Ettinger Journals

Supernova Seeding (SNS) Hypothesis

The Reasons Why Different Star Sizes and a Menagerie of Other Celestial Objects are Created from Supernova Remnants

The Moon Enigma By Douglas B. Ettinger

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8/14/2012

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A. Questioning the Nebular Hypothesis

Imagine if you will the analogy of an interstellar giant molecular cloud (GMC) with a normal cloud in the Earth's atmosphere. They both have particles of molecular dust and gases, but the clouds in our atmosphere typically have much more density and opaqueness. Have we ever witnessed Earth's clouds swirling into a disk, as the astrophysicist postulates for giant molecular clouds (GMCs) of thousands of solar system diameters gravitationally collapsing into a proto-star disk the size of one solar system diameter?

The answer is a qualified "yes". The atmosphere's clouds do swirl into huge rotating masses or cells of cold and warm fronts and occasionally into more compact hurricanes and tornadoes. However, the constituents of these clouds have the assistance of Earth's surface geometry and Earth's strong surface gravity. In addition, the Earth is spinning and provides a Coriolis affect creating common spins for various weather cells. The electromagnetic affect of the solar winds in combination with the magnetic dipole field of the Earth also adds impetus to the weather and formation of clouds.

A GMC is much less dense and spreads over a volume equal to thousands of solar system diameters. Due to its almost vacuous qualities, its density is only a very small fraction of our atmosphere and would need for its measured densities even more volume to equal the mass of an average size star like our Sun. The cloud is cold since it is old and has condensed into molecular particles from plasmas created by supernovae and novae. A GMC has no internal or external one directional gravity field, no electromagnetic properties, and no massive point source to aid its gravitational collapse into a disk. If the GMC has clumping it certainly will be random and equally dispersed; I cannot imagine a means for corralling enough clumps to create a massive point source to begin gathering gravitationally dust and gases to swirl inward from 20 to 50 astronomical units (AU) away.

If such an unbelievable gravity source is created, then how does it create a swirling disk? The dust and gases are attracted into the point source from all directions. The IMC does not have a defined surface or a one-directional gravity field like the Earth that can create a coplanar disk. I must be suspicious of any computer modeling that reputes to create a proto-star disk; please show me the initial chosen conditions. Any initial conditions for a computer model must incorrectly start with an unbelievable massive, spinning gravity source.

Let's perform a little calculation. Assume that the effective gravity field of an average star like our Sun with 1.99×10^{30} kilograms reaches outwardly to 50,000 to 100,000 AU. Supposedly, the Sun continues to attract an ice cloud of millions of objects of varying size, called the Oort cloud that is located at about this range of distance. The typical measured maximum densities of interstellar molecular clouds (IMCs) are 10^2 to 10^6 atoms per cubic centimeter.[a] A hydrogen atom has an approximate mass of 1.660×10^{-27} kg. Molecular hydrogen is then $2 \times 1.660 \times 10^{-27}$ kg. Hence, the average density of a GMC should be (10^4 particles / 1 cm^3) x (2) x (1.660×10^{-27} kg

/ per particle) x (1 cm^3 / 10^{-15} km^3) = 3.32 x 10^{-8} kg / km^3. The volume of a spherical shape is V = 4/3 x 3.14 x R^3. Density = mass / V. Solving for the radius of the required GMC cloud to collapse into the given mass of the Sun produces:

Radius (R) = $\sqrt[3]{[(3 / (4 \times 3.14) \times (\text{mass of Sun} / \text{density of GMC})]}$ km

Plug in the values and:

R = $\sqrt[3]{[0.239 \times 1.99 \times 10^{30} / 3.32 \times 10^{-8}]}$ km
= 2.42 x 10^{13} km = 160,000 AU

A molecular cloud is typically 70 parsecs across and its average radius is 35 parsecs times 206,000 = 7,210,000 AU. One parsec is equal to 3.26 light years which is almost the distance to the Sun's nearest star. The volume of typical molecular cloud is V_{GMC} = (4/3)(π)(35 parsecs)^3 and the volume of a typical spacing around a typical star in the Sun's neighborhood is V_{star} = 4/3(π)(4 ly x 1 parsec / 3.26 ly)^3 . Hence, by dividing V_{GMC}/ V_{star} = 21,953 stars. So a molecular cloud of this size should typically produce at least 22,000 stars assuming the average size to be that of our Sun and the spacing of 4 light years to be similar to what is in our Sun's neighborhood. There simply is not enough material inside this cloud to produce this many stars. The mechanism that provides an average spacing of 4 light years has not been imagined yet.

Our Sun requires at least the GMC volume equal to the spherical radius of 160,000 AU to make its mass. A proto-star cannot possibly have enough gravity effect at this distance at any time during its formation or at its final accreted mass to gather these materials from even a small fraction of this awesome distance.

Astrophysicists will offer a feeble counter to these facts by explaining that shock waves from supernovae can provide the trigger for star formation inside a GMC. These shock waves can only disperse the material even more, heating and ionizing the material to defeat any gravitational collapse from condensation, and reduce clumping in the cold cloud that is needed for a possible point source of a gravity field. I am thoroughly convinced that GMCs are not the source for star birth and gravitational collapse is not the mechanism. How does any one-point gravity source establish itself over all the other random clumps of materials? When material does fall toward a one-point gravity source how does it achieve a co-planar disk of spinning material when material is falling inward from all directions. These important questions remain unanswered. There must to be a better concept.

B. A Shift in Thinking

If one abandons gravitational collapse after condensation, and GMCs being the birthplace of stars, what is left to consider? This is where one must rely on inductive reasoning. Certainly, all can agree that the materials of our star with its higher metal content, the materials of the planets and satellites, and the material of our human bodies comes from the nucleosynthesis of stars that have already evolved and exploded into supernovae or novae. The supernovae have dispersed these materials light years into space as witnessed by their remnants. Deductive reasoning tells me that second and third generation stars with planets have to form some time between the supernova explosions and when the hot plasma of the shock fronts begin to condense to form GMCs that mix with other GMCs. The time for formation is obviously before the GMCs form and sometime after the initial chaos of the completed sequel of immense stellar winds and supernova explosions that expel materials from a dying star.

The formation time and location is narrowed down, but let's narrow its timeline some more by examining the mechanism that could possibly organize a compact spinning body of hot gases from all the chaos created by the unimaginable power of fusion, heat, motion, and noise of a supernova.

What could possibly defeat the entropy of such an event? Obviously, some organization does occur somewhere along the way. Our solar system with similar orbiting and spinning orbs are direct evidence that entropy has been defeated. Midsize stars and young stars with higher metals are more evidence that some physical phenomena is at work behind the scenes. What is this physical phenomenon?

There are gravity and electromagnetic forces that act at a distance. There are the nuclear binding forces and weak nuclear forces that act at atomic distances. Besides Dark Matter and Dark Energy, these forces are the only known physical phenomenon known by physicists. Let's try to select the mechanism for star rebirth by using deductive reasoning and then re-examining the observations and data astrophysicists know about supernovae.

The two nuclear forces are short-range forces that make themselves felt over distances about the width of an atomic nucleus and can be ruled out perhaps. The electromagnetic forces and the gravitational forces are the only two long-range forces. Of these, the electromagnetic force cancels itself (with slight and temporary local exceptions) because both attraction and repulsion forces exist together.

This leaves gravitational force alone in the field or does it? The most conspicuous bodies in the universe happen to be conglomerations of vast mass, and we live on the surface of one of these conglomerations. So, it is difficult to think outside the box and imagine any other force affecting large bodies and things that reside on their surfaces except for gravity.

Suppose you imagined in place of the Sun a million tons of electrons (equal to the mass of a very small asteroid). In place of the Earth, imagine 3-1/3 tons of positrons with the opposite charge of the electrons. The electromagnetic attraction between these two insignificant masses, separated by the distance between the Earth and the Sun, would be equal to the gravitational attraction between the colossal masses of these two existing bodies.

Of course, all this is just a paper calculation. The mere fact that electromagnetic forces are as strong as they are means that you cannot collect a significant number of like-charged particles in one place. They would repel each other too strongly.

C. Outlining the Supernovae Seeding Process

However, in the aftermath of a supernova explosion huge swathes of plasma of different elemental nuclei are spread outward into interstellar space in the form of a shock front. These plasmas are individual protons, electrons, and nuclei of multiple protons that are kept separated due to the high energies generated in the explosions. Hence, one has a significant number of like-charged particles in a relatively small region of space being compressed evermore by the kinetic energy of the moving shock front pushing against prior erupted material.

Each succeeding layer of synthesized star material of a very massive star is blown outward especially in the equatorial regions. These plasmas are very magnetic due to the motions imparted by the explosion. The ejection of each layer by either stellar winds or supernova explosions occur over a short time span compared with normal spans of time in the universe. These time spans are only in the thousands of years except for the first two expelled layers of hydrogen and helium. It is possible depending on the energy of momentum of the different materials that subsequent shock fronts will overtake and collide with previous shock fronts that was witnessed by modern man in recent supernova explosions, notably 1987A. With each successive explosion the protons become heavier going from hydrogen to helium to carbon to oxygen to silicon in the normal nucleosynthesis processes of burning or fusing star materials. The final elements that are produced by the nucleosynthesis process of fusion are primarily the extremely magnetic and heavy element, iron, and nickel that decay rapidly to iron helping to maintain an isothermal process in the initial period. Fission in the supernova produces most other heavier elements pass iron in the periodic table. The extreme kinetic power of the explosion smashes the elements already made together to produce these important but much scarcer elements. The most abundant elements from iron to hydrogen in the periodic table provide the most significant role in forming new, smaller, and higher metal stars with their planets.

In the final supernova blast, the iron plasma gathers more quickly into clumps and begins to spin due to the natural forces of electromagnetic radiation that create induced magnetic fields and induced electrical potential. Due to Lenz's Law currents of the free electrons in the surrounding plasma move opposite to the currents forming in the clumps of iron plasma. As in each succeeding expelled material there are smaller and more compact clumping compared to the previous clumping of expelled materials. The reason for faster and smaller clumping is the higher densities due to more nucleons inside their individual nuclei. This, in turn, creates faster and more attraction between the individual nuclei due to the close acting nuclear forces. Hence, iron clumps have higher velocities due to their isolated, lower masses. Each succeeding layer of different plasma is faster than the previous ejection velocity or shock front of plasma. Other major elements of nucleosynthesis such as oxygen and silicon clump into larger masses and intersect previous shock fronts of carbon, helium and hydrogen that are ahead. Finally, the most magnetic iron clumps strike and penetrate the other succeeding compressed layers and their shock fronts because of their highest velocities and densities. Like a cannon ball going through water the iron clumps slow-down attaining the slower speeds of the previous shock fronts.

Due to the extreme electromagnetic properties of the plasmas not yet allowing electrons to join with protons, an attraction mode starts between the positive charges of the iron protons and the negative charges of electrons forming in a surrounding cloud. As the electrons move closer to the clumps of protons they provide rotational energy and a magnetic dipole moment for the clump. The iron clump becomes a very strong electro-magnet with a dipole magnetic field which is the beginning of a point source for inward attractive forces. This is the birthing process for both stars and planets. The randomness of chaos of the smallest particles is the very thing that is defeating entropy. Their electromagnetic properties are arranging these clumps in a systematic process.

It is important to understand at this moment that each and every clump has a trend toward similar spin direction. The clumps have moved away from the source star but are still translating parallel to the source star. The source star in the aftermath of all the series of stellar wind emissions and supernova explosions becomes either a neutron star or a black hole with a residual gravity field. The materials of the various shock fronts have the aid of similar velocity vectors: the translation vector of the supernova star, the radial vectors from the explosion, and the small spin or tangential vector caused by the spinning equator of the source star. Hence, the organized, common trajectories of orbs are birthing and stealing from that rogue, increasing entropy.

How do these iron dipole magnets of random sizes make stars and find themselves as cores inside planets? For the purpose of discussion a new term will be utilized. The dipole magnetic fields created by these spinning iron orbs will be called magnetic spinning orbs or (MSOs). Sometimes the MSOs are also referred as either clumps of spinning iron plasma or iron blobs or magnetic orbs of iron.

These growing MSOs are very powerful and can reach outward with their electromagnetic fields to several astronomical unit distances as was suggested previously by the electrons inside the Sun and the positrons inside the Earth example. The different MSOs in a certain cluster are spreading apart radially but are still moving together with similar velocity vectors and are reasonably held together by an electromagnetic force similar to what attracts two parallel conductors with currents moving in the same direction. These MSOs gather more electromagnetic force because they are gathering more material and offsetting the influence of their increasing isolation. As these MSOs pass through each succeeding shock front of lighter materials they progressively slow down to match the velocities of the shock fronts they are penetrating and attract more materials. This process is similar to a familiar physics lab experiment where a magnet drops through a vertical, conductive aluminum tube. Unexpectedly, the magnet slows from dropping immediately onto the floor due to Lenz's Law. This law states that a changing magnetic field will induce another magnetic field that opposes the original one. The moving magnet generates a circulating electrical current in the tube that in turn becomes an opposing magnet.

In the case of an MSO, the translating, magnetic properties of the orb induce current not only in the electron clouds but also with both the positively charged individual protons and multiple nucleons (combinations of protons and neutrons) gathered into atomic nuclei surrounding the MSO. These positively and negatively charged particles are inside their own shock front and other shock fronts that the MSO is penetrating. Each shock front of different materials may have or may not have generated it own electromagnetic clumps. The larger magnetic properties of iron are not necessarily required to produce magnetic circuits. Other clumps of plasma of the other primary elements can also generate magnetic circuits.

In conjunction with the MSOs slowing because of the induced surrounding magnetic field, the MSOs also attract the free electrons and ions into the center of a swirling, collapsing disk that is perpendicular to its translational direction. These induced vortexes become the proto-star and proto-planetary disks. The charged particles fall onto the MSO and begin to increase its size and mass exponentially. Because the charged particles swirl inward in one direction they decrease the opposing spinning rate and increase the magnetism of the MSO. Any excess of electrons inside the star's core move toward the polar regions and are emitted along the magnetic field lines to create Herbig-Haro objects.[b] Some electrons follow the field lines until they intersect the proto-disk thereby completing an electrical circuit. The electrons then continue inward along the disk to add to the flow and attract more charged particles from farther regions in the growing perimeter of the disk.

This concept is very similar to Faraday's Dynamo, a familiar experimental device known to physicists.[c] A strong magnet provides a field through which a metal conductive disk is spun. Electricity is provided to the outside edges of the disk by brushes and an electrical supply. The circuit is completed by providing brushes at the center of the disk that are connected with wires to the brushes on the outside edges of the disk. The disk continues to spin as long as electricity is provided to the circuit. And conversely, if the disk is spun mechanically it will produce electricity. This is one of Faraday's important experiments that preceded the inventions of the electric motor and generator.

The metal disk is comparable to the proto-disk around an MSO. The strong magnet of Faraday's Dynamo becomes the spinning dipole magnetic iron orb. The electric current moving inward through the metal disk is comparable to the charged particles spiraling inward inside the proto-disk. The circuit that is completed by the wires between the brushes is just like the excess free electrons moving toward to the poles of the MSO and then traveling the magnetic field lines returning to the proto-disk to be re-circulated. Of course, more and more ions and electrons are added from the ever expanding disk perimeter. A feedback process ensures that the aggregation of charged particles increases, thereby increasing the mass of the MSO, thereby increasing the spin rate of the disk and the MSO, thereby increasing the strength of the magnetic field, and thereby increasing the size of the magnetic field that reaches farther outward to increase the radius of the effective proto-disk.

Hence, proto-stars and proto-planets are born. At a certain point effective gravitational fields become more influential due to their growing masses. These force fields eventually grow in strength and begin to attract other neighboring proto-star and proto-planetary disks to form multi-star systems and stars with planetary systems. This abstract outlines the concepts for the “Supernova Seeding” (SNS) hypothesis. Another hypothesis, “Collocation of Stars and Planets” (CSP) explains how the stars and planets occupy orbits with common spin and orbital directions. More details and supporting data for the SNS hypothesis follow.

III. Summarizing the Steps of the Supernovae Seeding Process

The steps of the supernovae seeding process are:

1. Blobs of iron and nickel plasma are ejected from a dying star’s core in the final supernova explosion.
2. Other explosions or major eruptions have expelled materials produced in burning cores in rapid succession prior to the final and largest explosion.
3. The biggest proportion of the star’s mass of hydrogen and helium is expelled first in less violent stellar winds when the star’s core is burning hydrogen to produce helium and when the next subsequent core is burning helium to produce carbon and oxygen.
4. Consequently, most massive star deaths result in concentric shells that have a mixture but also a major identifying constituent of synthesized material. The materials are expanding outward being compressed behind the individual shock fronts. The most massive and thickest shell is hydrogen which is being reheated after each core eruption by ultraviolet rays. This reheating maintains the ionization level of the outer shells.
5. The materials basically are emitted outward from the equatorial regions of the star like an expanding toroid appearing as ring type nebula when viewed through the hole in the toroid shape. Other random expulsions from other spherical regions of the star are not ruled out. Outer layers of the polar regions of the star move toward the equatorial regions to fill in the vacated region.
6. The iron blobs pass through each shock front over a short period of thousands of years and slow down to closely match the speed of the outer shells. These blobs or magnetic orbs (MSOs) gather materials from each compressed, concentric nebula.

The details by steps for what happens to these evolving iron blobs or MSOs are listed below. These steps very much overlap each other, but an attempt is made to best represent them in a chronological order. All these steps occur over in a very short time of thousands of years after the iron plasma is ejected from the star’s core in the final supernova. A brief description entails large clumps of very heavily charged nucleons of iron and their free electrons moving with high velocity, high density, and high temperature through other plasmas with less charged and smaller nucleons. These smaller nucleons are all moving together in the same direction with far less velocity, less density, less temperature and a smaller degree of ionization than the inner magnetic coil or MSO.

To date, experimental data for this scenario of two different plasmas interacting is very scant. Experiments with plasma performed at high pressures are non-existent. Representing the environmental conditions created by a supernova is probably impossible. However, plasma physics has postulated various theories for what happens to plasma of one type under lesser conditions in magnetic and electric fields. From this data physicists have developed consistent equations and laws. But these mathematical treatments may only have partial relevance to what happens with these hypothesized iron blobs.

The best academic discipline for handling such plasmas is magnetohydrodynamics (MHD) which studies the dynamics of electrically conducting fluids such as plasma. "The fundamental concept behind MHD is that magnetic fields can induce currents in a moving conductive fluid which in turn creates forces on the fluid and also changes the magnetic field itself. The set of equations which describe MHD are a combination of Navier-Stokes equations of fluid dynamics and Maxwell's equation of electromagnetism. These differential equations have to be solved simultaneously, either analytically or numerically." [d]

This author is not equipped to handle the required mathematics that is referenced. And, the chosen assumptions for the necessary parameters are comprised of good guesses. So the best intelligent guesses are used to develop a model. Very complicated mathematics is not yet appropriate until a rough model with more parameters is determined. A simplified approach for applying Maxwell's equations is utilizing a representation of solenoids or coils of wire. An inner coil represents the iron blob or MSO and an outer coil represents the plasma being penetrated by the iron blob. Equations for the conservation of energy are also utilized.

The current, "I", for these magnetic circuits will be determined by the total amount of charge, "q", in each coil for a given time after the supernova explosion and time, "t", that it takes for the charges to circulate the coil one time. Time, "t", will be based on the velocity, "v", of the MSO or inner coil and the thickness of the outer coil, "T". Hence, $t = T/v$ and $I = q / (T/v)$. The number of turns of each coil, "N", will be represented by the estimated cross-sectional areas of the coils for a chosen given time after the final explosion. These estimations or representations are primitive but are useful for modeling purposes. Those more talented and interested readers are welcome to approach this scenario using the more appropriate differential equations referenced above. This supernova seeding idea will eventually deserve and acquire a more disciplined mathematical approach.

The evolution of the expelled iron plasma that becomes a magnetic spinning orb (MSO) is described step by step in the following sections.

A. Production of Iron Blob Constituents

Nickel and iron nuclei, products of the final burning process of silicon, are violently expelled from the star's core. The nickel and some cobalt nuclei rapidly decay to iron nuclei (in thousands of years). The immense thermal energy of the explosion, the heat of nickel nuclei decaying, and the heat caused by the impingement of the iron plasma on other materials due to its kinetic energy all combine to maintain a high degree of ionization throughout most of its trajectory. The iron plasma will be transferring energy through heat loss, but as in an isothermal process where the temperature remains roughly the same.

