial wrappings. As a result, the old sunspot cycle dies and a new cycle with opposite polarization of sunspot pairs soon begins with reverse polarization. This results in weaker instabilities that can only surface at higher latitudes. It also results in the reversal of the polarization of the stellar bisolenoids.

A second model which the author favors results from eddy currents developing around the flux tubes. These produce magnetic fields that oppose the bisolenoidal magnetic fields that produce the eddy currents.

The eddy currents grow stronger as the sunspot period matures, resulting in the effective ends of the solenoids migrating toward the stellar lower latitudes. It then results in the release of eddy currents which spin toward the photosphere to form sunspots. Since these eddy currents are released near the effective ends of the solenoids, the sunspots migrate toward lower latitudes as the sunspot cycle matures.

Because the magnetic wrapping density increases toward the stellar centers, the eddy currents become more numerous and stronger as the sunspot cycle matures. Likewise, the sunspots become larger and more numerous at the end of the cycle and occur at lower latitudes.

When the induced eddy currents overwhelm the bisolenoid, its EMF goes to zero to end the sunspot cycle. The residual induced magnetic field remains active long enough to trigger the flow of electrons in a direction opposite the flow during the previous sunspot cycle. This results in the polarity reversal for sunspot pairs in the two hemispheres.

COLLAPSED STARS

Stars greater than 1.4 times the mass of the sun will eventually not be able to balance against gravity using either the pressure due to thermonuclear reactions or electron degeneracy pressure. As a result, these larger stars undergo supernova explosions and expel much of their masses.

The remaining cores will either collapse down to become neutron stars or black holes according to their masses. Those with final masses between 1.4 and about 3 solar masses will be neutron stars. Some neutron stars become pulsars. It is believed by some astronomers that magnetic instabilities wrap around the neutron cores and in some way produce the bipolar jets of radio noise that reach out from the neutron star poles.

Likewise these magnetic instabilities wrappings are believed to someway produce the bipolar flows of material from black holes, galaxies, and stars like SS433. The author believes that instead of magnetic instability wrappings contributing to bipolar flows they are produced by magnetic stability wrappings. If the magnetic field of a collapsed stellar objects is very strong, the magnetic lines of force are strong enough to survive the wrapping produced by the rapid rotation of the star due to the principle of conservation of angular momentum.

It is considered that current flows at relativistic speeds, relatively unimpeded by resistance about neutron stars that posses unbelievable, strong magnetic fields. The author believes the magnetic lines of force under these conditions can be stretched around the neutron core hundreds of times without breaking into magnetic instabilities. He also believes that multiple lines wrap about this core piling up on top of each other, to form an enormously powerful bisolenoidal core with like magnetic poles squeezed together at the center of the star. These like poles are held firmly together by the gigantic gravity of the collapsed star.

The left hand rule indicates the magnetic field will point outward at both the north and south poles of some stars. From the bisolenoidal two outside poles there should be a strong flow of radio noise. This radio noise would tend to be scattered as the magnetic lines of force bend around outside ends of the solenoids if the author=s two cone model was not active to focus the flows. The exit cones and synchrotron cones keep the flow of material directed outward from the poles.

This scenario can easily be extended to black holes, galactic centers, and stars such as SS433, except it results in matter flows rather than radio noise. Each of these type objects show bipolar flows more extensively than do the protostars as discussed earlier. Also, their magnetic fields are much stronger than exist for main sequence stars, which eliminates the magnetic instabilities or the release of eddy currents as discussed in model two. This may eliminate sunspot activity.

The current is flowing from the north pole to the south pole to produce the outward flows as shown in diagram C of Appendix III. If the current is reversed, the left hand rule shows the magnetic field of the stellar bisolenoids would point toward the adjacent solenoidal poles at the center of the stars. Then, they point upward toward the equator where the lines of force are tightly packed due to like bisolenodial poles being forced together by gravity.

This would eliminate the bipolar flows as was seen for current flowing from the north pole to the south pole. There would exist equatorial disk flows, where the tightly packed bisolendoial lines of force pass through the surface near the equator of the stars. The tight packing would create a large number of separate vertical flows on each side of the equator. Each would be focused by the author=s two cone model in a similar way as occurred for the bipolar flows.

Suppose there are five separate equatorial disk flows on each side of the equator rather than two polar flows as exists for the crab pulsar. In this case, as the star=s magnetic poles rotate around the rotational poles as described by the Light House Model of a pulsar, there would be two encounters with the earth=s direction for each of the ten equitorial disk flows.

Therefore, where it takes approximately 33 rotations per second of the crab pulsar to produce the observed radio pulses from a polar flow, it would take a rotational period of 1.65 seconds to produce the observed pulses by 5 disk flows on each side of the equator.

The millisecond pulsar PSR 1937 + 211 discovered in 1982 completes 642 revolutions per second if the pulses are a result of a polar flow of radio noise in conjunction with the Light House Model. Whereas, if there were 10 disk flows on each side of the millisecond pulsar it would take only 16 revolutions per second to produce the 642 radio pulses that are observed.

Many pulsars have a beat to the sound of their pulses. It would be much easier to explain these beats considering the equatorial disk flows than it is considering one polar flow of radio noise. The author thinks both polar flows and equatorial disk flows have been observed but we have lumped them all together as polar flows.

EARTH=S MAGNETIC FIELD REVERSALS

It has recently been determined that the earth=s core rotates faster than the mantle and crust. Could it be possible that the core has actually slowed down to more near that of the mantle? If so, it may have produced geobisolenoidals that reversed their polarity on average about every half million years in the past. This could be similar to the author=s suggestion as to what causes the sunspot polarity reversals. If the core=s rotation has slowed down it may be the reason that there has been a much larger time that has past since the last magnetic polarity reversal.

Overview/Bipolar Flows and Multi-equatorial Flows

* Bipolar flows occur from Pulsars, Protostars, Black holes, and Galaxies.

* Physicists believe magnetic rotational instability somehow contributes to bipolar flows. The author believes instead that magnetic stabilities contribute to both bipolar flows and multi-equatorial flows.

* The author proposes that the Light House Model, Exit Cone Model, and Synchrotron Cone Model and stellar Bisolenoidal Models, when considered as acting at the same time, could produce both bipolar flows, and multi-equatorial flows.

* The author believes that his Stellar Bisolenoidal Model may indicate that Millipulsars do not rotate as fast as was previously assumed.

* The author believes his Stellar Bisolenoidal Model may account for the previously unexplained beats existing for some Pulsar=s pulses.

Overview/Relativistic Particle Exit Cones

* Einstein said the force of acceleration in a closed elevator is equivalent to the force of gravity.

* The author believes the force of acceleration of a relativistic particle is equivalent to the force of gravity around a particle that has collapsed to almost being a mini black hole.

* The author believes that a particle that has collapsed to almost being a mini black hole has a dwarf exit cone, which is a dwarf cousin to the exit cone of a neutron star.
* The author believes that a relativistically accelerating charged particle has a dwarf exit cone pointing in the direction of particle motion that is a dwarf cousin of the exit cone of a neutron star.

The Author

Paul D. Thomas has taught mathematics, physics, earth science, and astronomy for more than 40 years in Universities and Colleges. He earned his Ed. D. at Texas A&M University Commerce, his MA and BS at Stephen F. Austin State University, his AA at Texarkana College. His primary interest is in astrophysics.

MORE TO EXPLORE

Emission from Neutron Stars, Stephen E. Schneider, Thomas T. Amy in Pathways to Astronomy, pages 543-544, McGraw Hill Pub. New York, N.Y., ISBN-10 0-07-249965-6

What are Pulsars? Jay M. Pasachoff in Astronomy from the Earth to the Universe, Sixth Edition, Brooks/Cole, pages 572-574, ISBN: 0-030-39548-8

Photon Sphere, Jay M. Pasachoff in Astronomy from the Earth to the Universe, Sixth Edition, Brooks/Cole, pages 595-596, ISBN: 0-030-39548-8

Synchrotron Radiation, Jay M. Pasachoff in Astronomy from the Earth to the Universe, Sixth Edition, Brooks/Cole, pages 645-647, ISBN 0-030-39548-8

A Universe of Disks, Omer Blaes in Scientific American, pages 48-57, October 2004

On the Hunt for Magnetars, Steve Nadis in Astronomy, pages 32-37, November 2006

SS433 (figure 27-30) Page 485 Astronomy, Fourth Edition, 1995 version by Pasacohff, Saunders College Publishing

Crab Pulsar, Figure 27-9, Page 479 Astronomy by Pasachoff, Fourth Edition, 1995 version, Saunders College Publishing

<u>M87, Figure 31-44, Page 568,</u> Astronomy by Pasacoff, Fourth Edition, 1995 version, Saunders College Publishing

<u>Figure 16-27 Page 494</u>, Explorations - An Introduction to Astronomy by Thomas T. Arny, Second Edition, 1998 version, McGraw - Hill

Black Hole Blowback, Wallace Tucker, Harvey Tanabaum, and Andrew Fabian, pages 43-49, Scientific American, March 2007

Lenz=s Law, Wikipedia, the free encyclopedia (can be found by doing a google search)

APPENDIX I

Two Cone Model of a Pulsar

When a star is less than 1.4 times the mass of the Sun it is destined to become a white dwarf and later a black dwarf. Once the star has used up all of its thermonuclear energy it attempts to use the energy produced by its own collapse to balance against gravity.