B. Clumping of Iron Blob Constituents

A large amount of free electrons and neutrons are involved with large nucleons of iron. These electrons interchange positions between nucleons thereby holding groups of nucleons together through electric forces. Similarly free neutrons are attempting to hold together the protons through nuclear forces and are interchanging positions between the iron nucleons. This interchanging of positions due to high temperatures results in rapid clumping of the iron plasma.

The free electrons in the growing clumps are traveling parallel to each other and act as conductors with electric current. Ampere's Law [e] teaches us that parallel conductors with current moving in the same direction attract each other with a force, F, per the equation:

$F = 2\,K\,[(I_1\,I_2\,l)\,/\,r]$, [f]

Where I = the currents, l = the length of the conductors, r = the distance between the conductors, and K = proportionality constant.

This effect of conductor attraction and free electron/neutron mixing provided by electric and nuclear forces eventually causes large scale clumping. This clumping is both random and very varied over a wide range of sizes.

C. Clumping Occurs in Clusters

Because of the randomness of the spraying of iron plasma from the supernova and the affects previously mentioned clumps begin to form in clusters that most generally have one or more dominant massive blobs. The clusters become more defined when they become more isolated by the average radial trajectories moving outward from the star and spread apart. There magnetic and electric fields of each cluster become mostly disconnected.

D. Magnetic Field is Induced in the Surrounding Plasma

The iron clumps or blobs with their free electrons pass through the various compressed, concentric nebulae and induce a magnetic field in the surrounding plasmas that have their own free electrons. A simplified equation for this magnetic field of current, I_c, is:

$B = K \sum [(I_c\,\Delta\,l\,\sin\theta)\,/\,r^2]$, [g]

And for a long straight wire surrounding the conductor:

$B_{conductor} = K \sum [(2\,I_c)/r]$ [h] Equation A

For a toroid of mean circumference, L, and having N turns of carrying current, I_s, the field intensity is:

$H = B_{outer\ coil} / \mu = (\mu\ N\ I_s / L) / \mu = N\ I_s / L$, [i]

And:

$B_{outer\ coil} = (\mu\ N\ I_s) / L$ Equation B

Where:

$\mu = \mu_r \times \mu_o$ = permeability of the material;
μ_r = the relative permeability of a material;
$\mu_o = 4\ \pi / 10^7$ weber / amp-meter which is permeability in free space. [i]

Equation A is utilized to find the induced magnetic field within the toroid or its representation as an outer solenoid. Equation B is utilized to find the magnetic induction inside the outer coil created by its own currents.

E. Magnetic Field Induced Inside the Iron Blob

The increasing and changing magnetic field in the surrounding plasma or outer coil creates an induced magnetic field inside the iron blob. This field per Lenz's Law [j] directly opposes the original field. This magnetic induction is exactly the amount determined by Equation B. However, the inner coil is mostly iron plasma and has a very high permeability. The permeability for solid iron is 600 which will be applied although this value is only a guess for highly ionized iron. Hence, the magnetic induction for the iron blob or MSO is:

$B_{inner\ coil} = (u_r\ u_o\ N\ I_s) / L$, [k]
$= 600 \times 4\pi/10^7\ (N\ I_s / L)$ webers/m^2 Equation C

F. Magnetic Fluxes Create Opposing Currents

Magnetic fluxes create opposing currents in the inner and outer coils. The circular currents on these coils create opposing dipole magnets. The current ratio of total current of the inner and outer coils is equal to the reciprocal of the inner and outer "turns ratio". Hence, the current of the inner coil or that circling inside the MSO is:

$I_{inner} = I_{outer} \times (N_{outer} / N_{inner})$ [l] Equation D

This relationship describes the mutual inductance of the two coils. and shows how current in the MSO, I_{inner}, increases as the outer coil grows in size by gathering more charged particles. The number of turns, N_{outer}, represents the quantity of charges in a cross-sectional area of the coil or toroid.

G. Outer Ring of Ions and Electrons are Attracted to the MSO

A feedback loop is created where increasing magnetic fluxes and increasing magnetic induction strength attract the lighter ions and free electrons which have their own magnetic properties from an ever growing outer ring or coil. The magnetic flux from the MSO reaches outward from its center and overtakes and/or pushes the outer ring flux farther away. The MSO is traversing very fast through the outer ring of charged particles which now are only influenced by the MSO's flux. These particles are then attracted to the MSO across the shortest distance like iron filings to a magnet. This distance approximates a disk perpendicular to the MSO's path of motion. These charged particles spiral inwards perpendicular to the MSO's magnetic flux and direction of travel.

Forces are created on the moving charges (both positive ions, their neutrons, and negative electrons) in a magnetic field. The charges, $\sum q$, move with a velocity, v, in a field of magnetic induction, B, and cover a distance, L, in time, t. Then $L = v \times t$ and the moving charges represent current, $I = \sum q/t$. Substituting $I \times L = (\sum q/t) \times (v \times t) = (\sum q) \times v$. Due to Ampere's Law the force on the charges is:

$$F = B\, I\, L \sin\theta,$$ [m]

$$= B\,(\sum q)\, v \sin\theta$$

Where "θ" is the angle between vectors B and v. The direction of force, F, is perpendicular to the vectors B and v. Hence, this force is directed inward on the charged particles toward the MSO now becoming a proto-star or proto-planetary core.

H. The MSO is Slowing to Match the Outer Shock Front and Nebulae Velocities

Due to Lenz's Law energy is transferred from the kinetic energy of the iron blob or MSO to creating induced magnetic and electric circuits in itself and in the surrounding plasma. The energy transfer slows down the MSO to where it begins to match the velocities of the outer shell of hydrogen and helium nebulae. As proto-star and proto-planetary disks are created these velocities are reduced in the range from 3000 to 10,000 km/s to the velocity of an average star of 200 to 300 km/s.

A conservation of energy equation can aid in determining the final strengths of the magnetic induction of the inner and outer coils prior to gravitational collapse dominating the scene. Only the energies of the magnetic fields and the beginning and final kinetic energies will be considered. The gravitational binding energy of the particles collapsing into the proto-star is balanced by the thermal energy provided for fusion in the star's core. The gravitational binding energy to pull together the planets is balanced by their kinetic energies. The radiation heat transfer away from the cluster of proto-disks is considered to be negligible. The potential energy of leaving the gravity field of the supernova star remnant is believed to go into aiding the control of velocity vectors that promote orbiting about the center of the resident galaxy.

The energies of the two magnetic fields of the outer and inner coils are considered. Those energies are equal to:

$$\text{Energy} = W(\text{joules}) = \tfrac{1}{2} S I^2,$$ [n]

Where:

S = self-induction = $(N\ \Phi) / I = N/I\ (BA) = N/I\ (\mu\ NI/L)\ A = (N^2\ \mu\ A) / L$, °

Where:

μ = coil core permeability
Φ = flux (webers)
L = length of coil
A = cross-section area of coil
N = turns in coil
I = current

Hence:

$W_{\text{inner or outer}} = \frac{1}{2}\ [(N^2\ \mu\ A) / L]\ (I^2)$ Equation E

Then by conservation of energy the combined magnetic induction energies are subtracted from the combined kinetic energies to obtain the final combined kinetic energies:

$(\frac{1}{2}\ mv^2)_{\text{inner}} + (1/2\ mv^2)_{\text{outer}} - W_{\text{inner}} - W_{\text{outer}} \approx (\frac{1}{2}\ mv^2)_{\text{star}} + (\frac{1}{2}\ mv^2)_{\text{residual proto-star disk}}$ Equation F

I. Proto-Star and Proto-Planetary Disks Begin to Evolve

Very dense magnetic flux develops from the polar regions of the proto-star and expands outward and curves back to meet the flux emanating from the opposite pole. The magnetic field lines are comparable to iron filings indicating field lines around a bar magnet. However, the proto-star's magnetic flux intersects the proto-star disk and creates an electro-motive-force (emf) that drives disk particles toward the proto-star's surface. The emf potential brings not only electrons but the ions of mostly hydrogen and helium which are striving to remain neutral and close to their opposite charges.

These proto-disks are very similar to an experimental device known as Faraday's dynamo. In the dynamo a rotating metallic conductive disk has brushes on the outside edge. Inner brushes on the disk are connected by wires to the outer brushes. When voltage potential is provided the metal disk rotates. In the case of the proto-star disk a limitless supply of electrons from the surrounding plasma are fed to disk perimeter supplying the current. These electrons along with their positive ions are forced inward at right angles to the proto-star's disk magnetic flux. And like a dynamo the proto-star disk of materials begins rotating at right angles to both the force and flux vectors.

J. Angular Momentums Become Balanced

As mentioned previously in Section F, the current directions of the inner coil and outer coil that produce spinning of their respective materials are opposed to each other. The materials of the outer coil begin to fall onto the proto-star's surface in the opposite direction of the proto-star's original spin. These opposing motions cancel the angular momentum of the falling material.

Eventually, the star stops spinning and begins to spin in reverse in the same direction as the in-falling, spiraling material.

These opposing initial spins are the basic reason why new stars do not spin out of control due to the angular momentum being supplied by the collapsing materials coming from 20 or perhaps 40 AU away. If the proto-star gobbles dense clumps of matter after its spin has been reversed the proto-star will expel some material at the polar regions to maintain a required level of angular momentum. These expulsions are known as jets or Herbig-Haro objects observed in star-birth regions of the galaxy.

K. Gravitational Forces Begin to Dominate

Most of the previous processes are developed from strong electromagnetic properties. Eventually, the masses of the proto-star and proto-planets become large enough that gravitational forces begin to dominate and reach farther outward than the electromagnetic forces. The electromagnetic properties of the proto-star disk are steadily reduced as the disk cools and becomes less dense with charged materials. This newer force begins to influence the larger bodies of mass and not just the small particles of gas and dust. These proto-orbs that existed in a certain cluster begin to attract each other.

These bodies or MSOs all generally have the same magnetic alignment thereby producing the same orbital and spin vectors. Also, a hierarchy is established where the largest MSOs attract each other first to form binary or multi-star systems. These primary bodies then attract secondary bodies of lesser mass that become the planets. The secondary bodies attract smaller bodies that become the satellites.

L. Final Spin Alignments Occur

Due to the initial chaos in the last eruptions and the final supernova of the source star some lesser MSOs within clusters obtain spins opposite the majority of MSO's. Other MSOs will have spin axis with large angles to the forming proto-star disk in which they are attracted.

In the earliest phase of proto-star disk formation the electromagnetic properties are highest for the most dominate MSOs which aids in aligning the spin vectors of all the other captured MSOs. There is enough electromagnetic energy to actually rotate a body with reverse spin by 180^{o}. All these MSOs in the earliest phases are very much at a high level of ionization and have strong magnetic fields. The torque required for this phenomenon can be equated to determining the magnetic moment of a coil in a field of magnetic induction, B.

Torque on coil inside a magnetic field = $T = B\ I\ N\ A\ (\cos\theta)$ nt-m,[p]

Where A = the area of the coil; θ = the angle the plane of the coil makes with the magnetic field. The magnetic induction of the proto-star is B and is determined at a distance, r, from one of its poles by pole strength, p, from the equation:

$B = K\ (p/r^2)$, [q]

Where:

$K = \mu_o / 4\pi = 10^{-7}$ newtons/amp^2 (weber/amp-meter)

And pole strength is p = M/L where L is the length of a bar magnet which in this case is the diameter of the proto-star or the distance between its poles. The magnetic moment of the proto-star or its coil equivalent is:

$M = I\ N\ A$ [r]

Hence:

$T_{coil} = [K(I_{star}\ N_{star}\ A_{star}/L_{star}) / r^2]\ I_{coil}\ N_{coil}\ A_{coil}\ (\cos\theta)$ Equation G

Let $T_{coil} = T_{sphere}$ = the unbalanced torque acting on a solid spherical body of moment inertia, I, that produces an angular acceleration, α.

$T_{sphere} = I\alpha = (2/5\ m\ r^2)(2\ \theta/t^2)$, where θ = angular displacement in time, t. Equation H

Then the angular acceleration, α, can be estimated by setting:

$T_{sphere} = I\alpha = (2/5\ m\ r^2)(2\ \theta/t^2) = T_{coil} = [K(I_{star}\ N_{star}\ A_{star}/L_{star}) / r^2]\ I_{coil}\ N_{coil}\ A_{coil}\ (\cos\theta)$

And assuming a certain original angle of tilt, θ.

The alignment of Uranus with its main satellite system is almost 90 degrees to the ecliptic plane.[s] This situation is a mystery and an extreme violation to the nebular hypothesis. A collision with a very large body could have possibly tilted its axis. The energy required would have more than likely broken the two bodies into many pieces. And, an explanation is still needed for the satellites of Uranus remaining on the planet's equatorial plane.

A simple explanation for Uranus' condition is provided by the SNS hypothesis. The initial proto-star disk and proto-planetary disk are highly magnetic. The most dominate magnetic disk will control the magnetic flux within a certain radius. If this flux interfaces with another opposing flux the stronger flux will provide the turning moment for flipping the smaller dipole magnet. In the case of Uranus whose magnetic axis was never aligned either one of two events occurred.

One event is that the Sun's youthful magnetic flux at Uranus' orbital radius was too weak to flip the planet. Obviously, in this case Neptune, which has a larger orbital radius, was already randomly aligned close to the ecliptic plane. The other possible event is that the magnetic flux was weakening due to the slowing and reversal of the star's spin as explained in Section J. After this phase the gravitational forces are more dominant for attracting the outer planets, but the gravity force field does not provide a turning moment for aligning more magnetic flux vectors.

These ideas have good common sense for the two outer ice planets as explained by the Collocation of Stars and Planets (CSP) hypothesis. The outer planets are the last bodies captured in orbits around the Sun. The filling of the orbits generally occurs chronologically from the most inner orbit to the most outer orbit. Hence, the outer ice planets would have acquired their orbits lastly when the gravitational forces dominated and the electromagnetic forces were dissipated. Be reminded that the outer planets were rapidly losing the strength of their own magnetic fields due to their residence in the colder perimeter of this stellar system. As temperatures decrease, the ionization level and magnetic properties also decrease. Hence, strong magnetic circuits ceased to exist for these outer ice planets and perhaps were not strong enough to align Saturn's spin axis.

M. T-Tauri Phase and Terrestrial Planet Formation

The majority of MSOs do not end up with enough mass to commence fusion and become stars. These lesser masses are destined to become planets or satellites. The largest of these bodies possess enough gravity and initial electromagnetic properties to capture and hold the lighter gases of hydrogen and helium in their atmospheres like Jupiter and Saturn. Only the smallest bodies could not retain these lighter gases and consequently are composed only of crustal ices and silicate mantels.

As the proto-star's size increases the hydrostatic pressure at the star's center eventually creates enough thermal energy to begin fusion of the hydrogen gas. The proto-star is joining the Main Sequence, but first enters the T-Tauri [t] phase that produces fierce stellar winds and drives away the gas and dust remaining in the proto-star disk.

These winds have extremely high velocities and are hotter closer to its center and affect the volatile atmospheres of the closer planets within about 3 AU radii. The hydrogen and helium is excited by higher ionization and is driven away from these small gravity fields. Only the rocky and metal cores of these planets remain. These planets are known as the terrestrial planets and are strikingly different from the larger outer planets that were less affected by the hot T-Tauri winds. These terrestrial planets include Mercury, Venus, Moon, Mars and Earth when it originally resided in the Main Belt of asteroids as predicted by the Earth's Metamorphosis (EMM) hypothesis. These terrestrial planets are the likeness of cores that formed the Sun and the outer planets. These cores are the vestiges of supernova seeds or iron blobs also referred as MSOs.

This series of steps outlines how the majority of star systems with companion stars and with planets are created. This process also explains how even a red or brown dwarf star can have planets, too. No collapsing cloud of cold molecular material is required. The SNS hypothesis explains an entire host of planetisimals such as the smallest comets and minor planets. Irregular bodies such as most asteroids can only be explained as the collisional aftermath of solidified bodies.

Supernovae, the ultimate source of all celestial bodies after the first stars, will now be examined.

IV. Understanding the Different Supernovae [u]

The supernovae of particular interest for the SNS hypothesis are Types Ib and Ic supernovae. These are stellar explosions that involve core collapse of super massive stars. Only this type of star existed in the early universe when the first stars and first galaxies evolved. These stars are believed to be in the range of 150 to 200 solar masses. A few stars in this mass range are still observed today.

Type Ia is the result of white dwarfs accreting mass from a binary companion. When the accreted mass exceeds the maximum mass that can be supported by electron degeneracy pressure it collapses and then explodes. White dwarfs are already the result of a previous supernova and are of no interest since they are a 2nd or more generation of star and have a mass not exceeding the Chandrasekhar limit of about 1.38 solar masses. Their explosions certainly add materials to the interstellar giant molecular clouds (GMCs), but are not included in the SNS hypothesis because of their low mass and because of the manner in which materials are expelled.

Type II supernovae are the rapid collapse of massive stars, but their masses are considered to be no more than 40 to 50 times the mass of the Sun. Type II must have at least 9 times solar mass; otherwise, the death of a star becomes a nova. More information is known about Type II than Type Ib or Ic, but is only considered as part of the SNS hypothesis for the knowledge that can be extracted from its remnants. Their masses are too low and reveal a 2nd or more generation of star. More importantly, these supernovae are distinguished from Type Ib and Ic by the presence of hydrogen in their spectrum. It is very possible, that Type II may convert to a Type Ib or Ic if subsequent stellar winds or explosions result in the expulsion of outer layers. This model is likely since the remnant stars of Type II have been in most cases identified with neutron stars or black holes.

The model for a supernova in the SNS hypothesis requires that the various shells have been stripped of at least the outer layers of hydrogen and helium. Compared to Type Ib, Type Ic supernovae are hypothesized to have lost more of their initial layer, including most of their helium. These two types of supernovae are referred to as stripped core-collapse supernovae which begin to satisfy the requirements for the SNS hypothesis.

The current model for Type Ib and Ic (also referred to as Type Ibc) explains that the outer layers are shed by stellar winds. Massive stars of 25 or more solar masses lose up to 1×10^{-5} solar masses each year which is equivalent to one solar mass every 100,000 years. Let's assume a first generation star at 200 solar masses is composed of 75 % hydrogen. To shed all of the hydrogen in the outer layer estimated to be 33 % of the all the hydrogen (¾ of 200 times 1/3 equals 50 solar masses) would take 50 x 100,000 years = 5 million years. This time span is reasonable for the model of a 25 solar mass star burning all its hydrogen in + or - 10 million years and all its helium in + or - one million years.

The SNS model for the expulsion of the other layers as the star evolves is not certain but generally assumes expulsion of each layer by either stellar winds or by explosions. The star undergoes repeated stages where fusion in the core stops, the core collapses until the pressure and temperature is sufficient to begin the next stage of fusion, and re-igniting to halt collapse. The subsequent layers of carbon, neon, oxygen, silicon, and iron are either shed by stellar winds or expelled more quickly by a rebound after fusion stops and implosion takes place. The SNS model prefers the more violent expulsion of materials. Eventually, when silicon fuel in the core runs out one final supernova occurs expelling mostly silicon and iron. The iron forms into blobs providing the seeds for the next generation of stars. This model of expulsion of each succeeding layer may resolve a major problem with Type II and Type Ibc supernovae. The problem is concerned with how the burst of neutrinos transfers its energy to the rest of the star producing the shock wave which causes the star to explode. The hydrostatic pressure would decrease after each succeeding layer is removed, but the temperature of each phase of the fusion process keeps getting hotter due to the energy of increased neutrinos and gamma production. This is only speculation with no theoretical or mathematical model to support it.

V. Applying Nucleosynthesis

Much useful information is provided by a model of star evolution and its nucleosynthesis for a 25 solar mass star. A table shows the various fusion phases, fuel, main products and duration for burning. The table reveals how the onion-like layers of a massive star are created. This table also indicates the layering of the different radially outward moving clouds or shock fronts created from the stellar winds and/or the subsequent eruptions.