Ultimately the star will force the electrons so close to the nucleus that they are affected by a force that keeps them out of the nucleus. This will produce a pressure that balances the star against further collapse. The condition is referred to as electron degeneracy and produces a pressure referred to as electron degeneracy pressure.

Since electron degeneracy does not depend upon thermonuclear processes, it does not have an expendable source and therefore can balance the star indefinitely unless the star somehow gains a mass above 1.4 solar masses. It therefore remains as a white dwarf until all residual thermonuclear energy and energy of collapse has escaped. After that time it continues as a black dwarf approximately the size of the earth.

If the star has a mass of more than 1.4 times the mass of the Sun, its degeneracy pressure is not enough to keep the electrons out of the nucleus of the atom, and therefore the electrons will be forced onto the protons to form neutrons. The star then becomes a neutron star, and a new degeneracy pressure called neutron degeneracy will balance the star at about 10 miles diameter, provided its mass is not greater than about 3 times the mass of the Sun.

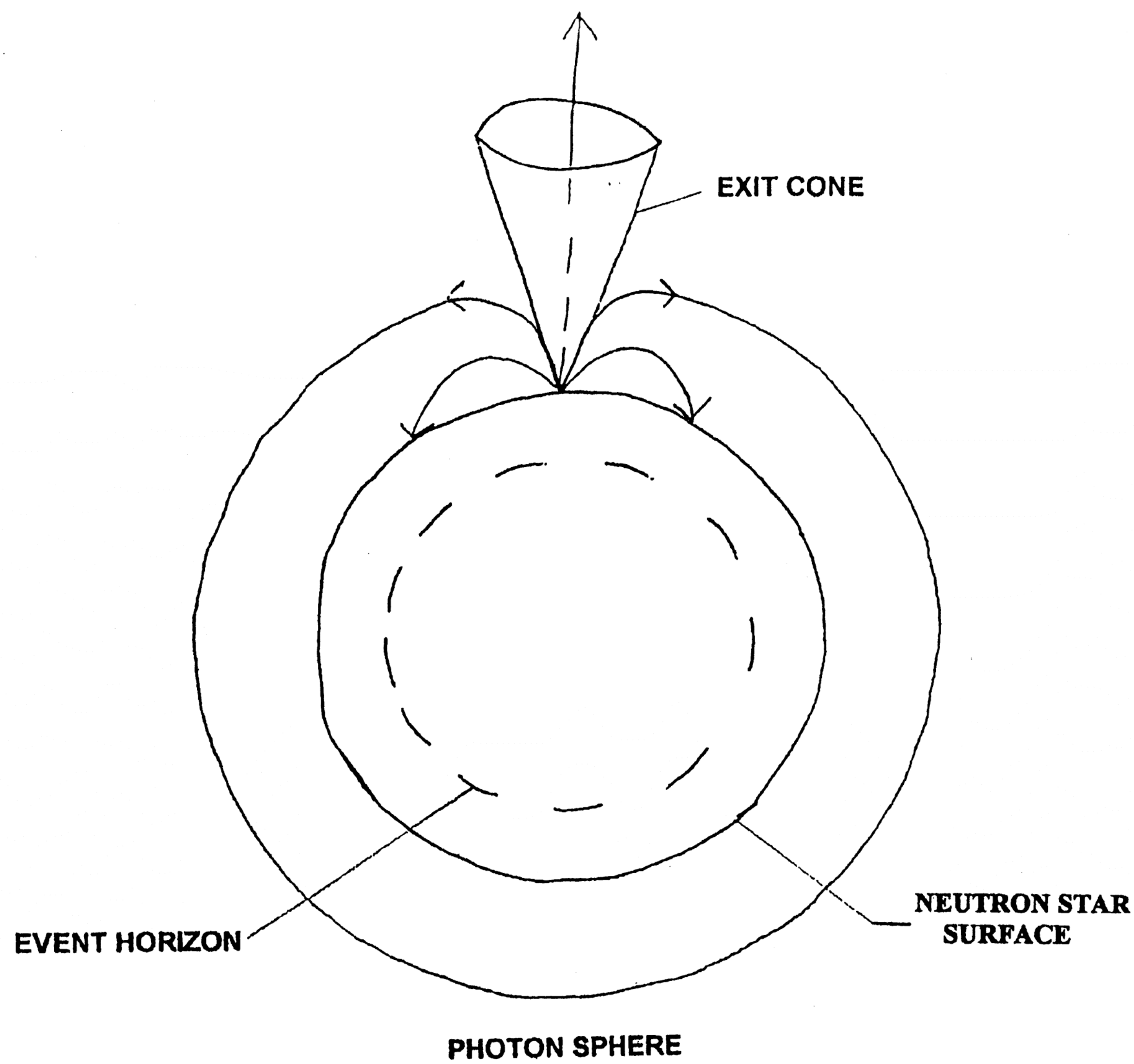
If a star's mass is more than about 3 times the mass of the Sun, the star will collapse to form a black hole. It will not be a black hole until its radius has contracted inside the event horizon where no radiation can escape. This radius is called the Schwarzschild radius and is given by

$$R_S = 3M_S$$

Where the mass of the star is in solar masses and the radius is in kilometers.

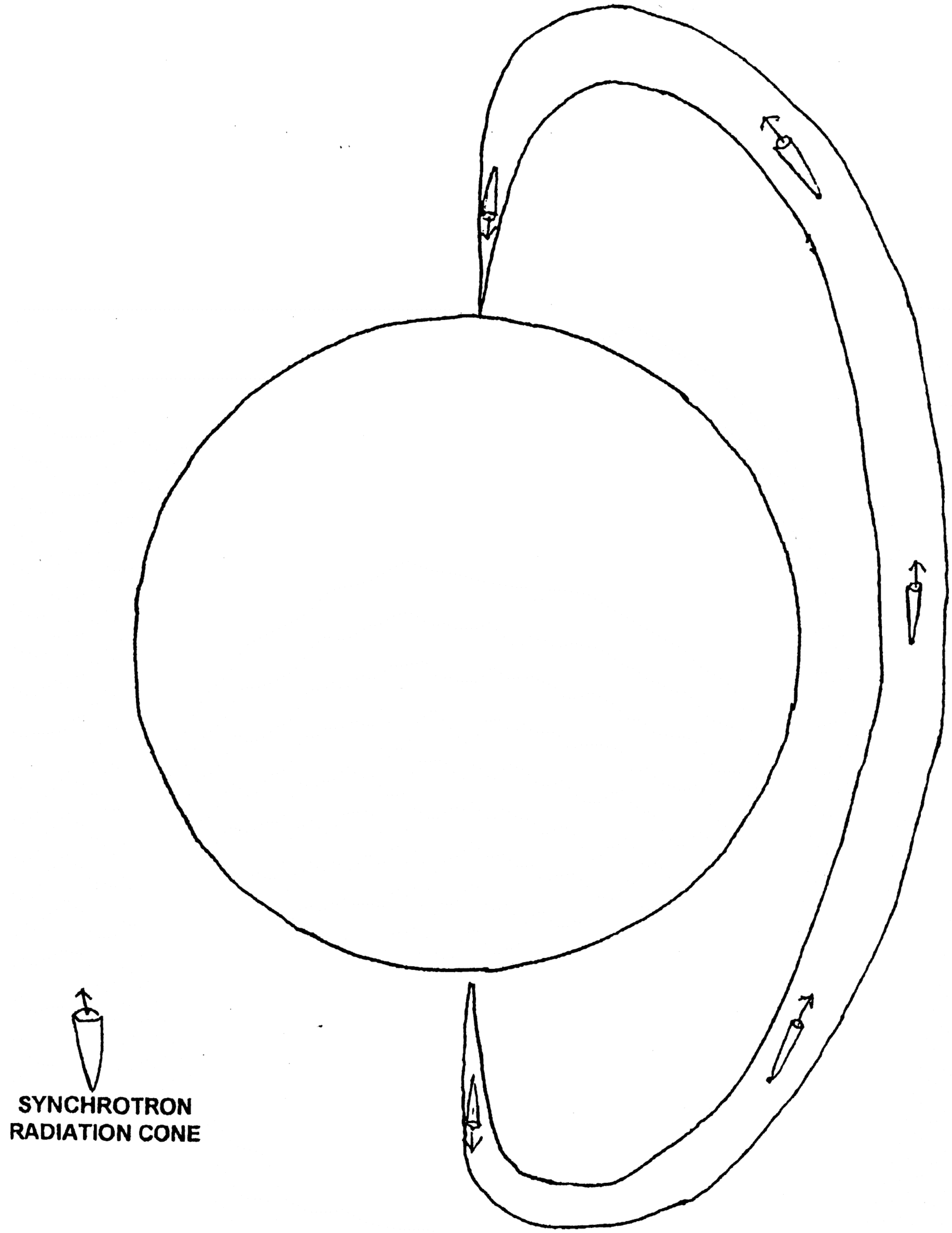
Suppose a star has a radius greater than the Schwarzschild radius and you were standing on the star and you shined a flashlight upward. Since light is attracted by gravity, there would be an imaginary exit cone pointed upward with its apex at the end of your flashlight.

Any radiation going up through the exit cone would escape into space. Radiation along the boundary of the exit cone would go into orbit around the star in what is called the photon sphere. Radiation emitted outside the exit cone would fall back into the star.

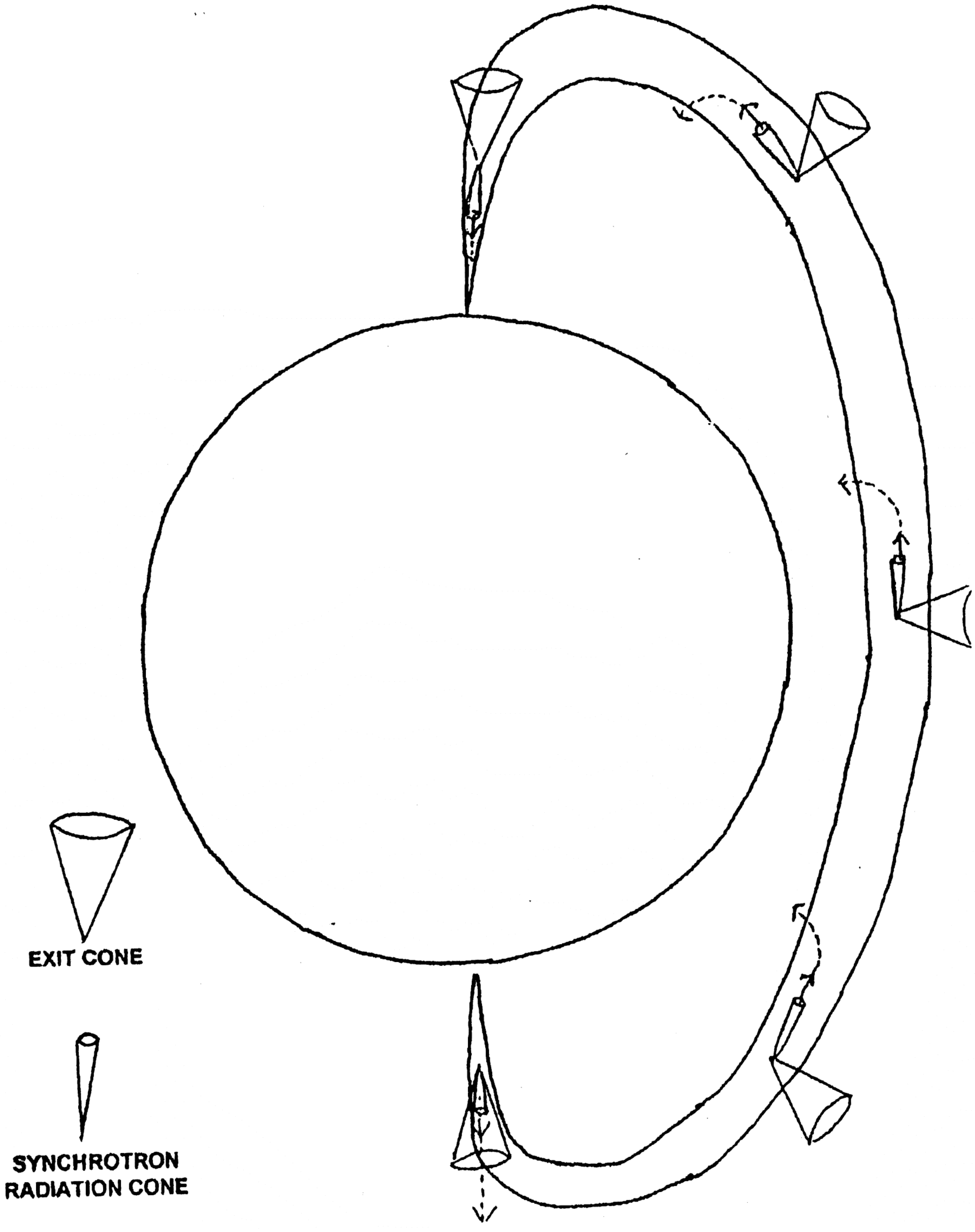


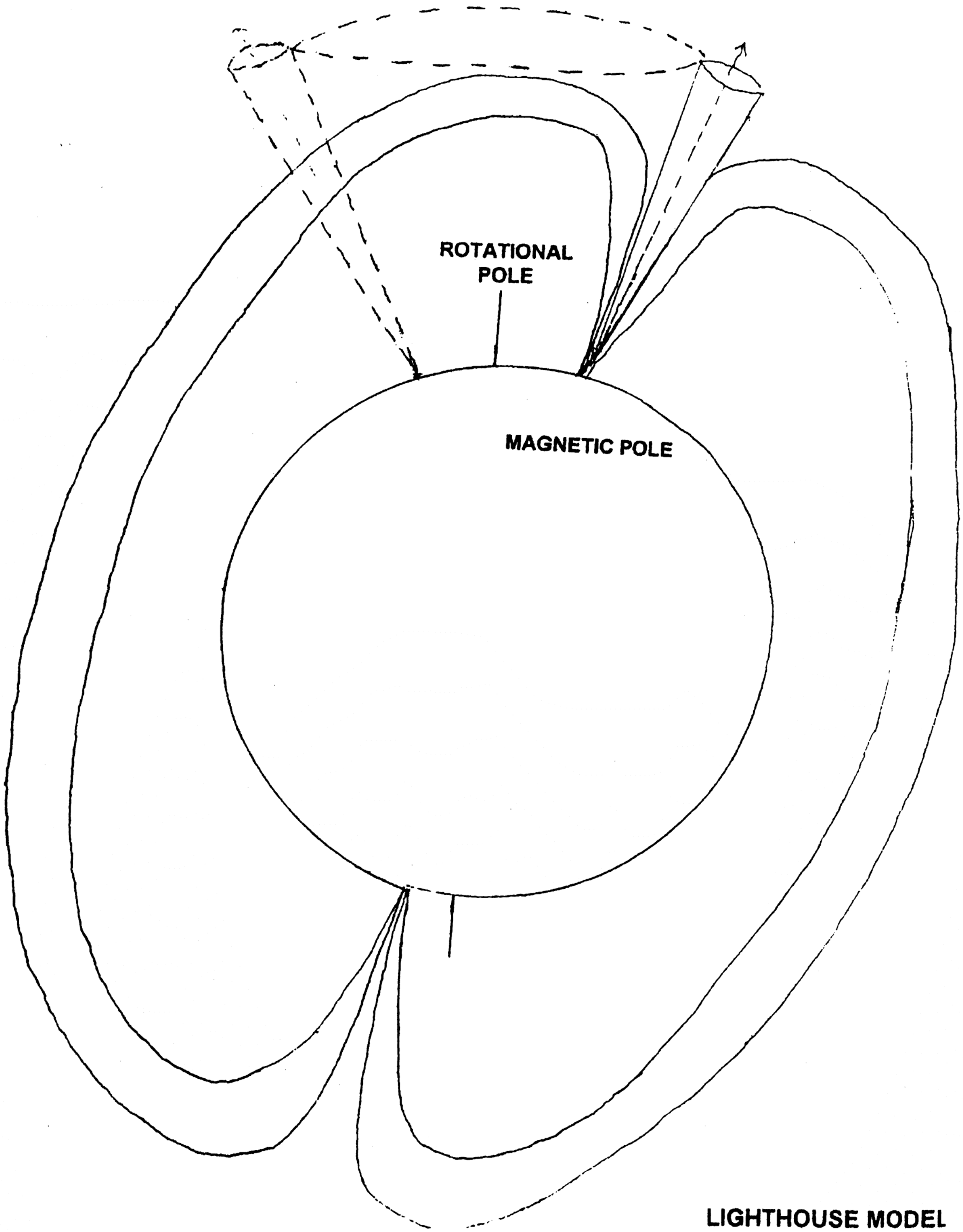
There exists another cone which is called the Synchrotron radiation cone. It is produced by charged particles spiraling around magnetic lines of force at relativistic velocities. That is, the charged particles are traveling at speeds close to the speed of light.