Table A - Stellar Nucleosynthesis Briefly Summarized v

Process	Main fuel	Main products	Duration
Hydrogen burning (via CNO cycle)	Hydrogen	Helium	10^7 years
Triple-alpha process	Helium	Carbon, oxygen	10^6 years
Carbon burning process	Carbon	Ne, Na, Mg, Al	1000 years
Neon burning process	Neon	O, Mg	3 years
Oxygen burning process	Oxygen	Si, S, Ar, Ca	0.3 years
Silicon burning process	Silicon	Nickel (decays into iron)	5 days

For each succeeding fusion process the amount of material produced is appreciably lessened. Nevertheless, the table indicates where the major constituents of the solar system came. The gas giants are composed mostly of hydrogen and helium. The cores of planets and most satellites are composed of iron, nickel, and sulfur. Nitrogen came from either the CNO cycle or the burning of carbon with hydrogen. Oxygen mostly bonded either with Si, Al, Mg, and Ca forming rocky materials, or with hydrogen to form water, or with carbon to form CO_2. Other major volatiles or ices besides water and carbon dioxide were created by the molecules of CH_4, methane, and NH_3, ammonia. These major volatiles became the major constituents of the ice giants, the satellites of the outer planets, and the atmospheres of the terrestrial planets. The SNS hypothesis explains how these materials became unusually distributed within the proto-star disk and within the existing individual celestial bodies. The current nebular hypothesis requires a process for a homogeneous mixing of the materials within the proto-star disk. The observed heterogeneous distribution of materials formed at unexplainable temperatures for the various celestial bodies does not support the idea of homogeneous mixing and the nebular hypothesis.

“The presence of the heavier elements of carbon, nitrogen, and oxygen places an upper boundary of approximately 150 solar masses on the maximum size of massive stars. It is thought that the “metal-poor” early universe could have had stars, called Population III stars, up to 250 solar masses without interference from the CNO cycle at the beginning of their lifetime.” [w] The original stars had no metals to limit their size being composed of only hydrogen and helium, the primordial materials of the Big Bang. The larger the size of the original stars, the more credence is given to the SNS hypothesis. According to the SNS hypothesis the supernova remnants of these stars must give birth to stars that range anywhere from the size of brown dwarfs to the size of about 25 solar masses with the average size being that of one solar size.

VI. Galactic Considerations

Another requirement of the SNS hypothesis is the source star’s velocity and type of trajectory. In order for the SNS hypothesis to work well the dying star must have a velocity comparable to our Sun of 250 km/s. Its original velocity vector along with the radial velocity vectors of ejecta from stellar winds, earlier eruptions, and the supernova explosions combine in such a way to produce parallel and curvilinear paths for the expelled materials. The original velocities of stars like our Sun exist for any typical spiral galaxy. It is postulated that spiral galaxies were created by the collisions of older elliptical galaxies. Elliptical galaxies [x] do not have stars with high velocities and regularly defined trajectories dominated by circular rotation. The stars in these galaxies generally have elliptical orbits with small amounts of back and forth radial motions throughout the entire ellipsoid shape. The stars for the most part remain within a fixed matrix and do not have star burst activity. The kinetic energy of the fast moving individual early elliptical galaxies was transferred to individual stars after the majority of these first galaxies collided to produce spiral galaxies. More than likely, small black holes inside elliptical galaxies combined to form the larger black holes of spiral galaxies and create the planar orbiting characteristics of the individual stars being attracted inward toward the central region. The combining of elliptical black holes after collision formed either the symmetrical bulges or central bars for the spiral galaxies. These collisions also left behind intermediate sized black holes that are randomly dispersed and just recently observed today. The higher velocities of the individual stars that orbit a spiral galaxy are helpful for making the SNS hypothesis more credible.

The currently accepted opinion is that elliptical galaxies came from two galaxies merging. The SNS hypothesis only considers the possibility of elliptical galaxies forming first after initial star creation in the post Big Bang era. Clumping of primordial matter created Population III super-massive stars almost at the same time that a higher level of clumping brought together these stars into various elliptical shapes. These first elliptical galaxies produced chaotic velocity trajectories along with gravitational forces to cause countless collisions with each other.

The massive first stars of these young elliptical galaxies fall into three categories of varying mass ranges. The 100-to-130 solar masses created pressure and temperature effects that allowed for large partial collapses and pressure pulses initiated by a thermal nuclear process called pair-instability of the core. [y] These pulses caused these stars to shed mass until their remaining cores were small enough to act like a normal core-collapse supernova. The primordial materials that are shed are either ejected toward the middle of the galaxy to be scooped and gathered by other stars; or via the SNS process create more star births; or ejected outwardly into the inter-galactic space, but remaining close to the galaxy's perimeter. An example of such a star today is Eta Carinae.

The next mass range is 130 to 250 solar masses. Their collapse due to pair-instability proceeds to completely compress the star's core creating overpressure that allows for a runaway nuclear fusion process. With more thermal energy released than the star's gravitational binding energy completed disrupts the star and leaves no remnant behind. This huge energy release in the core transforms into nickel-56 that rapidly decays 6.1 days to cobalt-56 that decays further in 77 days into the stable isotope of iron-56. The observed hypernova, SN 2006gy, is postulated to be such a star. Studies indicate that perhaps 40 solar masses of Ni-56 were spewed outward to collide with gases ejected earlier. [z] These pair-instability supernovae (SNs) provided both more primordial material to be ejected into the perimeters adjacent to the galaxy, and iron blobs with captured primordial material to seed the galaxy interior and produce smaller stars with higher metals.

The remaining mass range for consideration is 250 solar masses or more. These size stars are created closer to the center of the galaxy where the gravity field's concentration and push is greater. A different reaction process, photodisintegration, [aa] occurs after the collapse. This energy-absorbing reaction causes the star to continue its collapse into a black hole rather than exploding due to thermonuclear reactions. These massive black holes attracted each other and merged to form super-massive black holes which are postulated to be in the center of most elliptical galaxies. Much of their outer layers were more than likely expelled before photodisintegration took place.

A clear picture quickly evolves for elliptical galaxies. These galaxies, if not disturbed externally, become composed of low-mass, metallic stars that will become long-lived. The interstellar medium is sparse because the new star making due to seeding with iron blobs consumed most of the generated dust and gases. Elliptical galaxies are only 10 to 15 % of all observed galaxies and are less common in the early universe. These facts indicate that a major portion collided very early in time to form the more dominate population of spiral and irregular galaxies. A review of astronomy's deep field time elapsed record of galactic collisions does not reveal the subsequent formation of elliptical galaxies. Collisions as seen today only indicate the forming rotational, warping, stretching, and twisting characteristics – never an egg-like shape. An excellent picture of elliptical galactic collisions is given by February 15, 2012, APOD, displaying Stephan's Quintet. Three elliptical galaxies are interacting to eventually produce mature spiral galaxies. A mature spiral galaxy with much star-making activity and an undisturbed elliptical galaxy are part of the quintet.

Numerous elliptical galaxies have super-massive black holes and a higher proportion of star mass than spiral galaxies. Because of their large gravitational attraction they are found close to the center of galaxy clusters. As evidenced by their huge gravitational attraction, they generally possess an extensive system of globular clusters. As mentioned earlier, these ancient galaxies also possess a largely unobserved mass of primordial material surrounding their perimeter. This cold gas is not observed because the spectrum of light from the hotter, metallic stars inside the galaxy overshadows the spectrum signature for this material. This important primordial material left over from the first generation of supernovae eventually becomes mixed into spiral galaxies after the collision of two elliptical galaxies. If another elliptical galaxy collides with a spiral galaxy then even more primordial material is added to the mix to extend the formation of massive short-lived Population III stars.

It is well known that Type II supernovae are mainly observed in the spiral arms of galaxies and in H II regions of ionized gas, but not in elliptical galaxies. [bb] Similarly, Type Ib and Ic supernovae, which occur in regions of new star formation, have never been observed in an elliptical galaxy. [u] Surviving elliptical galaxies have long ago consumed all of their higher mass stars and internal gases and dust. Only spiral galaxies were granted more kinetic energy for their stars due to collisions. These collisions produced organized rotational motions and added more primordial materials that surrounded the elliptical galaxies. The collisions of two to more elliptical galaxies kept producing new massive stars of the Population II and Population I [cc] variety like our Sun. This is why there is still observed star burst activity today inside spiral and irregular galaxies. These galaxies are delivered more primordial materials via collisions later in the life of the universe.

Because they share a similar operating mechanism, Type Ib/c and the various Type II supernovae are collectively called core collapse supernovae. Type Ib and Ic are also referred to as stripped core-collapse supernovae. The new SNS hypothesis relies on the idea that not only the layers of hydrogen and helium, but the other layers are also stripped in fairly rapid succession as indicated by the model of an evolved Type II supernova with 25 solar masses or less. (see Table A) Type Ib and Ic are considered to have more than 25 solar masses but the last part of their evolution after the outer layers are expelled is much like the processes of a Type II supernova.

VII. Why Super Massive Stars Exist

A big question arises about why any super-massive stars greater than 200-solar masses exist today or even 9 billion years ago prior to the birth of the solar system. These stars have short life spans with 10 million years and they more than likely expel materials that create smaller stars. Any massive star more than 25 solar masses cannot be made in regions of Population I and II stars because the CNO cycle, a hydrogen burning nucleosynthesis process, with its catalyst of heavier metals interrupting further growth. However, some 200-or-more solar mass stars actually still exist today.

The SNS hypothesis provides a reason for the current existence of 200-solar mass stars which only can be proven by inductive reasoning. Stripped core- collapse Type Ibc supernovae are only known to exist in spiral/irregular and not elliptical galaxies. And Type Ib and Ic are from very massive stars which are easily identified being associated with variable stars such as Wolf-Rayet stars. The stars of these supernovae may have started from initial masses of 150 to 200 solar masses. These stars no longer exist in elliptical galaxies because all the primordial elements can no longer be corralled into more Population III stars. The star system is stable with the individual stars being held inside a matrix of stable elliptical orbits. The stars of an elliptical galaxy are generally old Population II stars that have evolved into smaller masses, with much longer lifetimes. In comparison, spiral galaxies evolved very early after being created by mature elliptical galaxies and continue to be created today from the collisions of the remaining elliptical galaxies and galactic clusters. There leftover primordial elements inside and surrounding these elliptical galaxies are agitated, mixed, and compressed inside the spiral arms of spiral galaxies to create a final spurt of super-massive Population III-like stars not hindered by the CNO cycle. The artifact of these non-existing Population III stars is a profusion of multi-star systems and stars with planetary systems inside these spiral galaxies.

Our 4.6 billion year old solar system with its Population I stars and its 8 billion year old Milky Way galaxy could possibly have the following timeline knowing that its higher proportion of metals evolved from a Population III star mixing its expelled materials with shock fronts and/or nebulae from existing Population II stars. The table below takes some guidance from Wikipedia's "Timeline of the Big Bang".[dd]

Table B - Timeline for Our Galaxy and Solar System

Event	BYA
Best current estimate for the age of the universe	13.75 $\pm$ 0.11
Primordial nucleosynthesis of H and He begins 10 seconds to 380,000 years later	13.7496
First stars form from primordial elements between 150 million to 1 billion years later	13.74-12.75
Primitive globular clusters of stars begin forming	13.00-12.75
First stars explode to create less massive, more stable stars every 6 to 10 million years during a span of about 1 billion years	12.75-11.75
Most globular clusters join to form elliptical galaxies that gather more primordial elements	12.75-9.75
Galaxies form into groups, clusters, and super-clusters caused by gravitational attractions	11.00 to present
Formation of spiral and irregular galaxies including the Milky Way begins with the collisions of elliptical galaxies	10.00 to present
The galactic disk of the Milky Way forms over a span of 2 billion years	8.80 $\pm$ 1.7
The mixing of primordial material surrounding the galaxies after collisions continues to create Population III stars that in turn create active starburst regions. Spiral galaxies eventually evolve into system of mostly Pop. I and Pop. II stars	10.00 to present
Either a super-massive Pop. II star inside an H II region or a Pop. III star inside a cluster of Pop. II stars is born and dies	7.00-4.5684
A supernova remnant is created that provides seeds for the Sun, a Pop. I star, and its planets	4.5683-4.5682
A proto-star disk is formed that creates a proto-star, captures planets, and is evacuated by the solar winds of the new hydrogen-burning star	4.5682-4.5681
The Sun joins the main sequence with a pristine planetary system	4.5680
The Earth forms a solid crust	4.540 $\pm$ 0.05
The Moon forms a solid crust	4.527 $\pm$ 0.01
Gaia (Earth) collides with a planet-size impactor and knocks Earth inward to share the Moon's orbit	4.1-4.0
The Late Heavy Bombardment (LHB) occurs within the inner solar system	4.1-3.9

VIII. Chronology and Velocities of Expelled Materials

The SNS hypothesis does not dispute the elegant theory of nucleosynthesis for the Big Bang and for stellar evolutions. The theory which describes the evolution of matter is well entrenched. It very successfully is collaborated by using data for the abundances of nuclei from stellar atmospheres, meteorite materials, isotopic anomalies, time-scales from radioactivities, molecular spectra lines from interstellar clouds, and the spectroscopy of dilute gases of planetary nebulae, supernova remnants, supernovae, novae, and jets.[ee] The SNS hypothesis only builds upon this amazing theory by providing ideas for the evolving structure of supernovae processes and their remnants.

It is important to summarize the chronology and velocities for expelled materials for the "Supernova seeding" (SNS) hypothesis. The SNS model requires an already accepted theory. The cores of massive stars become layered like onions as progressively heavier atomic nuclei build up at the center, with the outermost layer of hydrogen gas, surrounding a layer of hydrogen fusing into helium, surrounding a layer of helium fusing into carbon via the triple-alpha process, surrounding layers that fuse to progressively heavier elements. As this massive star evolves, it undergoes repeated stages where fusion in the core stops, and the core collapses until the pressure and temperature is again sufficient to begin the next stage of fusion, re-igniting to halt further collapse.[u] Where the SNS model deviates is how and when the materials are expelled. Much data collected from existing computer models and observations of supernovae and their remnants is utilized. [u] (Wikipedia; Type II Supernova)

The SNS model visualizes a massive star as a spinning ball of plasma with extreme electrical and magnetic properties that also has an orbital velocity around the center of its galaxy. Due to the combination of magnetic, centripetal, and resulting lessened hydrostatic pressure the materials are ejected mostly along the equatorial and lower latitudinal regions. After equilibrium is reached between the contending new radiation and hydrostatic pressures and other forces the star's materials from the higher latitudinal and polar region flow into the equatorial regions to maintain the smooth oblate shape of the star while mixing the affected outer layers. The spinning materials in the equatorial regions have less hydrostatic pressure due to the centripetal forces caused by rotation. The outward radial magnetic forces are caused by the rotating plasma creating circumferential strips of magnets that oppose each other. The magnetic repulsion is similar to trying to set two bar magnets side by side with the north poles aligned. Of course, they will repel each other. Hence, the forces countering the gravitational hydrostatic pressure make the equatorial region a prime candidate for most of the outward expulsion. The SNS model does not accept that materials are dispersed in an almost spherical manner. There are some observed but infrequent ejections from the two poles; these ejections are special cases and are not treated specifically in the SNS model.

The SNS model does accept that the hydrogen and helium layers are expelled by strong stellar winds with some possible major burping after the hydrogen core temperature drops and hydrogen burning ceases in a cyclic fashion; and after the helium core temperature drops and helium burning ceases also in a cyclic fashion. This removal of hydrogen and helium is never completed because there is always the flow and mixing of these elements from the higher latitudinal regions. Stellar winds and massive eruptions are rather random and never evenly distributed. Hence, hydrogen and helium atoms are still distributed throughout the star and are available for all the other burning processes of nucleosynthesis.

Knowledge of the solar winds is used as guidance in choosing a scale value for the radial velocity of the stellar winds from a massive star. Average solar wind speeds are 400 km/s and the range is 300 to 1000 km/s. Solar eruptions travel at velocities of about 420 km/s.[ff] Hence, a scaled value of 700 km/s can be chosen. Massive stars have been observed to lose the equivalent of a solar mass steadily over time every 100,000 years. If it is assumed the outer layer of hydrogen for a 200- solar mass star is 50 solar masses, then at the stated rate it would take 5 million years to expel this outermost layer which is a reasonable scaled value. Assume that the helium layer has proportionately about 15 solar masses. Using the same rate of expulsion it would take 1.5 million years to expel. Examining the model for core-burning nuclear fusion stages for a 25-solar mass star reveals that the remaining burning processes after the triple-alpha process for burning helium have an insignificant shorter duration of a little over one thousand years. Adding these rough duration times somewhat comparable for the evolution of a 200-solar mass star gives a total lifetime of not much more than 6.5 million years. A realistic range is 6 to 10 million years.

The current massive star evolution model for Type Ib and Ic supernovae expects all the onion-like layers of synthesized elements to be ejected at once in one supernova explosion after all the silicon fuel is consumed in its core prior to the outer layers of hydrogen and helium being removed over a long period of time by stellar winds. However, computer modeling of the final explosion fails to supply enough energy to expel any materials. The SNS model significantly deviates from the currently accepted model for this expulsion process. Basically, only one burning core occurs at a time and in a sequence going from carbon burning to neon burning to oxygen burning to finally silicon burning. If enough hydrostatic head of hydrogen or helium exists, burning cores of these two elements along with the deeper core burning can exist at the same time.

The SNS model continues to state that after each burning core consumes its fuel in a certain required temperature range and in a specific environment dictated by a sequence of increasingly heavier nuclei, there is an implosion and a resulting outward explosion that ejects most of the outer layers into space. These sequential explosions lasting only about 1000 or more years leading up to the final explosion are never observed because the final explosion produces the most kinetic energy and overtakes the other shock fronts prior to observers seeing the resulting light energy over many thousands of light years. It may be possible to see these explosions when a local massive star in our Milky Way such as Eta Carinae is near the end of its phases of burning. Perhaps we have already seen such eruptions not understanding the signature of light energy variability.

The average range of velocity for supernovae expelled materials is 2200 to 4400 km/s. Debris from an exploding white dwarf expands at 10,000 km/s per modeling and observation.[u] The Tycho supernova left behind a cloud of silicon, iron, and other heavy elements. Tycho's shock front is measured to expand an average of 7500 km/s.[gg] Much data like those presented provide likely scaled values for ejection velocities. For the SNS model each successive expulsion of materials has a higher velocity thereby enabling each successive shock front to intersect the previous. Due to gas drag and magnetic coupling each new shock front of material begins to move slower to match the previous slower velocity. Eventually the last onion layer of silicon, iron, nickel and sulfur with the fastest ejection velocity of 7500 to 10,000 km/s will become slowed each time it passes through each shock front that is ahead until it closely matches the velocity of the slowest material, the stellar winds of hydrogen. The stellar winds started at velocities of 300 to 1000 km/s and have slowed due the increasing potential gravitational energy created by the source star mass and the subsequent releases of matter from its surface. By the time the iron blobs, the seeds for new stars and planets, from the last explosion catch the last stellar wind shock fronts they are assumed to have slowed to the resultant velocity of the forming proto-star. In the case of our Sun that velocity is 250 km/s which are a combination of vectors provided by the progenitor star's translation velocity, the star's spin velocity, the radial vector velocities from the sequence of explosions, and the gravitational force vector from the spiral galaxy's central mass.

The reason why each successive shock front leaving the star's surface is faster than the previous is not totally obvious. But, the forming of different elements and their molecules must come together to create such bodies as our Sun's planets and satellites. A brief study of the structure of the star as it evolves is necessary.

IX. Evolution of Primordial Star Structure

The first stars after the Big Bang are called Population III stars. Computer simulations indicate these first stars were all extremely massive and their lives of 6 to 10 million years are very short compared to Main Sequence stars today.[hh] These stars for the most part expired quickly and no longer exist. They exploded to create smaller stars with higher metallacity, called Population II stars. Theories for these stars are based on studies of less massive stars from 25 to 100 solar masses.[cc] A few super-massive stars from 100 to 150 solar masses survive to this day such as Eta Carinae. It is believed that our Sun, came from the remnants of Population II stars that produced the highest proportion of metals inside our galaxy. The Sun is called a Population I star having a typically higher proportion of metallacity.

The seeds for starting these first stars are unknown, but suspicions lead to the clumping of the heavier primordial materials, lithium and beryllium, created by the Big Bang nucleosynthesis. These seeds then collected massive amounts of available ionized hydrogen and helium. As these stars began to grow in mass they were prevented from collapsing under their own weight by a combination of electron degeneracy pressure and radiation pressure of the very hot plasma. "When electrons are squeezed too close together, the exclusion principle requires them to have different energy levels. To add another electron to a given volume requires raising an electron's energy level to make room, and this requirement for energy to compress the material appears as a pressure." [ii] Radiation pressure is dependent upon temperature which is significant following the Big Bang.

The primordial star continues to grow while the high temperatures prevent fusion of any hydrogen or helium. As the environment outside the star is cooling the material added to the star becomes cooler and eventually attains a temperature within the star of about 7×10^7 Kelvin where hydrogen fusion may begin close to the surface of the star. The stars move farther apart and the environment further cools. Hydrogen fusion can no longer be supported on the surface, but will be supported deeper inside the star by hydrostatic pressure created by the force of gravity of a column of gas inside the star. As the star cools even more by transferring radiant energy to the left-over primordial elements between the stars, it eventually begins to collapse because there is not enough radiation pressure to counter the hydrostatic pressure. But the energy of hydrogen fusion takes over again because the hydrostatic pressure at a certain level provides enough temperature from the developed gas pressure = P = mRT/V where m = mass; R = universal gas constant; T = temperature; and V = volume.

This hydrogen burning process, however, can be interrupted if the star is too massive. The theory of thermonuclear reactions postulates that 130-to 250 solar masses at very high central temperatures will collapse due to "pair instability", the production of free electrons and positrons. No star remnant is left behind; but, a core of nickel and iron plasma is produced and expelled.[y] Hence, in this case, no intermediate metals between helium and iron are produced. The continuing discussion for primordial stars only includes massive stars in the range of 25 to 130 solar masses which are assumed to be second generation stars produced from the largest first stars and pair-instability supernovae.

"The presence of the heavier elements carbon, nitrogen, and oxygen places an upper bound of approximately 150 solar masses on the maximum size of massive stars. It is thought that the "metal poor" early universe could have had stars, called Population III stars, up to 250 solar masses without interference from the CNO cycle at the beginning of their lifetime." [w]

For the appropriate mass range a helium gas shell is created. The increased thermal pressure due to energy released by hydrogen burning causes the star to expand. The expansion cools the hydrogen layer and shuts off the reaction. The star contracts again. "This cyclical process causes the star to become strongly variable, and results in it blowing off material from its outer layers." [jj] The bottom of the helium layer eventually becomes hot enough at 2×10^8 Kelvin to start the triple-alpha process and produce mainly carbon and oxygen.

Both the hydrogen and helium layers are postulated to have very massive, violent eruptions near the end of their burning process. These eruptions are revealed by rings in the circumstellar medium (CSM) indicated visually by UV flashes from SN and by special radio and X-ray spectrometry.

A carbon-oxygen shell is created. The previous cyclical process starts over again for helium burning. This time the helium layer along with hydrogen is blown off in violent stellar winds. Evidence is given by Type Ic supernovae that shed their outer envelope of hydrogen and also helium. One of the few examples of a massive star ejecting its outer layer in this fashion in our Milky Way is Eta Carinae. Astronomers have witnessed massive eruptions estimated to contain enough mass to make 10 Suns. The star is currently 100 solar masses and is predicted to lose most of its outer layers and become 10 to 20 times the mass of the Sun before it explodes. [kk]

One final increase in thermal pressure due to energy released by helium burning causes the star to expand again. The expansion cools the helium layer and shuts off the reaction. The star contracts again to push the carbon-oxygen layer inward until the resulting increase in gas pressure, decrease in volume, and increase in temperature to 8×10^8 Kelvin of this layer - ignites the carbon burning process.

The subsequent fusion or burning processes of carbon, neon, and oxygen require successively more binding energy to produce their products. The much higher thermal pressures increase the expansion even higher because the external hydrostatic pressures have lessened over time since the outer layers of hydrogen and helium are slowly and steadily shed. The contraction is much more violent because more gravitational and magnetic potential energy is stored and is now being released against lessened hydrostatic pressure. A new higher temperature is achieved each time after contraction in the location of elements with highest atomic masses to start the next burning phase.

The final burning phase is with the fusion of silicon into primarily nickel, iron, and sulfur. Much of the nickel rapidly decays to iron. The silicon layer is expelled with a mixture of other previous synthesized elements. The cyclic conditions repeat themselves again, but iron and its brethren with higher atomic masses require energy for more binding of heavier elements unlike the previous elements. Nuclear energy of fusion is no longer available. All the remaining outer layers of mostly hydrogen and helium collapse onto the iron core. The gravitational and magnetic potential energies are violently released after the iron core is pushed to the point where radiation pressure and electron degeneracy pressure prohibit further contraction and rebound the iron core. There is an instant supernova explosion expelling the remaining outer contracted layer and spewing iron blobs of plasma from the failed core into the guts of the supernova remnant possessing materials from other shock fronts. This is the beginning of the seeding for the next generation of stars.

The remnant star under the iron core depending on the amount of mass that is left will become either a white dwarf (for 1.4 or less solar mass), or a neutron star (for 1.35 to 2.00), or a black hole for larger masses. The complete contraction of a white dwarf is resisted by electron degeneracy pressure. The contraction a neutron star is resisted by neutron degeneracy pressure. Any mass concentration that cannot support neutron degeneracy pressure or the thermal pressure created by fusion will collapse to a black hole. [u]

Why does not a supernova remnant like a white dwarf, which may have the mass of our star or more, resist collapse by generating more nuclear fusion comparable to what occurs inside our Sun? The final implosion from all the fuel being consumed and a subsequent explosion expelling any remaining fuel at a certain core radius has compressed the remnant star to a small size comparable to an asteroid and fusion is no longer an option.

The big difference between the SNS hypothesis and the normally, currently, accepted hypothesis is that the supernova star has explosions after each burning process consumes its fuel and starts an implosion. There is not one supernova explosion as is currently favored. Further collaboration of this change of the expulsion process is given by more recent observations and models of the luminous blue variable (LBV) star, Eta Carinae, and by recent computer models of how stars explode.

A. Study of LBV Stars Supports Sequential Eruptions

New data show that the material that absorbs radiation is unevenly distributed in the atmospheres of dying stars. Per the SNS hypothesis this should be the case. If astronomers don't correctly account for the higher intensity of light emitted by a clumpier atmosphere, they can be fooled into thinking that the wind carries away more mass than it really does. More dense clumps of ions in the surrounding atmospheres will radiate more strongly than an assumed more uniformly distributed material.

"Steady winds are simply inadequate for the envelop shedding needed to form a Wolf-Rayet star" was stated by Nathan Smith and Owocki in the July 1st - Astrophysical Journal Letters. [ll] Instead of the weight loss idea by stellar winds, a new idea is coming forth that extraordinary violent eruptions like the one that convulsed Eta Carinae in the mid- 1800s are slimming these massive stars. [mm] This idea directly supports the SNS hypothesis.

Luminous blue variable (LBV) stars [nn] like Eta Carinae are hypothesized to have these eruptions before it enters the Wolf-Rayet (WR) phase. One eruption would not be enough to shed all the mass, but several at different times during the entire LBV era would suffice as Smith proposes. "The nested shells of material surrounding the mushroom-shaped clouds recently cast out by the star suggest that Eta Carinae had in fact suffered previous outbursts over several thousand years." [mm] A Milky Way star called P Cygni brightened and shed a tenth of a solar mass in 1600. [oo] Furthermore, astronomers have recently identified in other galaxies several stars called "supernova imposters". These stars have not completely reduced to a SN core remnant, but had extremely bright and energetic eruptions.

"What's more, shells of material that surround some bona fide supernovae indicate that these once-massive stars ejected large amounts of material only a few thousand years before they exploded" as stated by Paul Crowther of the University of Sheffield in England. The evidence is mounting that supernovae of massive stars certainly have a sequence of large eruptions before the final fireworks.

Paul Crowther adds that the challenge of proving Smith's hypothesis is the brevity of the LBV era. Massive stars are rare and it is difficult to find one in this brief phase of evolution. The SNS hypothesis agrees with Crowther's accounting that reality is somewhere in between the mass-lost ideas of stellar winds and powerful eruptions. The SNS hypothesis directly supports that the stellar winds primarily expel some of the outer layers of hydrogen and helium in the luminous blue variable (LBV) phase. Then, violent eruptions - after each burning core phase is completed - occur during the Wolf-Rayet phase. Finally, a Type Ic supernova occurs. A summary of the evolution is the sequence of an O-type star converting to a LBV star that converts to a WN or WC-type Wolf-Rayet star that becomes a Type-Ic supernova.

B. Computer Modeling of Supernovae Explosions [pp]

Computer simulations have trouble reproducing star explosions. Stars normally have mechanisms to regulate themselves and remain very stable for millions and billions of years. These mechanisms favor the star dying a slow, quiet death. Troubles begin with the thermonuclear flame fizzling during simulations. The energy released causes the star to expand and cool, thereby quenching the burning. Unlike an ordinary bomb, a star has no walls to confine it and prevent self-extinguishment. Of course, no lab experiments can reproduce the conditions found inside a supernova. Hence, the explosion of a star remains a mystery, but computer simulations do indicate where some of the details of current ideas must change.

Thermonuclear flames can spread in two ways similar to what happens inside an internal combustion engine. Detonation being the most violent propagates at supersonic speeds and compresses the burning mixture. This process is the most likely occurrence compared to deflagration that propagates at subsonic speeds with much less heat diffusing through the fuel. However, astronomers detect a wide variety of elements in these explosions such as silicon and sulfur which would be destroyed by a detonation process. The deflagration process generating only one quarter of the temperature of detonation is quickly quenched thereby causing the explosion to fizzle. A possible answer to this dilemma is that the different elements created in the onion layers are ejected prior to the observed final supernova explosion involving the central core, which is basic to the SNS hypothesis. In this way the elements with smaller nuclei can survive the detonation process. The detonation process is able to cool sufficiently before its supersonic shock wave reaches the already ejected materials.

It is normally accepted at the end of life that a star with more than 10 solar masses has developed an onion-like structure comprised of successively heavier elements. The core is comprised mainly of iron and nickel that is maintained by quantum repulsion between electrons. Eventually the weight of the star squeezes the electrons into the atomic nuclei to form neutrons and electron neutrinos. The repulsion of the neutrons and remaining protons stops further collapse and a supernova explosion occurs. In computer simulations the energy created in the implosion quickly dissipates and fails to expel material.

Another possible answer to this conundrum is that the each layer of the onion-like structure has already been stripped making the energy release easier. Of course, the question arises as to what squeezes the electrons in the first place if the weight of the star has been greatly lessened after each layer has been stripped. The answer from the SNS hypothesis is that the layers were mostly stripped from the equatorial and lower latitudinal regions. After each expulsion phase materials on the star’s outer layers mix and flow from the higher latitudinal regions to re-fill the equatorial regions. Hence, some decent amount of hydrostatic pressure is maintained. Added to this potential gravitational energy release is the potential radiation energy due to higher temperatures and densities of the materials in the burning core created by ever higher binding energies. The evolving feedback loop imposes decreasingly less hydrostatic pressure, but exponentially more radiation pressure. These new ideas can provide enough energy release for an explosion and expulsion of materials.

Another idea for computer simulations was to add the effect of the energy of neutrino production. But gas absorbs neutrinos as well as emitting them and these models of explosions also fizzled. But it was discovered that steering away from spherically symmetrical assumptions produced better models. Multi-dimensional phenomena of convection and rotation were added to the model, which is a normal consideration for the SNS hypothesis. Rotational forces and convection aided in carrying the shock waves farther upward. Observed supernovae leave behind highly non-spherical, jumbled debris. Modern computer modeling for supernova explosions was excellently explained in Scientific American: September 18, 2006; "How to Blow Up a Star" by Wolfgang Hillebrandt, Hans-Thomas Janka and Ewald Muller. [pp] The SNS hypothesis attributes these observations to the proposed method of expulsion which typically occurs around the equatorial regions of the star. The release of materials is in the form of a jumbled torus. Seeing this torus hundreds to thousands of light years away at different kinds of orientation will certainly appear non-spherical and asymmetrical.

The affect of a very strong magnetic field squeezing matter outward along the rotational axis in two polar jets was also modeled. A few supernovae portray these jets which suggest electromagnetic properties. The modelers were concerned more with the anomalous jets. The SNS hypothesis certainly suggests very strong magnetic fields creating some of the kinetic energy for expulsion. The jets are considered non-typical and not included. Since the star is spinning with these charged ions and electrons, a magnetic field is not only created at the poles but also exists radially outward from the lines of current concentrated and organized in the equatorial regions. This magnetic field is another aid in moving the shock wave through the remaining outer layers of a star to perform its ejection of materials.

Perhaps the modelers for star explosions should revisit their simulations armed with some the ideas presented by the SNS hypothesis. The present study of evolved Wolf-Rayet stars provides more collaboration for the expulsion process expressed by the SNS hypothesis.

C. What Wolf Rayet Stars Tell Us

Wolf-Rayet (WR) stars are evolved massive stars with more than initially 20 solar masses which are losing mass rapidly by strong stellar winds or successive eruptions leading to a Type Ic supernova. Gas around these stars is moving at 300 to 2400 km/s by means of radiation pressure or by expulsion forces created deep inside the star. These WR stars reveal strong, broad emission lines of helium and nitrogen ("WN" sequence) or helium, carbon, oxygen ("WC" sequence). [qq] Super-massive O-type stars have ejected hydrogen-rich gas from the outer layers of the star. The emission lines are formed in the perimeters of the high-velocity wind regions surrounding the star.

The ejection process of these O-type stars reveals in succession nitrogen-rich products of the CNO cycle burning of hydrogen (WN stars), and later the carbon-rich layer due to helium burning (WC and WO stars). These stars then progress to either Type Ib or Ic supernovae. The phases of evolution from an O-type star to a luminous blue variable regardless of size from 25 to 100 solar masses always have a WN (hydrogen-poor) star before ending as a SN Type Ib or Ic. The larger mass stars from 40 to 100 solar masses also generate a WC star. The most massive stars create a WN (hydrogen-rich) star preceding the LBV phase. The resulting nebulae either create HII clouds, ejecta-type nebulae, wind-blown bubbles, or neutral hydrogen voids.

The events surrounding a WR star tell the story for the SNS hypothesis. The evolving massive star enters its first phase of burning hydrogen and emitting hydrogen in pulses to indicate a WN (hydrogen-rich) star. The second phase of burning helium creates the luminous blue variable where the emitting of helium is by a lower frequency pulsing. The third phase of carbon burning creates the WN (hydrogen-poor) star. The first emitted layers of hydrogen have been radially dispersed and are cooling. Further pulsing ejects the remaining helium layer that has large amounts of nitrogen from the CNO cycle or from hydrogen and carbon combination. The fourth phase finishes the carbon burning process that casts off non-synthesized carbon and oxygen. Traces of Ne, Na, Mg, and Al should also be seen in emission lines if not overpowered by the carbon and oxygen. This fourth phase is represented by WC and WO stars. The subsequent short-lived phases (calculated in years) of neon burning, oxygen burning, and silicon burning and their expelled layers are largely un-observed. Before their emission lines can reach Earth, the light energy from the subsequent Type Ib or Ic supernova saturates the region.

The Wolf-Rayet nebula types [rr] further substantiate the SNS hypothesis. One type of nebula is the resulting HII regions of ionized gases that will give birth to new, smaller stars. The initial layers of hydrogen removed during the hydrogen burning phase are now being re-radiated with ultraviolet light and re-heated by subsequent shock fronts, especially the explosion resulting from the expulsion of the iron and nickel core. When the iron blobs and other blobs of material just behind the last shock front intersect the re-heated clouds of hydrogen, an environment is created for birthing a new round of stars.

In the HII regions indicate the dominant spectral line which has a wavelength of 65.3 nm. [bb] This is the H-alpha line [ss] emitted by atomic hydrogen. Specifically, a photon of this wavelength is emitted when an electron of a hydrogen atom changes its excitation state from n=3 to n=2. These state changes happen frequently when an electron is captured by an ionized hydrogen atom and the electron moves from some higher state to n=1. It is concluded that HII regions consist of a mixture of electrons and ions and recombining hydrogen atoms. For the SNS hypothesis this is conclusive evidence that strong magnetic and electric fields exist in this HII matrix. These electromagnetic properties are required for iron blobs to begin attracting surrounding plasma to form a proto-star and its disk. Indeed, HII regions are the birthplaces of new stars and clusters of stars as is witnessed by 20th century observations.

Much can be learned by studying WR stars because these are the last vestiges of star and planet making in a spiral galaxy. For stars of less than 25 solar masses there is no final WR stage. For these smaller stars their death throes are much less frequent and their structure after an explosion is not as revealing for emission line analysis. The expected size of ejecta from the smaller stars is not as significant. The WR stage produces supersonic stellar winds, wind-blown bubbles, hydrogen voids, and ejecta-type nebula in the circum-stellar medium. These affects are preceded by the removal of the outer layers of hydrogen and helium of the star in the luminous blue variable (LBV) stage. All these features are predicted by the SNS hypothesis.

The first nebula envelop of a Wolf-Rayet star is rich in hydrogen. The fast stellar winds have removed much of the hydrogen of the outer layer and swept out a shell of compressed gas.

When the star reaches the Wolf-Rayet phase, its outer layers are almost free of hydrogen. The mass losses over time catch up with prior material losses to create this shell.

Imaging surveys of the environments of WR stars have found that in 50 % of cases a ring-like nebula is seen. These ring nebulae are classified either as R-type with H II regions that have subsonic expansion velocities, E-type nebulae formed out of stellar ejecta (chaotic internal motions and large velocities), or W-type with wind-blown bubbles showing thin sheets of filaments. [tt] The fate of the circumstellar gas results from interactions between 1) fast winds from the star while burning hydrogen on the main sequence; 2) the slower winds from the luminous blue variable phase while burning helium; and 3) the faster winds from the WR stage when subsequent burning processes of heavier nuclei take place. The resulting masses, morphologies, and chemical composition of these circumstellar envelopes strongly depend on the initial stellar masses, because of different nucleosynthesis; different time dependence of the winds or eruptions; and different ejection velocities. Chemical anomalies are due to rotation-induced mixing thought to be triggered by the ejection process. The rotational characteristic is due to both the spin of the star and the rotation of magnetic clumps passing through plasma creating a dynamo effect. Of course, rotation-induced mixing can be greatly enhanced by a nearby orbiting companion star, but is not necessary.

A nebulae study of a Wolf-Rayet star WR104 (Ve2-45) indicated the definite presence of a companion OB star. [uu] WR104 reveals a spiral structure with a diameter of 160 AU. The dust nursery at the collision front between the stellar winds is carried around with the natural orbital motion of this OB star completing one orbit every 220 days. "The spiral shape is a consequence of material being swept radially outwards by the stellar wind from this rotating formation zone. This is the classic "lawn sprinkler" spiral where the water is always flowing straight away from the center, but as the system rotates the water looks like it is flowing in a spiral when you look from the top." [vv] This study provides further evidence of large-mass ejections from a massive star have concerted velocity vectors as opposed to random, chaotic motions. It is these concerted velocity vectors (in this case observed very well due to a binary companion) that begin to start a trend for gas, dust, and blobs of plasma orbiting a much more dominate blob in the same direction. The conditions are being set for a star-planetary system like our solar system.

These observations bode well for the SNS hypothesis. As studies show all ejections eventually intersect and mix with each other while still in the plasma state. Spinning, magnetized blobs observed as ejecta establish rotation of the matter that it is passing through. Matter is dragged into their central regions creating the appearance of bubbles and hydrogen voids.

If seen from the correct orientation, nebulae are of the ring-type signifying that most massive ejections keep coming from the equatorial regions of the spinning star. Some typical ring-type nebulae are SNR Cassiopeia A, SNR 1987A, and Kepler's SNR. [ww]

X. Evolution of Star Masses ($M/M_{\odot}$)

The lifetime (τ_{ms}) of a star on the main sequence is highly dependent on its mass. The amount of time it takes a star to die in each of the stages of a red giant, luminous blue variable, Wolf-Rayet phase, and supernova are insignificant. The equation for a star's lifetime for masses less than 50 solar masses is given by:

$\tau_{ms} = 10^{10}$ years $(M/M_{\odot})\ (L_{\odot}/L) = 10^{10}\ (M/M_{\odot})^{-2.5}$ [xx]

The table below lists the $M/M_{\odot}$ ratio verses the lifetime, τ_{ms} . The lifetimes for very super-massive stars above 50 to 60 solar masses are estimated to be 6 to 10 million years.