The Synchrotron cone is a very narrow cone pointing in the direction of motion of the charged particle in the magnetic field. For the collapsed star the magnetic field should have the magnetic lines of force packed very tightly. This should result in the synchrotron radiation cone pointing very closely in the direction of the magnetic field.


SYNCHROTRON
RADIATION CONE

The only time that both the synchrotron radiation cone and the exit cone for a collapsed star are in phase with each other is when the charged particle is moving upward from the magnetic pole. At that point both cones would point upward allowing the synchrotron radiation to exit through the exit cone into space.


EXIT CONE
SYNCHROTRON
RADIATION CONE



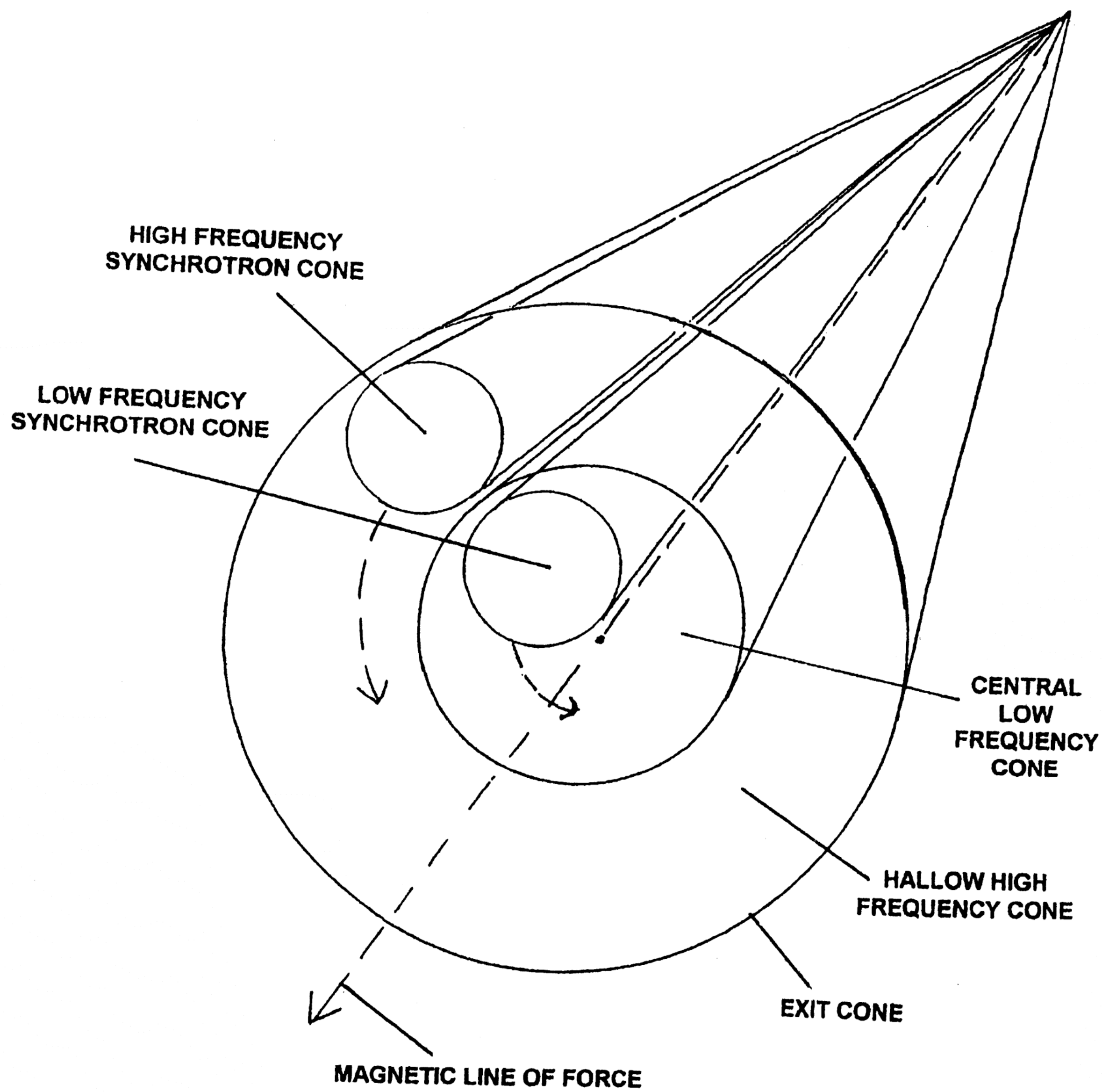
LIGHTHOUSE MODEL

It is believed that the magnetic poles of the star are offset from the rotational poles. This results in the magnetic poles rotating around the rotational poles. If radiation can only escape from above the magnetic pole when the Synchrotron radiation cone and the exit cone are in phase, this should result in energy coming toward the earth only once per rotation and at the moment when the earth is directly above the magnetic pole. This is known as the lighthouse model of a pulsar. It is the most accepted model of a pulsar. My two cone model simply incorporates three accepted models which have not previously been combined, to the best of my knowledge, in an attempt to explain the reason why radiation only reaches us from above the magnetic poles. Those models which I have combined are:

1. Exit cone model (page 491, Astronomy by Pasachoff Fourth edition, 1995 version, Saunders Col, Pub.)
2. Synchrotron radiation cone model (page 523*,* Astronomy by Pasachoff, Fourth edition, 1995 version, Saunders Col. Pub.)
3. Light house cone model (Page 477, Astronomy by Pasachoff, Fourth edition, 1995 version, Saunders Col. Pub.)

To quote Jay M. Pasachoff's Fourth Edition, 1995 version of Astronomy, Page 477, "We understand much less well the details of the mechanism by which the radiation is actually emitted in a beam, though we know in general, that we are seeing the effects of electrons moving in spirals around magnetic lines of force. Presumably the beaming has something to do with the extremely powerful magnetic field of the neutron star. The beam seems to have a central cone surrounded by a hollow cone. At higher frequencies, we detect mainly the hollow cone."

My question is: could we not expect that at higher frequencies the electrons would spiral faster around the magnetic lines of force and result in the Synchrotron radiation cone pointing further away from the axis of the exit cone than would the lower frequencies that spiral slower around the magnetic lines of force? If this is true then could we not expect the higher frequencies to be mainly detected in the hollow cone?

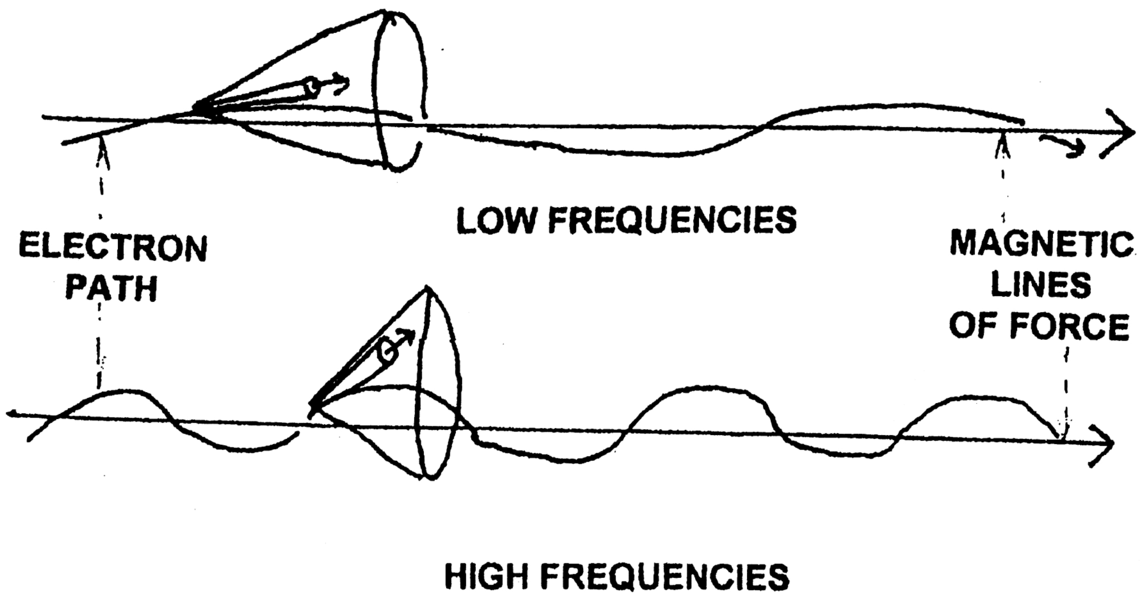

HIGH FREQUENCY
SYNCHROTRON CONE
LOW FREQUENCY
SYNCHROTRON CONE
CENTRAL
LOW
FREQUENCY
CONE
HALLOW HIGH
FREQUENCY CONE
EXIT CONE
MAGNETIC LINE OF FORCE