Table C - Star Lifetimes

$M/M_{\odot}$	Star Type	τ_{ms} (Years)
< 250 to 130	have true pair-instability supernovae	$\approx 10 \times 10^6$
< 130 to 100	have partial pair-instability collapsing to normal SN	$\approx 10 \times 10^6$
<100 to 60	SN Type-Ibc preceded by LBV and WR star	$\approx 10 \times 10^6$
60	O-type (spectral type)	2.0 billion
40	O-type	2.3 billion
<25	No longer has a WR star phase; O-type	2.7 billion
18	B-type (spectral)	3.0 billion
9	Minimum for Type II SN	4.0 billion
3	A-type (spectral)	6.0 billion
1.0	G-type (spectral)	10 billion
0.8	K-type (spectral)	11 billion
0.5	M-type (spectral)	13 billion

The data from the Table C above and information from a previous Table B for the timeline of our galaxy and solar system will be used to generate another Table D showing the evolution of star masses. This evolutionary process is dependent on the initial distribution and initial size of stars and a possible scenario for how galaxies interacted and evolved themselves. This very speculative table attempts to show how stars both keep decreasing in size and increasing their lifetimes since smaller masses greatly slow down nuclear reactions inside the star. The estimated sizes and distributions of new stars after supernovae occur is guesswork, but probable within a reasonable error range based on the sizes of the first stars and the size distribution of stars today.

Table D - Evolution of Star Masses ($M/ M_{\odot}$) for Elliptical Galaxies

Mass Variation Creates Different Types of Supernova	Death via Pair Instability Supernova (SN)		Death via Red Giant into Planetary Nebula	Death via Core Collapse SN	Death via Core Collapse SN	Death via Ib and Ic SNs	Death via Red Giant Into Planetary Nebula	
First Stars		2nd Star Generation	3rd Star Generation				4th Star Generation	
≤ 250 to 130 formed 150 my to 1 by after the Big Bang	---------------↓ 1 by (several recombinations from star mergers occurred)	40 to 3 ↓						
1 by later	Elliptical Galaxies formed 13 bya	↓						
2 by later	Galactic groups formed 11 - 5 bya	↓						
2 to 3 by later	Spiral/Irregular galaxies formed from collisions 10 bya to present	↓						
3.3 by later		40 to 25	-----------→	----------→	-----------→	--------↓ 2.3 by		
3.7 to 4.0 by later		25 to 18	-----------→	-----------→	--------↓ 2.7 to 3.0 by	↓		
4.0 to 5.0 by later		18 to 9	-----------→	--------↓ 3.0 to 4.0 by	↓	9.0 to 3.0	---------↓ 6.0 by	≤0.5 or continue to burn for ≤ 9.3 by = (1+2.3+6).
5.0 to 7.0 by later		9 to 3	-------↓ 6.0 by	↓	↓	↓	↓	

7.0 to 11.0 by later	Milky Way Galaxy began 8.8 bya		↓	↓	3.0 to 1.0	3.0 to 1.0	-----------→ 10.0 by	Either expelled to IMC after 13.3 by = (1+2.3+6) or continue to burn for ≤ 14.0 by = (1+3+10).
11.0 to 12.0 by later	LMC and SMC collided with Milky Way 2.5 bya		↓	↓	1.0 to 0.8	1.0 to 0.8	-----------→ 11.0 by	Stars continue to burn for 14.3 by = (1+2.3+11) to 16.0 by = (1+4+11).
12 or more by later			↓	0.8 to ≤ 0.5	0.8 to 0.5	0.8 to 0.5	-----------→ 13.0 by	Stars continue to burn for 16.3 = (1+2.3+13) to 18.0 by = (1+4+13)
Stars still burning			≤ 0.5	----------→	----------→	-----------→	----------→ > 13.0 by	Stars continue to burn for > 16.3 by = (1+2.3+>13) to > 19.0 by = (1+6+>13) or for the life of the universe.
This same logic for star mass evolution is repeated for the next range of star sizes: ≤ 130 to 100 solar masses since it is presumed that this second range is part of the first stars.								

D-2	Death via Partial Pair Instability Supernova (SN)		Death via Red Giant into Planetary Nebula	Death via Red Giant into Planetary Nebula	Death via Core Collapse SN	Death via Core Collapse SN	Death via Red Giant Into Planetary Nebula	
First Stars		**2nd Star Generation**	**3rd Star Generation**				**4th Star Generation**	
≤ 130 to 100 formed 150 my to 1 by after the Big Bang	---------------↓ 1 by (several recombinations from star mergers occurred)	25 to 1 ↓ ↓						
3.7 to 4.0 by later		25-18	-----------→	-----------→	-----------→	--------↓ 2.7 to 3.0 by		
4.0 to 5.0 by later		18 to 9	-----------→	-----------→	--------↓ 3.0 to 4.0 by	↓		
5.0 to 7.0 by later		9 to 3	-----------→	--------↓ 4.0 to 6.0 by	↓	↓		
7.0 to 11.0 by later		3 to 1	-------↓ 6.0 to 10.0 by	↓	↓	3.0 to 1.0	-----------→ 10.0 by	Either expelled to IMC after 13.7 by = (1+2.7+10) or continue to burn for ≤ 14.0 by = (1+3.0+10).
11.0 to 12.0 by later			↓	↓	↓	1.0 to 0.8	-----------→ 11.0 by	Stars continue to burn for 14.7 by = (1+2.7+11) to 15.0 by = (1+3+11).
12 or more by later			↓		0.8 to 0.5	0.8 to 0.5	-----------→ 13.0 by	Stars continue to burn for 16.7 by = (1+2.7+13) to 18.0 by = (1+4+13).
Stars still burning			MS	≤ 0.5		≤ 0.5	----------→ > 13.0 by	Stars continue to burn for >20 by = (1+6+ >13) or for the life of the universe.
This same logic for star mass evolution is repeated a second time for the next and last range of star sizes: ≤ 100 to 60 solar masses since it is presumed that this range is part of the first stars.								

D-3	Death via Ib and Ic Type Supernova		Death via Red Giant Into Planetary Nebula	Death via Red Giant Into Planetary Nebula	Death via Red Giant Into Planetary Nebula	Death via Red Giant Into Planetary Nebula	Death via Core Collapse SN	Death via Red Giant Into Planetary Nebula	
First Stars		**2nd Star Generation**	**3rd Star Generation**					**4th Star Generation**	
≤ 100 to 60 formed 150 my to 1 by after the Big Bang	-----------------↓ 1 by (several recombinations from star mergers occurred)	18 to 0.5 ↓ ↓ ↓							
4.0 to 5.0 by later		18 to 9	---------→	---------→	---------→	---------→	--------↓ 3.0 to 4.0 by		
5.0 to 7.0 by later		9 to 3	---------→	---------→	---------→	-------↓ 4.0 to 6.0 by	↓		
7.0 to 11.0 by later		3 to 1	---------→	---------→	--------↓ 6.0 to 10 by	↓	↓		
11.0 to 12.0 by later		1 to 0.8	---------→	--------↓ 10 to 11 by	↓	↓	↓		
12 to 14 by later		0.8 to 0.5	-------↓ 11 to 13 by	↓	↓	↓	0.8 to 0.5	------↓ 11 to 13 by	Stars continue to burn from 17 by = (1+3+13) to 18 by = (1+4+13)
> 14 by later and still burning			≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	Stars continue to burn from 18 by = (1+4+13) to >27 by = (1+13+>13) or for the life of theuniverse.

Table Codes:
MS means stars residing as Main Sequence stars;
IMC means Interstellar Molecular Clouds;
$M/M_{\odot}$ means star mass to solar mass ratio;
(**bya)** means billions of years ago from the present;
(**by)** means span of time in billions of years;
(-----↓ xx by) refers to death of star and time span for star to expire from its birth to a supernova.

When galaxies collide the residual star dust that did not become stars becomes mixed and concentrated in forming spiral arms to create not only new, but larger stars of the O and B spectral types. Much primordial material from the Big Bang surrounds these galaxies and also aids in making massive stars because the CNO cycle of nucleosynthesis is avoided due to the lack of metals. Subsequent collisions may occur that keep generating larger stars at much later times such as the near miss or collision of the Milky Way with the irregular galaxies, the Large and Small Magellanic Clouds.

Table E - Evolution of Star Masses ($M/M_{\odot}$) For Spiral and Irregular Galaxies

The example chosen is for the Milky Way that began about 8.8 billion years ago and had a either close encounters or collisions with the Large and Small Magellanic Irregular Galaxies.

E-1	**Death via Partial Pair Instability Supernova (SN)**		**Death via Red Giant into Planetary Nebula**	**Death via Red Giant into Planetary Nebula**	**Death via Core Collapse SN**	**Death via Core Collapse SN**	**Death via Red Giant Into Planetary Nebula**	
First New Stars Inside Spiral / Irregular Galaxies		**2nd Star Generation**	**3rd Star Generation**				**4th Star Generation**	
Spiral and irregular galaxies began to form from elliptical galaxies about 3.7 by after the Big Bang								
≤ 130 to 100 $M/M_{\odot}$ formed 3.3 to 6.7 by (about 5.0 by) after the Big Bang inside the Milky Way created by a collision of two or more galaxies.	-------↓ 10 my	25 to 1 $M/M_{\odot}$ ↓ ↓						
2.7 to 3.0 by later after MWG birth or 7.7 to 8.0 by after the Big Bang.		25-18	------→	-------→	-------→	--------↓ 2.7 to 3.0 by		
3.0 to 4.0 by later after MWG birth or 8.0 to 9.0 by after the Big Bang.		18 to 9	-------→	-------→	--------↓ 3.0 to 4.0 by	↓		
4.0 to 6.0 by later		9 to 3	------→	--------↓	↓	↓		

E-1	Death via Partial Pair Instability Supernova (SN)		Death via Red Giant into Planetary Nebula	Death via Red Giant into Planetary Nebula	Death via Core Collapse SN	Death via Core Collapse SN	Death via Red Giant Into Planetary Nebula	
First New Stars Inside Spiral / Irregular Galaxies		**2nd Star Generation**	**3rd Star Generation**				**4th Star Generation**	
after MWG birth 9.0 to 11.0 by after the Big Bang				4.0 to 6.0 by				
6.0 to 10.0 by later after MWG birth or 11.0 to 15.0 by after the Big Bang well into the future.	LMC and SMC collided with the Milky Way creating more super-massive stars about 2.5 bya.	3 to 1 $M/M_{\odot}$	-------↓ 6.0 to 10.0 by ↓ MS	↓ ↓ ≤ 0.5	↓ ↓ 0.8 to 0.5	3.0 to 1.0 1.0 to 0.8 0.8 to 0.5	------↓ 6.0 to 10.0 by ------↓ 10 to 11 by ------↓ 11 to 13 by	Either expelled to IMC after 13.7 by = (5.0+2.7+6) or continue to burn for ≤ 14.0 by = (5.0+3.0+6) on the Main Sequence (MS). ----→ MS ----→ MS
This same logic for star mass evolution is repeated for the next range of star sizes ≤ 100 to 60 solar masses since it is presumed that this range is part of the first super-massive stars produced inside a spiral or irregular galaxy.								

E-2	Death via Type Ib and Ic SNs		Death via Red Giant into Planetary Nebula	Death via Red Giant into Planetary Nebula	Death via Red Giant into Planetary Nebula	Death via Red Giant into Planetary Nebula	Death via Core Collapse SN	Death via Red Giant into Planetary Nebula
First New Stars Inside Spiral / Irregular Galaxies		**2nd Star Generation**	**3rd Star Generation**					**4th Star Generation**
≤ 100 to 60 $M/M_{\odot}$ formed 3.3 to 6.7 by (about 5.0 by) after the Big Bang inside the Milky Way created by a collision of two or more galaxies	-------↓ 10 my	18 to 0.5 $M/M_{\odot}$ ↓ ↓ ↓						
3.0 to 4.0 by later after MWG birth or 8.0 to 9.0 by after the Big Bang		18 to 9	---------→	---------→	---------→	---------→	--------↓ 3.0 to 4.0 by	
4.0 to 6.0 by later after MWG birth or 9.0 to 11.0 by after the Big Bang		9 to 3	---------→	---------→	---------→	-----↓ 4.0 to 6.0 by	↓	
6.0 to 10.0 by later after MWG birth or 11.0 to 15.0 by after the Big Bang well into the future.		3 to 1	---------→	--------→	--------↓ 6.0 to 10 by	↓	↓	
Beyond age of universe.		1 to 0.8	---------→	--------↓ 10 to 11 by	↓	↓	↓	
Beyond age of universe.		0.8 to 0.5	-------↓ 11 to 13 by	↓	↓	↓	0.8 to 0.5 $M/M_{\odot}$	------↓ 11 to 13 by ↓
Beyond age of universe.			Remain burning on the MS.	Remain burning on the MS.	Remain burning on the MS.	Remain burning on the MS.		Remain burning on the MS.
This same logic for star mass evolution is repeated for the next range of star sizes: ≤ 60 to 18 solar masses since it is presumed that this range is still part of the first super-massive stars produced inside a spiral or irregular galaxy.								

E-3	Death via Type Ib and Ic SNs		Death via Red Giant Into Planetary Nebula	Death via Red Giant Into Planetary Nebula	Death via Red Giant Into Planetary Nebula	Death via Red Giant Into Planetary Nebula
First New Stars Inside Spiral/Irregular Galaxies		**2nd Star Generation**	**3rd Star Generation**			
≤ 60 to 18 $M/M_{\odot}$ formed 3.3 to 6.7 by (about 5.0 by) after the Big Bang inside the Milky Way created by a collision of two or more galaxies	------↓ 2.0 to 2.7 by	→ 9.0 to 0.5 $M/M_{\odot}$ ↓ ↓ ↓				
4.0 to 6.0 by later after MWG birth or 9.0 to 11.0 by after the Big Bang		9.0 to 3.0	-------→	-------→	-------→	------↓ 4 to 6 by
6.0 to 10.0 by later after MWG birth or 11.0 to 15.0 by after the Big Bang well into the future		3.0 to 1.0	-------→	-------→	------↓ 6 to 10 by	↓ ↓ ↓
Beyond age of universe		1.0 to 0.8	-------→	------↓ 10 to 11 by	↓	↓
Beyond age of universe		0.8 to 0.5	------↓ 11 to 13 by ↓	↓	↓	↓
			Remain burning on the MS.	Remain burning on the MS.	Remain burning on the MS.	Remain burning on the MS.
Star masses below 18 solar masses will not be considered although they are produced during star bursts after galaxies collide. These smaller stars do not significantly contribute to producing more stars. The recent collision of the LMC and SMC irregular galaxies about 2.5 bya created another new round of super-massive stars.						

XI. Considerations for Supporting Dark Matter

The study of the evolution of star masses reveals through stellar nucleosynthesis and supernovae that they decrease in mass almost exponentially over time from large masses starting at perhaps 250 or more solar masses. These masses begin to level off at about 1 or less solar masses due to their expected lifetimes and the estimated lifetime of the known universe. A study of galactic evolution is required to understand why super-massive stars still exist. The SNS hypothesis requires a methodology for producing the re-birth of stars from supernovae remnants at an adequate rate and size distribution. In addition, a very intriguing, thought-provoking idea arose during this pursuit. A reason for Dark Matter was revealed.

After approximately 150 million to 1 billion years from time = zero, the first stars began to form from the condensation of the cooling primordial matter. At this same time the clumping of this matter also created elliptical galaxies or the gravitational collapse of massive groupings of stars. As these massive stars exploded after very short lives, their outer layers of primordial matter were either ejected outwardly or inwardly from the galaxy's center. Either this matter moved inward to form more stars or it moved outward toward the galaxy's forming surface. Continuing explosive forces pushed much of this divergent, ejected, primordial matter exterior to the galaxy before it could be captured for more star production. This material cooled and lost velocity and was finally captured by the elliptical galaxies' gravity fields. This material probably joined other primordial material that was attracted toward the elliptical galaxy's gravitational center originally and did not possess enough combination of kinetic and thermal energy to cause massive star production. Hence, it is hypothesized that all initial elliptical galaxies possess huge massive nearby surroundingshells of cooled molecular hydrogen and helium outside their luminous surfaces.

The embryo for this idea came from the knowledge of H II regions in our galaxy. An H II region is a large, low-density cloud of partially ionized gas (principally hydrogen) in which star formation is or has recently taken place. The phases of short-lived massive stars emit ultraviolet and other electromagnetic radiation to illuminate these clouds. These phases are the luminous blue variable (LMB), the red giant, and the Wolf-Rayet events; these events can also supply the hydrogen that has cooled and is being re-ionized by subsequent expulsions of materials. The final supernova explosion of these massive stars not only disperses the material from an H II region, but also creates the seeds or magnetic iron blobs that gather these ionized gases to form proto-star disks.

At greater and greater distances several succeeding ionization fronts begin to slow to subsonic speeds. The pressure of each newer ionized front causes the volume of the circum-stellar nebula to expand and eventually overtakes the prior fronts as it slows down, too. This not only describes the birth of H II regions but also the beginning birth of new stars. The SNS hypothesis emphatically claims that star making occurs this way and not by the nebular hypothesis that claims that gravitational collapse of cool giant molecular clouds (GMC) create proto-star disks.

Careful astronomical studies reveal very important features of these H II regions: [bb]

1. The lifetime of these regions is of the order of a few million years which is expected. The lifetime should be in the range of the overlapping of massive star lifetimes.
2. Radiation pressure from hot young stars will eventually drive most of the gas away. This condition is fully expected because the T-Tauri phase of proto-stars has fierce winds.
3. Other interstellar gases are driven away by the kinetic energy of the last eruptions and final supernova explosion.
4. The young stars in H II regions show a strong trend for possessing planetary systems. “The Hubble Space Telescope has revealed hundreds of proto-planetary disks call “proplyds” in the Orion Nebula.” [yy] This finding is excellent collaboration for the SNS hypothesis.
5. *The whole process is very inefficient producing stars from less than 10 per cent of the gas.* [zz]

The previous fact #5 leads to certain inductive reasoning for the existence of Dark Matter. Re-visiting the Tables D and E for the evolution of star masses reveals that the first stars born almost 12 billion years ago have re-processed themselves at least 4 or more times. If the star reproduction rate is in the order of 10 %; and, a simplified assumption is used that the total beginning mass was represented by the first-born stars, then the following equation gives an order of scale proportion of luminous mass today with the total starting fermionic, luminous mass one billion years after the Big Bang.

M_0 = starting mass in the first-born stars 1 billion years or less after the Big Bang
M_p = present day luminous mass for the universe

Then, the ratio of these two masses is in the order of:

$$\begin{aligned} M_p \quad &= 0.1 \times M_0 + 0.1(0.1 \times M_0) + 0.1(0.1 \times 0.1 \times M_0) + + 0.1(0.1 \times 0.1 \times 0.1 \times M_0) \\ &= 0.1 \times M_0 + 0.01\, M_0 + 0.001\, M_0 + 0.0001\, M_0 \\ &= 0.1111\, M_0 \end{aligned}$$

However, let’s now assume that 50 % of the residual star dust after each re-processing went toward the center of the elliptical galaxy to create more stars and 50 % partially escaped the luminous boundary of the galaxy and was captured in a circum-galactic shell to remain in limbo. The star dust remaining for the second reprocessing or new processing of super massive stars is:

$½ \times (1.0 – 0.1)\, M_0 = 0.45\, M_0$

Each new smaller reprocessing of stars is determined the same way.

Then, the proportion of existing star mass is determined:

Stars created after first reprocessing = $M_1 = 0.15\, M_0$
Stars created after the second reprocessing = $M_2 = 0.15\, (0.15\, M_0) = 0.0225\, M_0$
Stars created after the third reprocessing = $M_3 = 0.15(0.15 \times 0.15\, M_0) = 0.0034\, M_0$
Stars created after the fourth reprocessing = $M_4 = 0.15(0.15 \times 0.15 \times 0.15\, M_0) = 0.0005\, M_0$

The total mass remaining as stars after each reprocessing is:

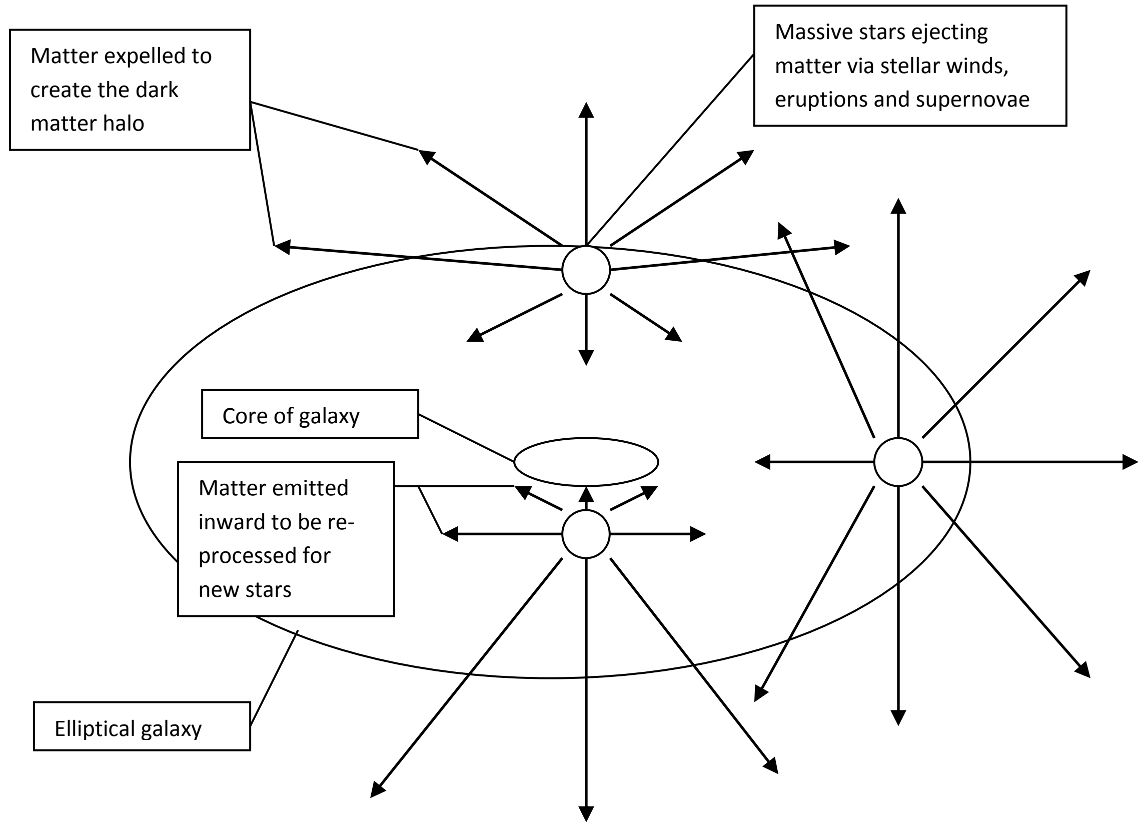
$M_p = M_1 + M_2 + M_3 + M_4 =$

$= (0.1500 + 0.0225 + 0.0034 + 0.0005) \times M_0 = 0.1764\ M_0$

The super-massive, short-lived stars from 18 to 250 solar masses expired to produce numerous smaller stars and become themselves black holes, neutron stars and white dwarfs. Some of the unseen matter is trapped within giant molecular clouds (GMCs) and is part of the residual progenitor stars, but this mass is insignificant when compared to the hydrogen atoms and molecules that escaped the galactic perimeter during the first generation of supernovae.

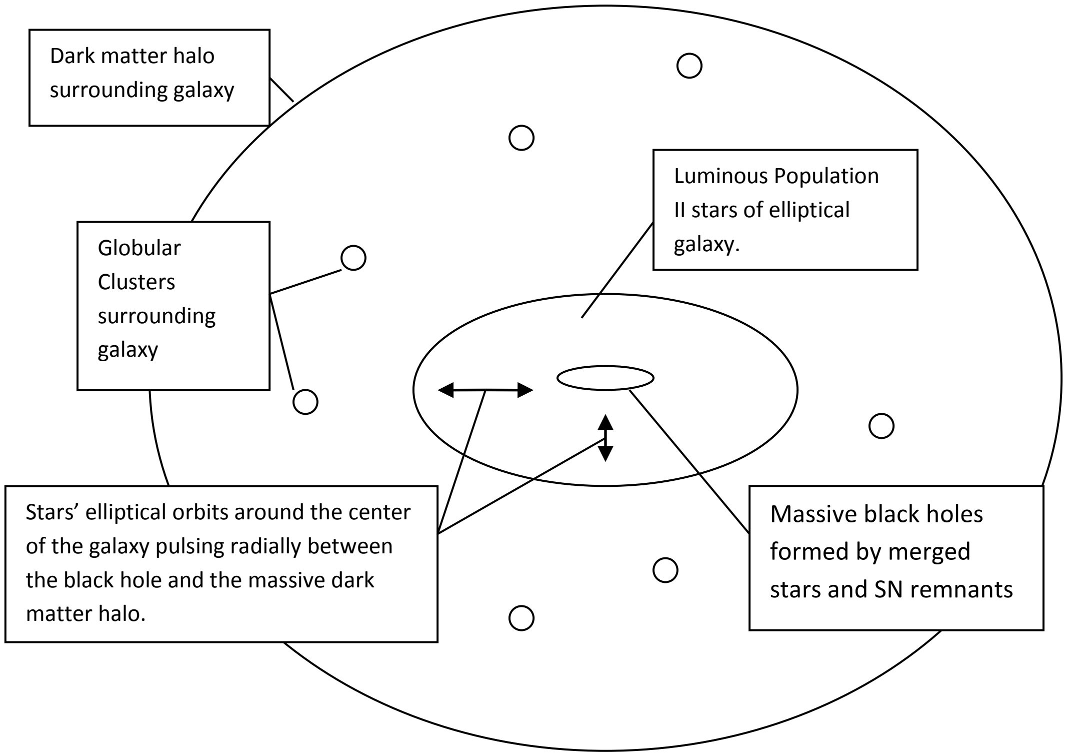
The conclusion, although simplistic, is appealing for matching current thinking that the luminous mass today is only about 17 % of the original mass of all the first stars. What happen to the other 83 % of matter? Could this be the currently undetermined dark matter which cosmologists account for the largest part of the material universe? So where is this matter today? The assumptions of this discussion claim that this matter with its gravitational influence exists mostly on the perimeters of all galaxies and is an unseen outer spherical or ellipsoidal shell. This matter is in the form of extremely cold neutral atomic (H I) and molecular (H II) hydrogen and helium that either did not originally become consumed by star making processes as the elliptical galaxies formed or was expelled from the galaxy envelop by the kinetic energy of supernovae. See Diagram A below that shows the expulsion of materials by super-massive stars from young galaxies.

Diagram A - Expulsion of Matter from Young Galaxies



Young galaxy with massive stars expelling matter via fierce stellar winds, eruptions from nuclear burning phases, and supernovae. The more massive blobs of material from the SN explosions are captured before escaping into the dark matter halo.

Diagram B - Expulsion of Matter from Young Galaxies (Continued)



<u>Mature elliptical galaxy with smaller, older, longer-lived stars and massive, non-interactive dark matter halo</u>

This matter cannot be seen directly because it possesses little energy to release electromagnetic radiation and has no chance of being ionized because of its isolation from the star-making center of galaxies. An H I region is an interstellar cloud composed of neutral atomic hydrogen and can be observed in both our galaxy and neighboring galaxies. These regions are non-luminous save for the emission of 21-cm (1,420 MHz) region spectral line. [bb] This line requires not only some ionization but also temperatures of about 100^0 K. to be observed. The ionization is caused by the interface with ionization fronts of H II regions being created by massive star eruptions and supernovae. As already mentioned, these conditions of ionization and higher temperatures are not found in regions just outside the perimeters of galactic luminosity where postulated prodigious amounts of neutral hydrogen lurk.

Actually this circum-galactic material is already observed but not recognized for what it really represents. H I emissions are mapped when two galaxies collide to show material being pulled away which helps determine the way the galaxies are moving. During collisions this exterior material mixes with some ionized gas and is heated enough for astronomers to see the emission line of 21-cm. It is this very material that stretches stars into connecting strands between the galaxies as they pass each other. The stars are both affected by gas drag and the gravity forces of the massive amounts of unseen gas.

Other examples of this unseen gas, which will now be called “dark matter”, are the Magellanic Bridge (MB) and Magellanic Stream (MS). [aaa] The MB is a high-velocity cloud of gas connecting the Milky Way to the Large Magellanic Cloud (LMC) and the Small Magellanic Cloud (SMC). [bbb] The MS came into existence by a near-collision two billion years ago of these two galaxies with the Milky Way. The MB is a stream of neutral hydrogen that links the two Magellanic Clouds. Their combined near-misses and/or collisions created both the visual effects of dark matter surrounding these galaxies and the expected star forming sites including vigorous star burst activity in the LMC.

Observational evidence makes it very clear that this unseen dark matter [ccc] exists close to the exterior boundaries of both elliptical and spiral galaxies and in the intergalactic space between galaxies and their globular clusters. A listing of evidence with brief descriptions follows:

1. A Swiss astrophysicist, Fritz Zwicky, determined that the Coma cluster of galaxies had unseen mass. He applied the total mass based on motions near its edge and compared that estimate to one based on the total brightness of the cluster. The gravity of the visible galaxies in the cluster was far too small to account for their orbits. This discrepancy started the “missing mass problem”. Of course, if an estimated unseen mass for each galaxy is added the problem goes away. This observation is direct evidence that each galaxy, both elliptical and spiral, have an unseen large amount dark matter.
2. Collaboration of galaxies having this extra mass occurred with gravitational lensing observations. As predicted by the General Theory of Relativity the mass of a cluster of galaxies should deflect light from background galaxies and predict the mass of the cluster. The results almost match the previous finding for galaxy motion studies. The missing mass that deflected light more than what was expected by the observed mass was termed dark matter.
3. Velocity dispersions are another method of measuring the dark matter affect for both spiral and elliptical galaxies. “Measurement of the diffuse interstellar gas found at the edge of galaxies indicate not only dark matter distributions that extend beyond the visible limit of the galaxies, but also that the galaxies are virialized (i.e., gravitationally bound with velocities corresponding to predicted orbital velocities of general relativity) up to ten times their visible radii.” [ccc] Globular clusters show little evidence of dark matter generally because their smaller sizes limited the amount of unseen gas being emitted into their perimeters during the re-processing of their stars. However, globular cluster orbital interactions with their galaxies do show evidence of dark matter.
4. Galaxy mass profiles are calculated to look different from their light profiles. “The typical model for dark matter galaxies is a smooth, spherical distribution in virialized halos.” [ccc] These profiles were obtained mostly from spiral galactic rotation curves. Most stars in spiral galaxies orbit at approximately the same speed indicating a velocity curve having a flat appearance throughout its entire radius. This finding presented in 1980 revealed that more than 50 % of the mass of

unknown composition in these galaxies was contained in a dark galactic halo. Low surface brightness (LSB) galaxies [ddd] are postulated to be totally dominated by dark matter that contributes mostly to their visible rotation curves. Probably in the case of LSBs younger stars near the surface of the galaxy contributed a larger concentration of gases to the interior edge of the halo to obscure the LSBs.

For spiral galaxies a universal density profile suggests a very thin stellar disk and a spherical dark matter halo with a flat core. Elliptical galaxies show evidence for dark matter via strong gravitational lensing. Other studies require that extended mass fill dark haloes in order to support hydrostatic pressures from dispersing the galaxy.

5. Stars inside elliptical galaxies generally have elliptical orbits with radial motions. Their primordial motions have not yet been affected by the collision or near-collision of another galaxy. These radial motions are due to small pulsations where the stars move between the gravity field of the central region of concentrated star mass and of any galactic black hole, and the gravity field of the postulated dark matter halo. Possibly some of these radial motions could be measured adequately to determine the amount of dark matter halo that helps to control this motion.
6. The observed collisions and near-misses of galaxies show tidal interactions and overall warping of spiral galaxies well ahead of the luminous regions coming in contact. As galaxies pass each other in near-miss scenarios stars are stretched several galactic lengths away causing filaments and strands mostly due to gas drag of the outer dark matter haloes which is now postulated to be neutral H I and H II hydrogen. Most spiral galaxies have the very recognizable spiral arms that are likely due to the frame drag of the spherical haloes that surround them. All of the outer unseen haloes obviously affect the attraction and orbital characteristics of globular clusters that surround both elliptical and spiral galaxies.
7. “Dark matter is crucial to the Big Bang model of cosmology as a component which corresponds directly to measurements of the parameters associated with Friedmann cosmology solutions to general relativity. [ccc]

The search for dark matter’s composition is on-going. The basic assumption is that dark matter is primarily non-baryonic being made of one or more elementary particles other than the normal fermions of electrons, protons, neutrons, and neutrinos. Dark matter has much more mass than the visible universe and supposedly does not interact with the electromagnetic force. The postulation being presented is that dark matter is very cold neutral H II and H I hydrogen and helium that has difficulties being detected in the electromagnetic spectrum until it is heated to about 100^0 Kelvin and ionized. In its current state this matter is transparent and non-interactive when viewing the encased luminous galaxies. Not enough light energy is emitted from the galaxies to energize the present cold state of their halos. Observations of galactic stars are comparable to viewing fish swimming inside a glass bowl. This new postulation not only provides the composition of this mystery brew, but also its computed large percentage of mass-energy in the universe and its reason for existence. No MACHOs or WIMPs or Higgs Bosons have to be invented and/or discovered by large particle colliders.

Finally, it is highly recommended to perform a certain laboratory experiment to further prove what dark matter really is. The most unbelievable part of this hypothesis for the author is how astronomers can see rather clearly through a long column of cold neutral hydrogen and helium and observe the luminous part of a galaxy. Various density/volume ratios for this dark matter could be chosen to give the "observed mass to dark matter mass" ratio for different galaxies. Then the laboratory produces a long column and fills it with neutral hydrogen and helium at these different chosen densities. Then the temperatures of these different gas densities is reduced within the range of 10^0 to 50^0 K. or as low as is achievable. Electromagnetic radiation is then transmitted at one end of the column over the full spectrum from radio to X-ray radiation to examine the effects of each type of radiation at the other end of the tube or column. Naturally, the affects would have to be scaled or extrapolated to produce the total affect of looking through a typical postulated shell of dark matter surrounding a galaxy. This experiment is most likely possible. Does anybody reading my journals have the means and funding for such a juicy project? The author would love to hear the results.

XII. Supernovae Remnant (SNR) and Circum-Stellar Medium (CSM) Characteristics and Anomalies

The supernovae (SN) of primary interest are those resulting from a massive star core collapse that comes from Type II, Type Ib, and Type IC SNs. From their remnants evolve the birth of other stars, planets, and other planetisimals. Of particular interest are the stripped supernovae, Types Ib and Ic, that have lost most of their outer layers of hydrogen and helium prior to the collapse of a Wolf-Rayet star. The best candidate stars to study are those that have produced false supernovae like Eta Carinae in releasing large amounts of energy by blowing away large amounts of mass, but still remaining a star on the Main Sequence. Eta Carinae is considered somewhere between a luminous blue variable (LBV) and a Wolf-Rayet (WR) star. These rare massive stars are creating at this very moment the shells of circum-stellar materials that will be penetrated by the final blast that ejects blobs of iron and nickel thereby setting the stage for the supernova seeding process.

There are even fewer good candidates of supernovae remnants (SNR) to study. The ones of interest are those that came from core collapse supernovae. Supernovae in our galaxy are estimated to occur only once in 100 years which includes Type Ia SN. SNRs in other galaxies are observed, but difficult to study because of the huge distances between galaxies and obscuring dust lanes. The timing of supernovae occurrences is important. The actual seeding process of iron blobs or MSOs traveling through the outer shells takes about 1000 or more years. More is learned by studying SNRs in this age range. Catching SNRs at the moment they happen is also very instructive; the illumination of the outer shells by ultraviolet and light radiation occurs for a brief period of time.

Astronomers like to classify SNRs into shell-type, Crab-like, and composite remnants. [eee] The shell-type are believed to be caused by the shockwave from the explosion which plows through the circum-stellar medium (CSM) heating and stirring the particles. There is a strong belief that the CSM is existing material in the surrounding galactic clouds. However, many shell-type SNRs have multiple shells leading some to believe that previous stellar winds and major eruptions have occurred on the progenitor star.

The observation of these multiple shells and especially their spectra become supporting data for the supernova seeding (SNS) hypothesis.

The Crab-like SNRs refer to nebulae like the Crab Nebula that came from a Type II SN. The remnants look more like a "blob" than a "ring" in contrast to shell-type SNRs. The nebulae are filled with high energy electrons that are believed to be flung out from a pulsar or the resulting neutron star. However, observation of the nebula in X-ray, light, and radio spectra indicates that the electrons interact with magnetic fields throughout the nebula and not just the pulsar which would be highly directional. This particular process is called synchrotron radiation and is also supportive of the SNS hypothesis. As the spinning iron blobs punch through the various shells of CSM their magnetic inductive strength exponentially increases flinging its free electrons and ions into very fast equatorial orbits around the blob or MSO.

Synchrotron radiation is caused by accelerating charged particles at ultra-relativistic velocities inside the fields of bending magnets in the laboratory. This radiation has a characteristic polarization and can range over the entire electromagnetic spectrum. [fff] A class of astronomical sources where this synchrotron emission predominates is evidence of iron blobs or highly magnetic spinning orbs (MSOs). These sources are called pulsar wind nebula of which the Crab nebula is archetypical. [ggg] "Pulsed emission gamma-ray radiation from the Crab has recently been observed up to $\geq$ 25 GeV, probably due to synchrotron emission by electrons trapped in the strong magnetic field around the pulsar. Polarization in the Crab at energies from 0.1 to 1.0 MeV illustrates a typical synchrotron radiation." [fff] The huge amounts of occasional high energy cosmic rays from the Crab and other pulsar wind nebulae cannot be explained by just the pulsar. The extremely hot, magnetic, spin velocity of the iron blobs or MSOs is causing this unexplained energy.

The Crab Nebula has other distinctions that support the SNS hypothesis. The combined mass of the nebula of 2 to 4 M_Θ and the estimated neutron star mass of 1.4 to 2 M_Θ is much less than the expected progenitor star's mass of 9 to 11 M_Θ which is required by theory to produce a neutron star. A serious question arises about the missing mass of about 5 M_Θ. The supernova seeding process can explained that this missing mass is an integral part of the MSOs forming and traveling through the outer shells or perimeter of the SNR. The MSOs can easily possess 5 or more M_Θ but their sizes are small fractions of a solar mass. In addition, these MSOs cannot be resolved by observations except for knots of matter because of the obscuring CSM and multi-proto-disks that appear to be blob-like and not defined as single point sources.

Another anomaly of the Crab is its helium-rich torus which crosses the pulsar region and composes 25% of the visible ejecta. Again the SNS hypothesis can come to the rescue and answer the reason for its existence. The torus supports the SNS idea that most of the ejecta from stellar winds and eruptions leading to the final explosion are ejected from the equatorial regions of the progenitor star.

Abundant data from supernova remnants resulting from Type II SN are not available, but some unique features that possibly address the supernova seeding process are compiled below for the better studied SNRs:

1. The Vela SNR [hhh] is 11,000 years old and indicates that electrons in the outer shell are re-combining with atoms as seen by many different energy bands. This fact possibly marks the age for a SNR when the degree of ionization and the temperature of the CSM are no longer factors for producing stars and planets.
2. Cassiopeia A SNR [iii] is about 300 years old with a shell-like appearance. It is observed to have fast-moving knots that are considered to be condensing dust. More than likely, this indicates the time period when the MSOs have matured and are beginning to grow exponentially.
3. RCW103 SNR [jjj] is considered to be about 1000 years old with a shock wave moving at 1200 km/s with the SNR. Molecular hydrogen is observed surrounding the SNR that has emissions of ionized iron. This snapshot of the SNR denotes a typical age for a specific velocity of the outer shock front and a time before the energetic iron blobs approach the outer shells of hydrogen. The Crab Nebular data also supports this view.
4. The Crab Nebula [ggg] is dated extremely accurate at 958 years old and has an envelop velocity of 1500 km/s. The mean temperature is 11,000 to 18,000 K. and it mean density is 1300 particles per cm^3.
5. The 1998S SNR [kkk] inside galaxy NGC 3877 has a rapid expansion of hydrogen-enriched ejecta. The shock wave is interacting with slower moving very dense matter lost in the later stages of evolution. There is a CO forming region with temperatures of 4000 to 4500 K. This recently observed SN is possibly a false SN and the progenitor star had a violent, energetic eruption during the helium burning stage that expelled carbon and oxygen, but much less energetic than the final explosion. The observed emission of hydrogen is represented of the expulsion of the outer layers consisting of much more hydrogen than helium. This possible scenario certainly supports the idea of large eruptions occurring during the consumption of fuel for each core burning process.
6. The famous 1987A SNR [lll] inside the LMC was caught in the act of its final explosion. This SNR reveals a 3-ring structure that glowed due to the ultraviolet flash of the explosion. High velocity material is emerging from the explosion to over-take the slower moving surrounding rings. The collision of these materials when it is observed a few hundred years from now should produce much more supporting data for the SNS hypothesis. The ring structure certainly does confirm previous eruptions before the final SN explosion. The structure also indicates that material is ejected in an equatorial fashion and creates knots of matter surrounding the progenitor star. The inner ring surprisingly reveals a very symmetrical distribution of these knots.