Other possible applications that are suggested for consideration are the polar jets that extend into space from objects such as collapsed stars or super black holes at the center of galaxies where the accretion disk circles their rotational equator. Could the highly efficient Synchrotron radiation produce photon pressure to continuously move the particles from the disk toward the poles from heights where the gravitational force is weaker, but photon pressure plus gravitational force result in the particles being moved into lower regions near the poles where both cones are in phase and the polar jets result?

Examples:

1. SS433 (figure 27 - 30) Page 485 Astronomy, Fourth Edition, 1995 Version by Pasachoff, Saunders College Publishing.
2. Crab Pulsar, Figure 27-9, Page 479 Astronomy by Pasachoff, Fourth Edition, 1995 version, Saunders College Publishing.
3. M87, Figure 31 - 44, Page 568, Astronomy by Pasachoff, Fourth Edition, 1995 version, Saunders College Publishing.
4. Figure 16.27 Page 494, Explorations - An Introduction to Astronomy by Thomas T. Amy, Second Edition, 1998 version, McGraw - Hill.

Another consideration suggested is the effect of the Synchrotron radiation cone on the accretion disk about a forming star. Could the photon pressure of the highly efficient Synchrotron radiation contribute, along with the flux tube model, to the polar jets and the formation of the Herbig-Haro objects even though no exit cone exists for these objects? See Figures 24 - 7 and 24 – 8A of Astronomy by Pasachoff, Page 425, Fourth Edition, 1995 version, Saunders College Publishing. Also see Figure 13.6 page 381, Explorations - an Introduction to Astronomy by Thomas T. Amy, Second Edition, 1998 version, McGraw - Hill.


LOW FREQUENCIES
ELECTRON
PATH
MAGNETIC
LINES
OF FORCE
HIGH FREQUENCIES

APPENDIX II

TWO CONE MODEL OF A BIPOLAR PROTOSTAR
(Follow up of "Two Cone Model of a Pulsar")
By Paul D. Thomas Ed.D.

The author's paper entitled "Two Cone Model of a Pulsar" left him with a nagging problem. The question of radio pulses only radiating from the poles of a Pulsar was answered using the combination of the following: Lighthouse Model and Exit Cone Model of a neutron star and the Synchrotron Radiation Cone. Yet, there was a problem. Bipolar flows occurred for a protostar that were very similar to the bipolar flows of radio radiation for pulsars. The protostars are light mass objects that would not normally have an exit cone because the exit cone usually exists only on massive, collapsed objects.

A possible answer to this problem was directly in front of his face, without being detected. Einstein showed in the General Theory of Relativity that the force of accelerating through space, in an enclosed laboratory, would be indistinguishable from the force of gravity. If a charged particle accelerated from rest to near the speed of light almost instantaneously, as happens near stellar magnetic poles, and the charged particle experienced the acceleration as if it were gravity that was equal to the gravity of a massive collapsed star, the particle should have exhibited a dwarf exit cone through which its escaping energy would have departed. This allowed the author to explain the bipolar flows of protostars.

In the late 1940's, as a teenager, the author was walking from his house to Atlanta, TX, when Lawrence Loper offered him a ride on his new motorcycle. He was seated behind him holding onto a strap on the seat that required him to reach beside his thighs with both hands. Suddenly, Lawrence accelerated with a thrust forward that caused the author's feet to lift higher than his head and he could see the pavement just below his forehead. He held on for dear life and tried screaming loud enough to get Lawrence's attention, but the exhaust noise was louder. When Lawrence stopped accelerating, the noise of the motorcycle decreased, Lawrence heard him, and stopped. The author rolled off the back of the motorcycle headfirst, rolled over, stood up, and has never been on a motorcycle since.

For the following discussion imagine that the earth's gravity ceased to exist so that one can better concentrate on the force, comparable to gravity, produced by acceleration. In the manner that Einstein's enclosed space laboratory acceleration compared to gravity, the author experienced the sensation of gravity. He felt as though gravity were pulling him southward as the motorcycle accelerated northward.

Suppose that Lawrence's motorcycle could approach the speed of light going north. The author would have experienced gravity southward that would have mimicked the gravity of a collapsed star to the south. If this was so, and he was wearing a miner's light, there would have been an exit cone pointing northward. The only light that could escape would be exiting northward through that exit cone.

When Lawrence decelerated going northward from near the speed of light using his brakes, the author felt as though gravity were pulling him forward and there was an exit cone pointing southward. If Lawrence then turned around and accelerated from zero velocity, southward to near the speed of light, the author would have felt as though gravity were pulling northward and the exit cone would be pointing southward-the same direction as the cone pointed when he was decelerating northward.

Compare the motorcycle and a charged particle moving at a relativistic velocity in a magnetic field around a protostar. When this charged particle approached the magnetic pole of the protostar, the magnetic lines of force squeezed together the nearer they approached the magnetic pole. This resulted in the deceleration of the charged particle toward the pole. This made the particle experience the pull of gravity downward resulting in an exit cone pointing upward from the pole. As the particle was decelerating downward, the exit cone and synchrotron cone were 180 degrees out of phase unless the synchrotron cone points opposite the direction of motion, for the decelerating, relativistic particle. This would result in the alignment of the exit cone and synchrotron cone.

When the particle reached zero velocity, if the previously stretched magnetic field lines could have rebounded the particle upward to near the speed of light, it experienced a gravitational force downward that mimicked the gravity of a collapsed star. An exit cone pointed upward in the same direction as it pointed moments earlier when the particle was decelerating downward. If the magnetic field was not strong enough to rebound the particle, then the flux tube produced similar results.

Consider that, instead of just one charged particle decelerating downward, almost instantaneously, from near the speed of light to zero velocity, then changing directions and accelerating upward to almost the speed of light, there were millions of charged particles doing that near the magnetic pole. Instead of having one massive collapsed star with an exit cone pointing upward, each of the millions of particles would experience its own individual exit cone pointing upward, aligned with its synchrotron cone.

These accelerating, charged particles, occurred at both poles producing electromagnetic photons at the poles, which beamed out in narrow, concentrated cones as a bipolar flow. When molecular and dust particles intersected with these concentrated bipolar beams, they were accelerated due to photon pressure, in the direction of the bipolar beams, resulting in the bipolar flows photographed so well by powerful telescopes.

Accept that an individually, charged particle, accelerating near the speed of light, had an exit cone. Should it also have possessed a miniature photon sphere, which would have contained captured photons that could not escape?

If this exit cone disappeared as the charged particle reached zero acceleration at the poles, would it have released the captured photons? In the case of the solar system, could these released photons have had any influence on the auroras of Jupiter, Saturn and Earth?

When charged particles in an atomic accelerator hit a screen, they produce a florescent glow. These particles are traveling with relativistic velocities, but decelerate to zero velocity almost instantly on contact with the screen. Could the release of the photons, captured in the photon sphere about each charged particle, contribute to the florescent glow due to the disappearance of the photon sphere when the particle reached zero velocity?

Earlier in this paper it was mentioned that if the synchrotron cone pointed opposite the direction of motion for a relativistic, charged, decelerating particle, the synchrotron cone and the particle's exit cone would be aligned. Could it be possible that the synchrotron cone is really the same as the exit cone for the relativistic, decelerating particle? If so, a common factor in the mathematical representation of the two cones could be solved and the two results could be set equal. Would this produce a mathematical prediction that could be tested experimentally? It would then indicate that the author was incorrect in the "Two Cone Model of a Pulsar" where he stated that the exit cone of the Neutron star and the synchrotron cones were only aligned when the charged particles were exiting the poles. They would also be aligned as the particles approached the poles.