Circum-stellar mediums (CSM) are of primary importance for supporting the supernova seeding process. This discussion only considers CSMs created by the stellar winds and large eruptions (called supernova imposters) leading to the final SN explosion. Astronomers also consider the surrounding materials of giant molecular clouds (GMCs) as being CSMs and sometimes confuse the two types of CSM. Does the SNRs or a SN imposter's envelop create the observed outer shell with its own material or does the shock front push against an existing GMC to produce the observed shell. It is difficult to determine the actual scenario but recent radio and X-ray spectrometry have resolved many of these issues. The spectrum of ionization inside the outer shells reveals a concentration of materials that could only come from the progenitor star.

The archetypical star for producing CSM is Eta Carinae considered to be a single or binary luminous blue variable star that is close to entering the Wolf-Rayet phase. Stars in this mass class of 100 to 150 M_Θ are quite rare with only a few dozen being known in our Milky Way galaxy. Eta Carinae is famous for its giant eruption or supernova imposter event that was observed in 1843. Its luminosity has varied with different rates ever since. Its brightness was observed to double in 1998 and 1999. [kk] A bipolar nebula surrounds the star with enough obscurity to make confirming its double-star status very difficult. These two mushroom shaped clouds are each about 400 AU in diameter and contain enough mass for 10 Suns. X-ray observations show three structures: an outer horseshoe- shaped ring about two light years in diameter, a hot inner core about 3 light months in diameter, and a hot central source less than 1 light month in diameter. The outer ring is predicted to be one thousand years old. [mmm]

Studies of Eta Carinae reveal that over its entire expected lifetime of 4 million years the star ejects material slowly with some infrequent large eruptions. The star is now regarded not to be a freak but the norm for any massive star going through the LBV and WR stages near end of life. Before the final explosion this star is modeled to slim down from its progenitor mass of 100 to 150 M_Θ to a mere 10 to 20 M_Θ. A controversy exists about the mass-loss rates due to neglected clumping and the overestimated strength of the stellar winds. "If astronomers don't account for the higher intensity of light emitted by a clumpier atmosphere, they can be fooled into thinking that the wind carries away more mass than it really does." [mm] Hence, the mass-loss rates are being reduced making steady winds inadequate for the shedding of the outer layers of a massive star to become an eventual Wolf-Rayet.

This revised thinking now proposes that several violent and massive eruptions similar to the one that occurred in 1843 to Eta Carinae need to occur to achieve the necessary mass-loss. It has been estimated that these eruptions have occurred over several thousand years creating the observed shells outside the inner mushroom-shaped nebula. This new data and modeling perfectly dovetails with the SNS hypothesis that requires eruptions and removal of subsequent layers after each core burning process. Astronomers are now collaborating data from other stars to confirm that Eta Carinae events are quite normal. P Cygni star in the Milky Way showed brightening and loss of considerable mass in 1600. Several stars in other galaxies have been identified as being supernova imposters that imitate Eta Carinae. [mm] One of these analogues is SN 2006jc [nnn] observed in galaxy UGC 4904 when it brightened on October 20, 2004. The star survived only to finally explode two years later as a Magnitude 13.8 Type Ib supernova on October 9, 2006. This unusual example collaborates both the modeling of core burning processes and the expulsion of the stars outer layers at the end of each core burning phase. The two year period between the SN imposter and Type Ib SN events matches fairly well the predicted burning periods for neon, oxygen, and silicon for a star with $\geq 25\ M_\Theta$.

Nathan Smith of the University of California, Berkeley, has developed an eruption model where these stars expel materials a few thousands year before they die as supernovae rather than storing all the onion layers to the end. [mm] Any such model greatly enhances the ideas for the expulsion of materials in supernova explosions expressed by the SNS hypothesis.

XIII. The Origin of Cosmic Rays

Piergiogio Picozza, a physicist at the University of Rome Tor Vergata in Italy claims that data received from PAMELA, the Payload for Antimatter Matter Exploration and Light-nuclei Astrophysics, has placed serious questions on the mechanism for accelerating cosmic rays. Cosmic rays are fast moving particles that carry extraordinary amount of energy and continuously bombard the Earth from every direction. The most popular explanation for the origin of these particles of hydrogen and helium nuclei is their creation in the shock waves of supernovae, one of the few phenomena powerful enough to impart such energy comparable to the biggest particle accelerator in the United States. [ooo]

"Clouds of charged gas rush outward during a supernova and generate strong magnetic fields. These magnetic fields could accelerate charged particles to tremendous speeds and eject them into space." [ooo] Those words explain very well what happens to a magnetic spinning orb (MSO) that is expelled from a supernova and is penetrating the various outer shells. The issue that Picozza discovered from the PAMELA data is the consistent differences between measurements of hydrogen and helium particles that a single shock wave cannot explain.

This new puzzling data actually helps to explain the SNS hypothesis. A stripped supernova, Type Ic, is expected to expel its outer layers of hydrogen first, and then its helium in roughly concentric shells. When the final supernova occurs the shock wave containing the MSOs penetrates the helium shell first creating a particular energy level for helium nuclei and electrons that are ejected from its spinning, magnetic mass either from its equatorial or polar regions. After the MSOs reach the predominately enriched hydrogen outer shell the inward fall of materials begins to counter the spin of the MSO and lower the energy levels of ejected hydrogen nuclei and electrons. This picture can easily explain the new observations from PAMELA.

Observation of SN 1006 remnant in the X-ray spectrum has shown synchrotron emission being consistent as the source for cosmic rays. However, the measured energies of 10^{15} eV are too high to be produced by SNRs unless you account for MSOs close to the peak of their spin velocity and magnetic induction strength to produce this energy. Cosmic ray analysis can more than likely support the supernova seeding hypothesis.

XIV. SNR Envelope Sizes and Velocities

The archetypical supernova remnant for a super massive progenitor star in the range of 200 $M_{\odot}$ is difficult to find. So the meager SNR data from progenitor star masses in the neighborhood of 25 to 150 solar masses are utilized. The kinematics and physical characteristics are studied for various snapshots taken in time from zero time of the SN explosion to about 11,000 years later for the Vela SNR. Supernova imposters and Wolf-Rayet stars help supply information regarding pre-supernova winds and major eruptions. The table is developed to display the archetypical characteristics of a SNR for a super-massive star between 150 and 200 solar masses that would supply the necessary "supernova seeding" or "magnetic spinning orbs" (MSOs) that become future stars and planets. This evolving progenitor star is shedding material long before the final familiar supernova occurs. The data for the table comes from various sources: observations of SNRs, interstellar matter, LBV and Wolf-Rayet stars, solar wind data, some speculation, and a few calculations. The mass-losses at various stages are only projected predictions starting with a 200 $M_\odot$ star that ends up becoming a typical Wolf-Rayet 30 $M_\odot$-star shedding material at the end of each core-burning process. The final remnant of the progenitor star becomes a neutron star or black hole with a mass of 1.3 to 2.0 $M_\odot$.

The velocity of the SNR outer shell or shock front, the shell's rough diameter in parsecs, and the time it took the SNR envelop to expand indicate a consistent and congruent group of kinematic data. The state of the matter inside the shell is given by its temperature, density, and ionization. Some of the mean velocities are calculated by simply dividing the SNRs envelope radius by the estimated time since the SN occurred. The table is believed to be representative of all the major phases of an archetypical evolving massive progenitor star. Various data of the table are footnoted to show its source. The sources are listed below.

Supernova Remnants	
(1)	Crab Nebula [ggg]
(2)	Vela SNR [hhh]
(3)	Cassiopeia A SNR [iii]
(4)	SNR RCW 103 [jjj]
(5)	SNR 1987a [lll]
(6)	SNR 1988s [ppp]
(7)	SNR 1978k [qqq]
(8)	Eta Carinae LBV star [kk]
(9)	SNR 2006jc [nnn]
(10)	SNR 1998s [kkk]
(11)	SNR RCW 86 [rrr]
Interstellar Matter:	
(12)	H II regions [zz]
(13)	Warm Neutral Medium (WNM) [sss]
(14)	Warm Ionized Medium (WIM) [sss]
(15)	Typical Wolf-Rayet star [qq]
(16)	Solar wind and eruptions [ff]
(17)	Calculated values
(18)	Projected values based on mass-loss of 1$M_\odot$ /100,000 years and a lifetime for a 200 $M_\odot$ being 6 to 10 million years.

Table F - Major Phases of an Archetypical Evolving Super Massive Star

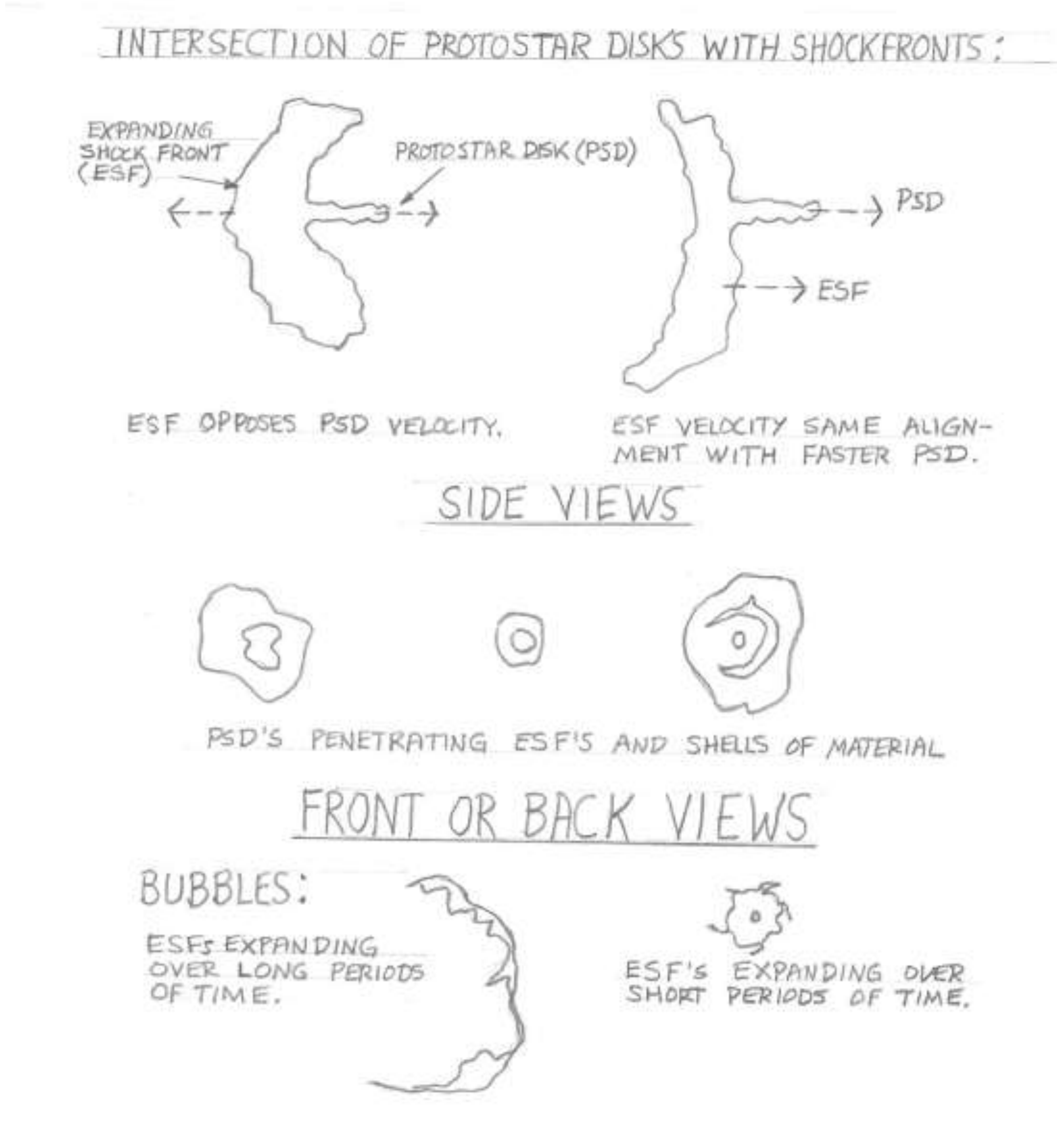
		Velocity (km/second)	Radius of Shell (parsecs)	Time (years)	Temperature of Shell (K^0)	Density (parts/m^3)	State of H	State of iron	Projected mass-loss ($M_\odot$)
Phase 1	**Expulsion the of H layer**	215 or 300 to 1000 (16)	≈ 2.2	< 10 x $10^{6;}$ ≈ most ejecta over 1000.	6000 (13) or 10,000 (14)	0.2 to 0.5 (13) and (14)	Either neutral atom or ionized.	N/A	60 (18) [mostly H]
Phase 2	**Expulsion the of He layer**	Avg. = 1000 to 1200 (17)	≈ 1.7	< 10,000 (5); ≈ most ejecta over next 1000.	≈ 4000 to 6000	1 x 10^{2} (12)	Ionized (re-heated by new shockfront- Hα emission)	N/A	15 (18) [mostly He with some H]
Phase 3	**Expulsion of C (O & N) layer**	Avg. 5200 (17) or 2000 to 2400 (15)	0.612 [2 ly] (8)	1000 (8); ≈ 500 for largest stars.	4000 to 4500 (10)	1 x 10^{4} (12)	Ionized (re-heated again - Hα emission)	N/A	23 [spectrum indicates C, O, and N]
Phase 4	**Fast core burning eruptions**	15,000 (5) or 17,000 (17)	0.026 to 0.077 (8)	2 (9) or 3 to 4	36,000 to 40,000 (8)	≈ 50 x 10^{12}	Ionized very energetically (Hα emission)	N/A	23 for neon; 23for oxygen; 23 for silicon
Phase 5	**Supernova (largest brightening)**	30,000	N/A	< 0.3 to 0.6 (from SN light curves)	1 x 10^{6} to 1 x 10^{7}	N/A	Ionized (X-ray emission)	Created by either fusion / decay of Ni	31 (leaving behind 2 or less $M_\odot$)
Phase 6	**Iron plasma forming into MSOs**	≈ 15,000 to 20,000; 16,000 (5)	0.01 (6)	20 (5) (inner ring illuminated)	≈ 10,000 to 1 x 10^{6}	≥ 100 x 10^{12} (6)	Ionized (X-ray emission)	Ionized	(spectrum also indicates Fe & S)
Phase 7	**Free expansion of ejecta**	10,000 (7)	2.0 (7)	200 to 500 (7)	≈ 10,000 to 1 x 10^{6}	≥ 100 x 10^{12} (6)	Ionized (Hα emission)	Ionized	(spectrum also indicates Fe & S)
Phase 8	**Sweeping up CSM (strong X-rays)**	1200 (1) or 1500 (4)	> 1.7 [5.5 ly] (1)	1000 (1) and (4)	11,000 to 18,000 (1)	1300 x 10^{6} (1) Flux is 1x10^{12} eV.	Ionized (Hα emission)	Ionized and com-pressed inside MSO	New stars and planets are 10% of ejecta.
Phase 9	**Outer shell cooling (H re-combining)**	≈ 1000	> 2.0 [6.5 ly]	2000 (11)	6000 to 10,000 (12)	10,000 (12) to 100 x 10^{6}	Ionized and re-combining)	Ionized and com-pressed but obscured	90% of the ejecta are tiny planetisimals or part of ISM that become GMC's.
Phase 10	**Shell interior cooling and envelope edge dissipating**	300 to 500	20	11,000 (2) to 100,000	50 to 100 (cold neutral medium-CNM)	20 to 50 (cold neutral medium-CNM)	Neutral (H I 21 cm line emission)	Dust	

This is a good moment to discuss some very unique and puzzling pictures. NASA provides daily photographs of the universe with explanations written by professional astronomers. These photographs are called APODs or the Astronomy Picture of the Day. The first one was provided on May 18, 2006, called the "Shell Game in the LMC" credited to John P. Gleason.[ttt]

The Large Magellanic Cloud (LMC) was viewed through narrow filters that transmit only the red H-alpha light of ionized hydrogen. The photograph was taken in a section of the LMC known for its strong stellar winds and ultraviolet light. This H II region is called the Tarantula Nebula and is famous for forming large stars. The picture surprisingly shows well distributed shell-shaped clouds of hydrogen gas surrounding massive young stars. The simple explanation given is that strong stellar winds sculpted these shells or bubbles. A better explanation is that this region had a recent star burst of new massive stars occurring at roughly the same time. These massive stars of relatively equal mass are evolving similarly along the same timeline. As witnessed by the photograph these stars are already shedding their outer layers of hydrogen gas as the rapidly burning core of hydrogen keeps decreasing its radius within the star causing the burping of outer layers. These shells of hydrogen will become some the material for the next generation of smaller stars and planets when the progenitor stars explode and send MSOs outward penetrating these shells and gathering their materials magnetically and gravitationally.

A second APOD deserves some extended discussion due to peculiar bubbles, holes within shock fronts, and protruding columnar forms within a dense expanding gas. This APOD dated January 18, 2012, called "Cygnus X: The Inner Workings of a Nearby Star Factory" [uuu] best depicts most of the different shapes found in energetic emission nebula. This photograph indicates more details than the previously discussed APOD because it is only 4500 light years away in our own Milky Way Galaxy and is rated as being the best and largest star forming region. Also, this snapshot of time is different from that of the APOD of the LMC bubbles. The LMC bubbles represent the first phase of an evolving massive star when it expels its outer layers of hydrogen as indicated in Table F. This APOD of Cygnus X is a snapshot taken during phases #7 and #8 of Table F when free expansion of the ejecta and the sweeping up of circum-stellar medium (CSM) occur. Another difference between the two APODs is that the star burst region in Cygnus created massive stars that were in a close open cluster. Their expanding shock fronts and expanding circum-stellar materials overlapped and intersected each other producing the strange forms that are shown. These forms are the results of new proto-star disks impacting and penetrating other nearby shock fronts coming from other stars expelling materials at roughly the same time. Some sense needs to be made for these chaotic images which do show some repeatability. A possible interpretation of these shapes is given by the following diagram.

Diagram C - Interpretation of Shapes Observed Inside a Star Forming Emission Nebula of the Milky Way Galaxy



XV. SNR Compositions

As expected the composition of a pre-supernova remnant should be exactly the heavier metals that were shed during the various phases of stellar winds and eruptions, the so-called elements of the onion-like layers created by nucleosynthesis. After the supernova, the heaviest materials that are made by fusion inside the star; iron, sulfur, nickel and cobalt are then revealed. These last core burning materials are flung outward into the shells of materials already ejected. For some SNRs close to Earth have distances from the progenitor star that can be resolved within a few parsecs. Spectra data can then possibly reveal the order of material expulsion. Iron plasma that becomes MSOs should be seen overtaking the outer shells and shock fronts.

The standard definition of an SNR is an expanding gaseous shell that plows into the surrounding interstellar medium (ISM), and pushes, compresses, and intermingles with it. The forward shock continues to expand and the reverse shock travels backward into the ejecta heating it to millions of degrees Kelvin. The difference in definition for the supernova seeding (SNS) process is that the SNR includes materials that were previously ejected by stellar winds and eruptions from the implosion of a series of core burning processes. The shells of materials surrounding the progenitor star prior to the final explosion are referred to as the circum-stellar medium (CSM) that came from the progenitor. It is not assumed that the onion-like layers remain with the progenitor star until the supernova occurs. Observations and studies by the newest space radio and X-ray telescopes are now proving this postulation.