Physicists consider that magnetic rotational instabilities may produce magnetic flux tubes compacted tightly around the magnetic polar axis of the Pulsar. These flux tubes may guide the bipolar flows from Pulsars, Galaxies, and Black Holes. This is yet to be proven. The Author thinks if these do exist, then above the poles, where the magnetic lines of force become less compacted and bend away from the bipolar axis, the material and radiation, would tend to scatter. The alignment of the exit and synchrotron cones keep the beams focused.

The Author questions if it would be possible to observe the bipolar flow Zeeman effect using spectrographs. If it is possible to do so it could lead to better understanding of these conditions since the splitting of spectral lines measures the intensity and direction of the magnetic field.

Overview/Bipolar Flows

- Bipolar flows occur from Pulsars, Protostars, Black holes, and Galaxies.
- Physicists believe magnetic rotational instability somehow contributes to bipolar flows.
- The author proposes that the Light House Model, Exit Cone Model, and Synchrotron Cone Models, when considered as acting at the same time, could produce the bipolar flows in conjunction with a flux tube produced by magnetic stabilities rather than magnetic instabilities..

The Author

Paul D. Thomas has taught mathematics, physics, earth science, and astronomy for more than 40 years in Universities and Colleges. He earned his Ed.D. at Texas A&M University Commerce in 1978. His primary interest is in astrophysics.

MORE TO EXPLORE

Emission from Neutron Stars, Stephen E, Schneider, Thomas T. Arny in Pathways to Astronomy, pages 543-544*,* McGraw Hill Pub. New York, N.Y., ISBN-10 0-07-249965-6.

What are Pulsars? Jay M. Pasachoff in Astronomy from the Earth to the Universe, Sixth Edition, Brooks/Cole, pages 572-574*,* ISBN: 0-030-39548-8.

Photon Sphere, Jay M. Pasachoff in Astronomy from the Earth to the Universe, Sixth Edition, Brooks/Cole, pages 595-596*,* ISBN: 0-030-39548-8.

Synchrotron Radiation, Jay M.. Pasachoff in Astronomy from the Earth to the Universe, Sixth Edition, Brooks/Cole, pages 645-647*,* ISBN 0-030-39548-8.

A Universe of Disks, Omer Blaes in Scientific American, pages 48-57, October 2004.

On the Hunt for Magnetars, Steve Nadis in Astronomy, pages 32-37, November 2006.

DIAGRAM A

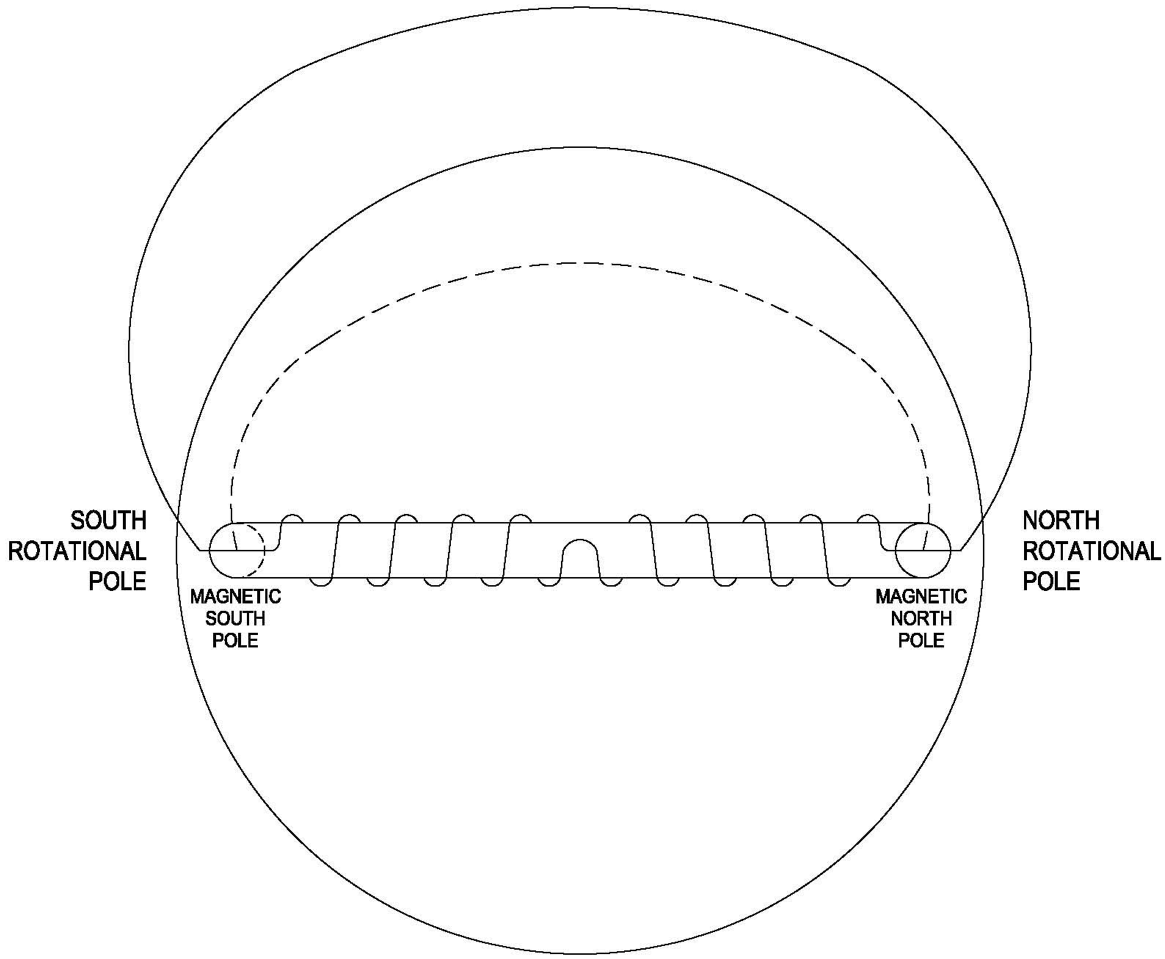
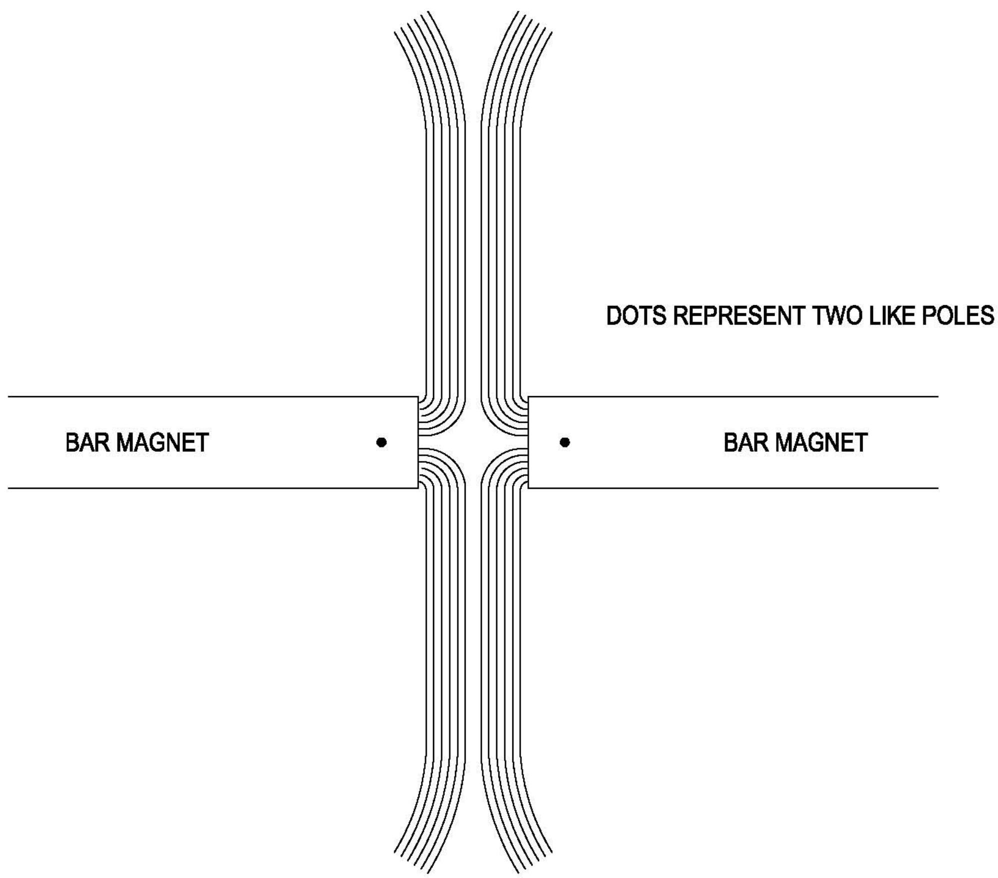
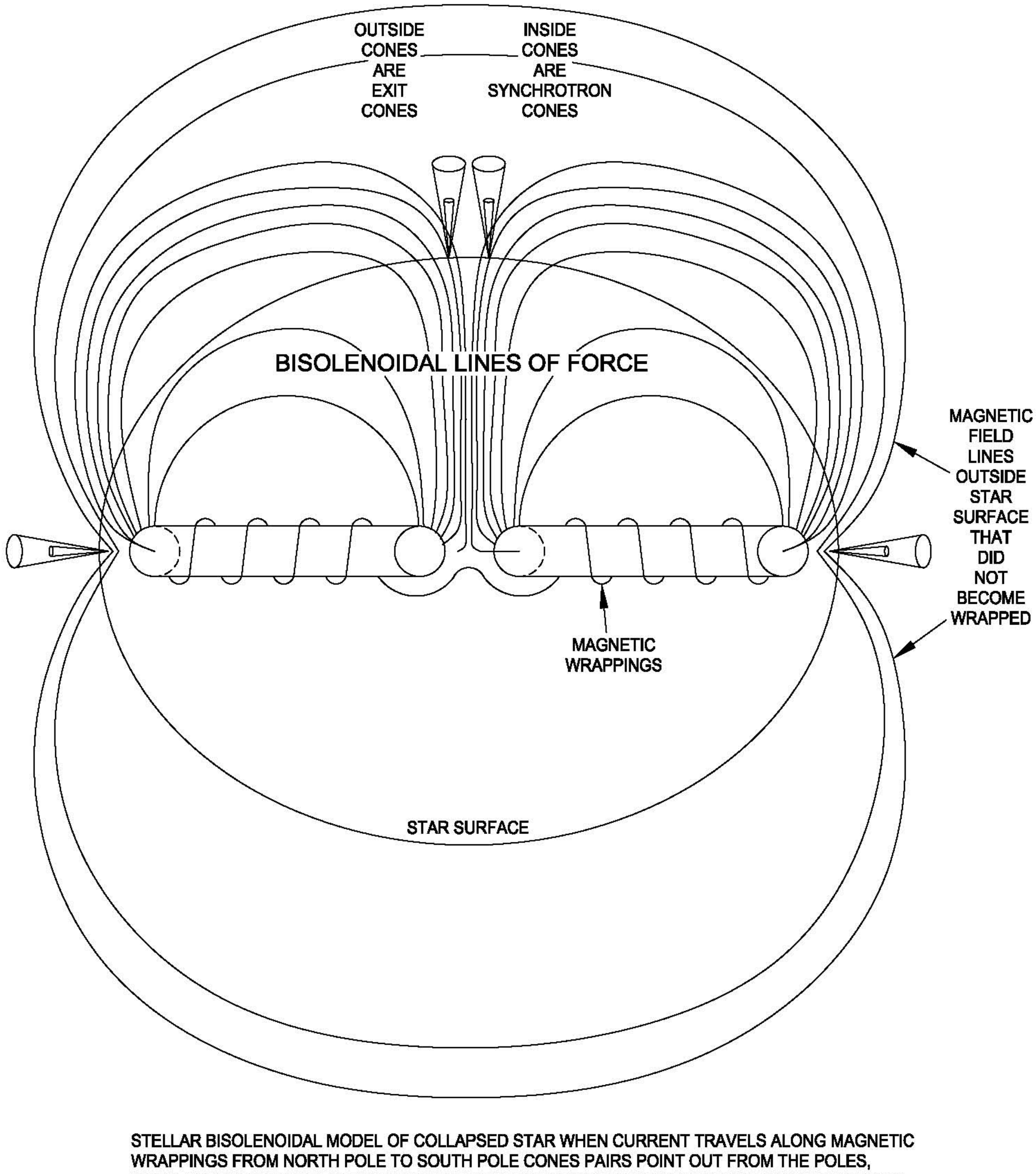

SOUTH
ROTATIONAL
POLE
MAGNETIC
SOUTH
POLE
MAGNETIC
NORTH
POLE
NORTH
ROTATIONAL
POLE

DIAGRAM B



MAGNETIC FIELD WHERE TWO BAR MEGNETS ARE FORCED
TOGETHER WITH THEIR LIKE MAGNET POLES ADJACENT

DIAGRAM C



STELLAR BISOLENOIDAL MODEL OF COLLAPSED STAR WHEN CURRENT TRAVELS ALONG MAGNETIC WRAPPINGS FROM NORTH POLE TO SOUTH POLE CONES PAIRS POINT OUT FROM THE POLES, WHEN CURRENT TRAVELS FROM SOUTH TO NORTH THROUGH MAGNETIC WRAPPINGS MANY PAIR OF CONES POINT UP FROM THE EQUATORIAL AREA. IF ROTATED ABOUT STAR MANY PAIRS OF EXIT TROUGHS ARE CREATED.

DIAGRAM D

POSSIBLE MILLIPULSAR WITH 12 PAIRS OF CONES RESULTING IN 384 PULSES PER SECOND
IF IT ROTATES 16 TIMES A SECOND AND EACH PAIR OF CONES POINT TOWARD THE EARTH
2 TIMES PER ROTATION

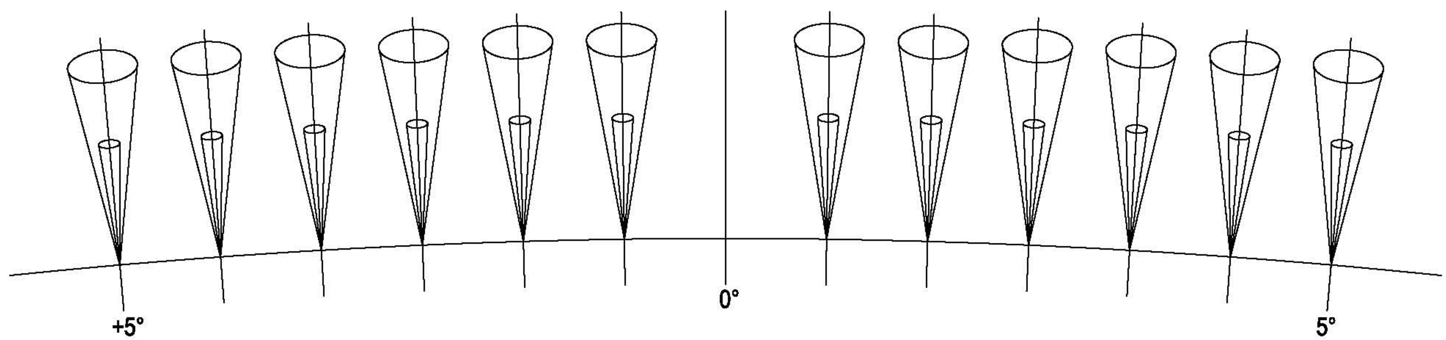
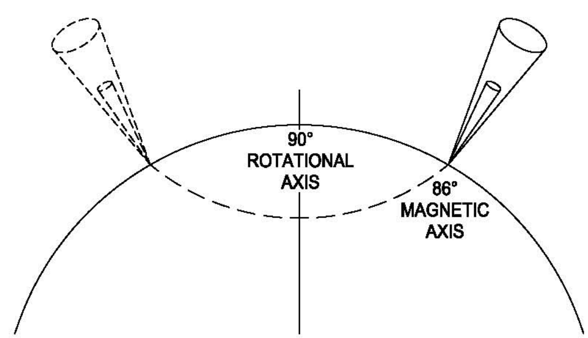


DIAGRAM E

SAME PULSAR AS DIAGRAM D WITH 384 ROTATIONS PER SECOND RESULTING IN 384 PULSES PER SECOND



APPENDIX IV

DEFINITIONS

BIPOLAR FLOWS - Occur when either radiation or material flow through an imaginary cone away from both poles of a star.

BIPOLAR JETS - same as bipolar flows

BISOLENOID - Two solenoids, held end to end, by some force where like poles are adjacent.

BLACK DWARF - A white dwarf becomes a black dwarf when all of its left over energy has dissipated. The black dwarf is still balanced against gravity by electron degeneracy pressure and can exist eternally.

CAPACITOR - An electric circuit element used to store charge, consisting in general of two metallic plates separated and insulated from each other by a dielectric. It is also known as a condenser.

DWARF EXIT CONE - Same as individual exit cone.

EDDY CURRENTS - An electric current induced within the body of a conductor, when that conductor moves through a non-uniform magnetic field or is in a region where there is a changes in magnetic flux, also known as a Foucault Current.

EFFECTIVE END OF THE FLUX TUBE - It is the location where the magnetic wrapping density is low enough that the two solenoids allow eddy currents to escape and migrate to the surface to form sunspots. The effective ends migrate from higher to lower latitudes as the sunspot cycle progresses. This results because the eddy currents become stronger as the sunspot cycle matures.

DWARF PHOTON SPHERE - It is where radiation passing along the boundary of dwarf exit cone will go in orbit about the relativistic particle Dwarf Exit Cone and Circle it eternally. The region about the particle where the radiation is circling is called the Dwarf Photon Sphere.

ELECTRON DEGENERACY PRESSURE - When electrons are forced so close to the nucleus of the atoms that a nuclear force keeps them from approaching any closer, a pressure results that can balance a star against gravity externally. Stars less than 1.4 solar masses can be balanced in this way and are known as white dwarfs.

EQUATORIAL DISK FLOWS - If the current flows south to north to produce bisolenoidal magnetic field lines they will point upward from stellar centers vertically to the neutron star=s equatorial surface to produce a synchrotron cone inside an exit cone. If these two cones are rotated around the star an exit trough is formed in which radiation will flow outward.

EQUATORIAL FLOWS - Same as equatorial disk flows.

EVENT HORIZON - An imaginary surface around a black hole from which no particle or energy can escape from inside.

EXIT CONE - If one could stand on the surface of a neutron star and shine a flash light, pointed upward, an exit cone, with apex at the flash light, would point vertically. This imaginary cone would allow radiation passing through it to escape into space. Light passing along the boundary would go into the photon sphere and circle the star eternally, whereas light outside the exit cone would fall back into the star.

FLUX TUBE - The tightly packed tube of magnetic lines of force surrounded by a solenoid of a bisolenoidal star.

GEOBISOLENOID - The author=s term for a bisolenoid around the core of the earth if it exist. If so, it would have probably been produced by a faster rotating core than exists today.

HERBIG-HARO OBJECTS - A diffused mass of interstellar dust and/or gas visible as dark or luminous patches according to the way the material absorbs or reflects radiation.

HURTZ SPRUNG RUSSELL DIAGRAM - This is a diagram of stellar surface temperature verses stellar surface brightness as compared to the sun.
INDIVIDUAL EXIT CONE - Einstein said that the acceleration in an elevator traveling near the speed of light cannot be distinguished from gravity. The author believes that a charged, relativistic particle will therefore be affected so much by its enormous accelerating force that it will mimic gravity equivalent to a collapsed star and will therefore have its own individual exit cone.

LEFT HAND RULE - If current flows around the loops of a solenoid, one can point the fingers of the left hand around the solenoid in the direction of current flow and the left thumb will point toward the direction of the solenoidal magnetic field.

LENZ=S LAW - It gives the direction of the induced electromotive force (EMF) and current resulting from electromagnetic inductions. For a current induced in a conductor, the current is in such a direction that its own magnetic field opposes the change that produced it.

LIGHTHOUSE MODEL OF PULSAR - Magnetic poles are often offset from the rotational poles of a neutron star. If the earth is above a point on the magnet pole=s path around the rotational pole and radio noise is propagating upward from the magnet pole, a radio telescope will receive one pulse of radio noise per revolution of the star.

LIKE MAGNETIC POLES - Two negative magnetic poles are referred to as like poles. Also two positive magnetic poles are referred to as like poles.

MAGNETIC INSTABILITY - Segments of magnetic lines break away from the magnetic wrappings around a stellar bisolenoid and swirl upward. If they reach the star=s surface, they contribute to sun spot activity. For this paper, these are referred to as magnetic instabilities. These are believed to occur for main sequence stars that do not have super strong magnetic fields.

MAGNETIC STABILITY - This is a condition that exist when the magnetic field is very strong, which keeps segments of the bisolenoidal magnetic field lines from breaking away to form magnetic instabilities. It is believed that both collapsing and collapsed stars possess magnetic stability.

MAGNETIC WRAPPING DENSITY (MWD) - It is the number of magnetic wrapping per linear meter along the stellar bisolenoid. The author believes the MWD increases with movements along the solenoid toward the stellar center.

MAGNETIC WRAPPINGS - These are the magnetic field lines that become wrapped about the cores of collapsing stars to form stellar bisolenoids.

MAIN SEQUENCE - This is the part of the Hurtzsprung Russell diagram, which is represented virtually by a straight line that is angled upward from right to left and is the location where young stars spend most of their stellar evolutionary life. These stars have a constant surface temperature, radius, and brightness for billions of years. Plus, they have a constant thermonuclear nucleus during this time frame.

MILLIROTASTARS - collapsed stars that rotate from 100 to 1000 times per second.

MILLISECOND PULSAR - A pulsar that has between 100 and 1000 pulses per second or 1 to 10 per millisecond. It is commonly accepted that this implies between 100 and 1000 revolutions per second but this paper places doubt on that number of revolutions for those pulsars.

NEUTRON DEGENERACY PRESSURE - When gravity overcomes electron degeneracy pressure, the combination of electrons and protons produce neutrons. The star collapses down until a neutron star is formed in which a force keeps the neutrons from coming any closer to each other. The resulting pressure is called neutron degeneracy pressure. When the larger star=s gravity overcomes neutron degeneracy pressure, a black hole is formed.

NEUTRON STAR - It is stars with final mass between 1.4 solar masses and some 3 solar masses. Gravity has overcome the electron degeneracy pressure, and the stars collapsed down until the electrons combined with the protons. This combination created neutrons. These stars collapsed down to some ten miles in diameter, where, a new degeneracy pressure called neutron degeneracy pressure balanced the stars.

PROTOSTAR - It is an interstellar gas and dust cloud condensing into compacted objects. The pressure of collapse produced heat in the center of the protostar. Where this heat is too low to reach a central temperature of 10 million degrees, the protostar becomes a planet like object. If it=s central temperature reaches 10 million degrees, thermonuclear burning begins in the form of a proton - proton chain reaction and it becomes a star instead of a protostar.

PHOTON SPHERE - Radiation passing along the boundary of the neutron star exit cone will go into an orbit around the star and circle about that star eternally. The region about the star where this radiation is circling is called the photon sphere.

PULSAR - This is a neutron star in which the magnetic pole is offset from the rotational pole. As the magnetic poles rotate around the rotational poles in a light house fashion, it sends out radio noise from the magnetic poles. For those pulsars aligned correctly with the earth, a pulse will be received on earth each time the magnetic pole points toward the earth. This paper proposes that pulsars can also arise from the earth being above bisolenoidal equatorial flows of radio noise.

RELATIVISTIC - Any particle traveling with a great enough fraction of the speed of light in which the Theory of Relativity must be taken into account, is referred to as a relativistic particle.

ROTASTAR - the author=s name for a collapsed star that rotates between 0 and 100 times per second.

SOLENOID - A current carrying coil of wire that acts like a magnet when current passes through it.

STELLAR CAPACITOR - Similar to electric capacitor but stellar in size. It stores charge on each side of the center of a star where the magnetic field between the like poles of the stellar bisolenoid act as the dielectric of the capacitor.

STELLAR BISOLENOID - This is when the magnetic field line of a collapsing star wrap around the core of a star in such a manner that the current rotates around the core in opposite directions on opposite sides of the star=s center. This forms two solenoids with like poles held close together by the star=s gravity. A stellar bisolenoid is formed. See diagram A of APPENDIX III.

SYNCHROTRON CONE - If a relativistic charged particle gives off radiation, there will be a cone pointing in the direction of motion of the particle in which the radiation must exit. Outside the cone no radiation can escape. The closer the particle approaches the speed of light the smaller the diameter of the cone becomes, such that it will close totally at the speed of light.

SS433 - It is the 433rd object discovered and logged into a catalog of objects with emission lines in their spectra. Today we know that there are jets on each side of a collapsed object such as a black hole or neutron star. This object has a thirteen day orbit about a large star that expels more gas than the compact object can absorb, so it ejects some of the gas with the help of its two jets. SS433 is a much more complicated object than this definition indicates so one should read a detailed description such as AThe Mystery of SS433" by Larry Krumenaker from the Black Hole Encyclopedia found by doing a computer search.

WHITE DWARFS - This is the normal, last invisible stage of a star whose mass is less than 1.4 solar masses. Electron degeneracy pressure has balanced the star with a radius comparable to that of the earth. When all the left over energy from collapse is radiated away it will become an invisible black hole and exist eternally in that state.

BISOLENOID MODEL OF STARS

BY PAUL D. THOMAS, Ed. D.