“The Chandra and XMM-Newton missions have inaugurated the era of true spatially resolved X-ray spectroscopy. For supernova remnants, this means the capability to measure, for the first time, the detailed distribution of the ejecta and the spectra of ejecta at different positions in the remnant.” [vvv] These missions discovered that the elements and their relative abundances for Type Ia and Type II remnants are different. Type Ia remnants from white dwarfs show relatively strong Si, S, Ar, Ca, and Fe, and weak O, Ne, and Mg emission lines. Type II remnants from massive stars generally show a reverse pattern. This result is perfectly expected by the SNS hypothesis. The white dwarfs still had remnants of the final core burning processes which were the elements with the heavier atomic numbers and almost no lighter elements since they were shed in previous core burning processes when the white dwarf was originally a massive star. Type II remnants should indicate all the stated emission lines but be stronger for the lighter elements because they are part of the outer shells which are generally obscuring the inner shells of heavier elements.

A main point is made by X-ray spatially resolved spectroscopy for core collapse supernova remnants. All the important elements that a star produces in its onion-like shells are found in relative abundance except for carbon. Carbon that is produced in the third core burning process was ejected early and possibly cooled sufficiently to form molecular bounds with readily accessible oxygen and hydrogen. Or more simply the emission line for carbon is difficult to be detected. Another important point is shown by the study of 1000 year-old SNR Cassiopeia A. Elemental abundance maps showing the spatial positions of various elements reveal that elements with similar “Z” values cluster in the same positions. Neon and magnesium are spatially together; so are silicon, sulfur, argon, and calcium; and so are iron and nickel.

[www] This clustering is expected even among all the chaos because layers of the same elements are ejected together according to the SNS hypothesis.

Other surprises from the Chandra mission reveal that the spatial position of high channel energy and high flux for iron and silicon is in the outer perimeters of the SNR. This fact indicates according to the SNS process that the MSOs of iron and silicon plasma have overtaken all the other shells after one thousand years and are possibly still gathering hydrogen and helium.[www]

More surprisingly, Chandra data clearly indicate the overturn of nucleosynthetic products in a large region in the southeast of the SNR Cassiopeia A, where Fe-rich material can be seen ahead of Si-rich material, indicating that some of the layers deep into the onion-like skin structure of the exploding star have overtaken regions dominated by lower-Z elements. [xxx] This so-called spatial overturn is not as important as the other overturn of iron and silicon with the other lighter nucleosynthetic products of oxygen, neon, and carbon. Silicon and iron are expected to be in close proximity since they were ejected either together or apart by only days or weeks. Since the spatial location of iron and silicon is in the outer perimeters of the SNR Cassiopeia A, the overturn of the all the preceding elements by Fe and Si is largely confirmed. More distance may be required to overtake the most outer shells of helium and hydrogen.

Stripped core collapse SNs that have lost most of their outer layers of hydrogen and helium, luminous blue variable (LBV) and Wolf-Rayet stars that have copious mass-losses through stellar winds and eruptions, and the recent SN 1987A are proof that super-massive stars lose their outer layers of hydrogen and helium well before becoming supernovae. The rings around SN 1987A are an example of a progenitor star with various shells of circum-stellar nebulae. The rings were easily seen from the UV flash from the explosion. The inner ring was re-energized after a 10 to 11 year time lapse that determined an expansion velocity of 16,700 km/s. [lll]

These circum-stellar nebulae can also be detected from the presence of narrow Hα emission line in the spectra of Type IIn SNe. A high-dispersion (R ≈ 30,000) echelle spectroscopic survey by two observatories of 16 Type II supernovae (SNe) was made to search for narrow emission lines from circum-stellar nebulae ejected by their massive progenitors. Of the 16 SNe observed, SN ejecta were clearly detected in four SNe and possibly in another two SNe and circum-stellar material was detected in only SN 1978K and SN 1998S. An upper limit of roughly 2.2 parsecs for the size of the circum-stellar ejecta nebula was confirmed which is considered to be consistent with the typical sizes observed for nebulae around luminous blue variables. [yyy] This data directly connects outer shells of ionized hydrogen having a nebular radius of 2 parsecs or less being formed prior to a progenitor's Type II supernova.

The previously referenced article in the Astronomical Journal categorized two types of circumstellar nebulae from their survey. The first type are swept up by SN ejecta within a year or two, as demonstrated in time-sequenced spectra for SN 1988Z. In the case of SN 1997eg, previous observations have shown a narrow SN spectrum that disappeared one year later. These nebulae are considered small (≈ 0.01 parsec) and in the case of SN 1997eg, very dense at $\geq 10^7$ parts/cm^3. Their masses were considered to be ejected immediately before the SN explosion.

The second type of circum-stellar nebulae is longer-lived indicating larger size. These nebulae are considered to be counterparts of Wolf-Rayet or LBV stars. For a nebula radius of 2 parsecs and an SN ejecta expansion velocity of 10,000 km/s, the impact of SN ejecta on the circum-stellar nebula is expected to be about 200 years after the SN explosion causing luminosity and X-ray emissions.

"Among the SNe we surveyed, we detected CSM around SN 1978K and SN 1998S. In the case of SN 1978K, the circum-stellar nebula was not yet hit by the SN ejecta 21 years after the SN explosion. This must belong to the second type of circum-stellar nebula described above. In the case of SN 1998S, the rapid temporal evolution of the spectral lines from the CSM over the first year indicate that this material is interacting with the SN ejecta and must belong to the first type." [yyy] This journal reasoned that these two different types of SNRs came from different types of progenitor stars. The SNS hypothesis supports the idea that these different types of SNRs are different snapshots in time of an evolving massive star. A typical massive star is shedding different envelops of material over various periods of time. The first type is a snapshot of the result of two large eruptions caused by the implosion of two core burning processes that were less than one year apart such as the time between the neon and oxygen burning processes or even the time between the oxygen and silicon burning processes. The second type is another snapshot of the result of two large eruptions caused between two core burning processes such as between the carbon and neon burning processes.

Another case study that supports this idea of a certain sequencing of eruptions prior to the last and largest explosion is the circum-stellar medium of SN 1987A discovered by soft X-ray emissions. Very importantly, the ejecta of the later explosions have more kinetic energy to overtake previous shells of ejecta. "A soft component {of X-ray emissions} (< 15 keV) shows a thermal bremsstrahlung spectrum of 10 to 12 keV, and may be due to thermal emission from shock-heated ejecta. In January 1988, X-ray emission in the range 6-16 keV flared up, on a timescale of a few weeks, to three times the level of the previous three months. Here we interpret the flaring as the result of interaction of the supernova ejecta with pre-existing circum-stellar matter, whose density distribution was peaked because material blown off from the progenitor star ran into slower- moving material ejected during an earlier stage of the star's life." [zzz]

All the results of these studies of composition of SNRs and their spatial distribution directly support the SNS hypothesis. The supporting amounts of data and the samples are meager because astronomers are dealing with events that occur rarely within mankind's short history of observation and SNRs are very difficult to resolve for extra-galactic events because of their immense distances from Earth. The sampling is further constrained because it more than likely only includes massive stars in the range of 15 to 100 $M_{\odot}$; preferably the sampling should be 100 to 200 $M_{\odot}$ to further enhance how second and third generation stars of 9 to 25 $M_{\odot}$ are derived via the SNS process.

XVI. Supernovae Seeding (SNS) Process vs. Nebular Hypothesis (NH)

Each process or hypothesis describes how stars and planets are formed and how they come together to form a star with a planetary system. Each process should address how all different sizes of stars are created (with the exception of the first primordial stars) and how all different sizes of planetisimals from the size of Jupiter to the size of a comet are created. Each process should also address how all types of systems are created from a brown dwarf having a planet to two stars of different sizes being binary companions. The major controversies between the two ideas are summarized below.

1. Creation of the proto-star disk with its planets:
    a. SNS – Hot, ionized material is attracted electromagnetically by a highly magnetized spinning orb (MSO) of iron plasma well before gravity begins to dominate.
    b. NH – Cold, molecular material of a giant molecular cloud (GMC) creates a random point source for originating a gravitational collapse.
    c. SNS – The medium is extremely hot, dense and ionized as found in H II regions and is created by the colliding shock fronts of a progenitor star's eruptions.
    d. NH – The medium is very cold, condensed molecular regions relatively far from supernova shock fronts and the hot stellar winds of other stars.
    e. SNS – Individual proto-planetary disks of varying sizes created due to the magnetic properties of MSOs that are sprayed equatorially into the progenitor star's circum-stellar shells of different types of ejecta; these proto-planetary disks in a hierarchical fashion are attracted to the closest or most dominate proto-star disk.
    f. NH – Proto-planets are created at certain orbital distances within the proto-star disk by accretion of the same disk materials that fall into the star.
    g. SNS - Binary stars are created due to proto-star disks clumping close together along similar trajectories after a supernova explosion.
    h. NH – Multi-star systems are created while in close proximity inside dense star clusters.

2. Evolution of massive stars:
    a. SNS – The progenitor star loses most of its mass over a series of pulses and eruptions after each core burning process is interrupted or ends.
    b. NH – The majority of the progenitor star's mass-loss occurs during the core collapse supernova event.
    c. SNS – Shells of distinct synthesized materials radially expand and are overtaken by later shells of material in a random asymmetrical fashion causing uneven mixing.
    d. NH – The materials of a GMC are fairly homogeneous and remain mixed and intermingled as the cloud collapses into a proto-star disk which causes difficulty explaining the large differences of planetary compositions and their general compositions with the Sun.
    e. SNS – The majority of the iron core is expelled forming MSOs; a smaller portion is left behind to become part of the white dwarf remnant star.
    f. NH – Typically the iron core remains with the remnant star and only traces of iron are emitted into the CSM.

3. Evolution of Galaxies:
    a. SNS – Mostly elliptical galaxies formed closely following the Big Bang.
    b. Current galactic evolution – Galaxy types randomly formed one billion years after the Big Bang.
    c. SNS – Many collisions occurred near the beginning of the epoch of Galactic formation which formed spiral and irregular galaxies now being the dominate forms. These collisions are still happening but at a slower rate.
    d. Current galactic evolution – Galactic collisions generally create elliptical galaxies from spiral galaxies.

4. Continuance of Super-massive Star Production:
    a. SNS – The collision of galaxies through the eons have activated metal-poor primordial material surrounding the galaxies to produce more super-massive stars without being interrupted by the CNO cycle.
    b. Current galactic evolution – Intermixing of interstellar materials inside spiral galaxies and during galactic collision can only produce massive stars only to a rough limit of 150 $M_{\odot}$ because of the CNO cycle of nucleosynthesis.
    c. SNS – The majority of matter is still in its original form surrounding both elliptical and spiral galaxies.
    d. Current galactic evolution – The primordial materials from the Big Bang are mostly depleted.

5. Proto-star Evolution:
    a. SNS – A highly magnetic spinning iron orb create both a magnetic field and a dynamo effect that attracts charged ionized nucleons and electrons from the expanding shells of an SNR.
    b. NH – Some discontinuity within the GMC possibly caused by a SN shock front becomes a core of gravitational attraction for a star birth.
    c. SNS – The MSO attracts successively heavier metals as it penetrates each farther expelled shell from the progenitor star. This feature initiates the varied differentiation of materials for each planet.
    d. NH – The proto-star's core attracts the well mixed higher metals from the proto-disk having no regard for any type of differentiation except that the heat from the center will drive off the lighter volatiles from any inner planets.
    e. SNS – Lenz's Law predicts MSO and the in-falling materials have opposing spins thereby avoiding any large spin-up of the proto-star that would destroy it.
    f. NB – The material falling onto the surface of the proto-star creates a common angular momentum that can spin-up the star and easily destroy it. A feeble explanation is that jets called Herbig-Haro objects release angular momentum at the polar regions. However, these objects do not have enough observed mass.
    g. SNS – An explanation is offered by the electromagnetic properties of each MSO that causes alignments of both the orbital and spin vectors of the planets.

h. NB – The nebular hypothesis has difficulty explaining why the spin and orbital vectors of the planets are mostly aligned.
i. SNS – Post stellar system formation events are explained because the SNS process produces a prodigious amount of planetisimals of varying sizes from large dust size to planet size that populate interstellar space and are swept up by star systems orbiting the galaxy. Some of these post-formation events in our own solar system are the major collisions of planetary size objects with Earth and Mars; general tilted spin axes; short and long period comets; irregular satellites and asteroids; later periods of heavy bombardment; continuing rings of dust around the outer planets, and planetary size objects in the Kuiper Belt.
j. NH - Many post-formation events have been explained recently in the past 20 years by various ideas and modeling. The idea of an Oort Cloud supplies an unlimited supply of comets over the life of the solar system. The Nice Theory provides answers for rogue planets that caused later major planetary collisions and bombardments in the inner solar system. This same theory with the outward migration of the ice giants also supposedly creates the minor planets in the Kuiper Belt.

XVII. Observations, Data and Modeling for Supporting the SNS Hypothesis

The following listing briefly summarizes the numerous astronomical observations, compiled data from space telescopes and radio/X-ray spectrometry, and computer modeling that support the supernova seeding (SNS) hypothesis. The details of this collaboration have been discussed in the body of this paper and are roughly in the order that they are presented in this listing.

1. Current modeling of supernova types:
   a. Stripped layers of hydrogen and helium from Type Ib and Ic SNs.
   b. Stars from 130 to 250 $M_{\odot}$ creating pair-instability and releasing all core-burning products.
   k. Stars from 100 to 130 $M_{\odot}$ creating partial pair-instability shedding outer layers to become Type II SN.
2. Stellar nucleosynthesis model for a 25-$M_{\odot}$ star: (see Table C)
   a. Provides the sequence of burning processes for making synthesized elemental products which is congruent with observed materials within SNRs.
   b. Provides the burning process time spans that are congruent with the shells observed in SNRs.
3. A credible postulated timeline for star-mass evolution is established: (see Tables B, D, and E)
   a. The evolution of galaxies with their composition of stars is explained.
   b. The details of "pre" and "post" galactic collisions as observed are explained.
   c. The reasons for star burst activity and the continuing supply of primordial materials as witnessed in recent galactic collisions are explained.
   d. The distribution and population of various star masses is postulated which includes the locations of Population I and II stars and H II star forming regions.

    e. Very possibly the origin and composition of dark matter is answered with some proof provided by the Magellanic Bridge and Stream discoveries.
4. The unveiling of more data about supernova remnants (SNRs): (see Table F and Diagrams A and B)
    a. The predictions and observations for ejecta from LBV and WR stars including SN imposters provide a standard picture for the evolving CSM surrounding progenitor stars.
    b. Computer modeling of supernova explosions strongly suggests that the progenitor star's onion-like layers of synthetic materials should be mostly blown away prior to the final explosion.
    c. The scaled values of velocities for expelled materials are congruent with the spacing of timescales between eruptions and shock front collisions.
    d. The major phases of an archetypical super-massive star are assembled to represent all the core-burning processes, all the eruptions leading up to the SN event, and then all the subsequent collisions of the radially outward moving shock fronts. These phases certainly display a useable model for the SNS hypothesis utilizing observed data at numerous and critical points.
5. Better ideas for unusual types of radiation signatures from outer space:
    a. Cosmic rays coming from two different shock fronts for hydrogen and helium at different energy levels are perfectly expected from the SNS process.
    b. Cosmic rays of unusually high energy levels not explained by a neutron star source can be generated by MSOs prior to a mature proto-star disk forming.
    c. Synchrotron radiation caused by strong magnetic fields and accelerated electrons cannot be fully explained by a pulsar or spinning neutron star located in the center of a SNR. Measured synchrotron radiation is emitted from all parts of the SNR which cannot be explained by a highly directional emission from a pulsar. Multiple highly magnetic spinning orbs (MSOs) spread throughout the perimeter of a SNR can answer this puzzling anomaly.
6. Spectroscopy surveys of SNRs:
    a. Recent radio and X-ray spectroscopy surveys are able to distinguish CSM of progenitor stars and SN ejecta from the general ISM.
    b. An upper limit of 2.2 parsecs for the radius of circum-stellar nebula was determined which is consistent with observations of LBV and WR star's expelled materials; this information agrees well with ejection velocities and the time intervals between ejections.
    c. The measured relative abundances of lighter verses heavier elements show distinct differences or Type Ia and Type II SNs that agrees with the SNS expected sequence of expulsions.
    d. The measured and plotted clustering of periodic table "Z" values inside SNRs and the overturn of heavier elements within Cassiopeia A SNR produce more evidence to support the morphology of a progenitor star's ejecta and CSM.
    e. The rings around 1987A SN revealed by UV flash verify previous eruptions occurring within certain time constraints.

f. One SNR spatial study categorized two different sizes of circum-stellar nebulae: one type is ≤ 0.01 parsec in radius and was revealed in less than one year after the SN; a second type is about 200 parsecs in radius and is expected to collide with the its SN shock front in 200 years. These time spans verify ejection intervals and ejection velocities.

XVIII. Conclusion

The Supernova Seeding Hypothesis explains why the universe continues to produce stars of varying sizes and how these stars most generally have a system of organized planets and other smaller bodies. Unlike its most popular competing theory, the Nebular Hypothesis, it addresses all the issues of star system formation without having any overriding mysteries or conundrums.

The SNS process utilizes the plasma state of materials created by the enormous energy of initial super-massive stars expiring by exploding in several phases in the early universe. Matter in the excited plasma state is separated into its individual fermions of electrons, protons, and neutrons which are highly electromagnetic in combination with their given kinetic energy. Matter is also separated into different elemental nuclei due to the way the initial stars burn their beginning hydrogen and helium fuel. As each type of fuel is consumed within the core of the star, a new elemental material or combination of these elements are produced that are ejected or splattered outward mostly equatorially to form a shock wave and ring of mostly segregated material. As each type of fuel is fused and consumed a subsequent explosion creates the next shock wave and a ring of another type of mostly segregated material.

Each subsequent shock wave and outwardly moving ring is faster that the previous. Hence, all the rings of materials eventually intersect each other to produce heterogeneous mixtures with random different aggregate sizes and random ratios of these different elements. Each ring of material has clumping which creates unequal electromagnetic fields thereby allowing the clumps to grow faster than the smaller clumps. The random clump size produces a hierarchical system of aggregated matter. The final ring of expelled material in the last supernova of a progenitor star is iron, and nickel that is rapidly decaying into iron. This material is given the most kinetic energy from the most violent of all the explosions. This iron also clumps dramatically into very magnetic spinning orbs (MSOs) that eventually pass all the other rings of material.

The MSOs dominate the aggregating of materials drawing materials from the largest distances as they pass through each mostly segregated set of materials. These MSOs become the “seeds” that produce varying sizes of celestial bodies from stars to satellites depending on their original size and the amount of clumping and density of ring materials where they passed. Not every orb need have an iron core in this process. Many aggregated bodies may have formed from the cores of other elements which attracted lighter elements but never passed close to a MSO.

What makes the SNS process very unique from the Nebular Hypothesis is the way all the materials which are very much in the plasma state are organized by their electromagnetic properties and not by gravitational energy. There is entirely too much chaos for aggregating materials to become organized by gravitational means. There are too many fast moving point sources of gravity to produce one major point source for a star. This same reasoning applies to prevent a cold, molecular cloud of hydrogen from seemingly collapsing into a proto-star disk which is the questionable starting point for the Nebular Hypothesis.

Very strong electric and magnetic fields and resulting magnetic circuits created by a MSO passing through electrified surrounding plasma cause the MSO to slow down to match the velocities of the other rings of materials, cause opposing spins of the MSO and the surrounding plasma, and creates an electrical field current pulling surrounding plasma toward the MSO across a rotating plane perpendicular to the translation motion of the MSO. This SNS process explains in this manner how a proto-star disk is formed and how an exponentially growing attracting point source is created for a star or any other size body.

The magnetic circuit between the MSO passing through surrounding plasma causes the plasma to circulate in the opposite direction. When this surrounding plasma falls inward along current lines within the proto-star disk, it spirals inwardly in the opposite direction of the spinning MSO. The opposing accumulative force of the accreted material prevents the star from spinning too high and flying apart. Hence, stars generally have rotational velocities close to our own Sun. The best part, the planets, is now explained.

As a star is formed from this SNS process, so are other bodies of varying sizes formed in the same way in proximity to the most dominate electromagnetic source and the less gravity source. Hierarchical systems are created where the star attracts planets and planets attract satellites. The star grows sufficiently to possess enough gravity such as our Sun to attract other hierarchical systems from as far as 30 to 60 AU. If one of those systems is a star of equivalent size or just a brown dwarf, then a binary star system is formed. The planets are orbiting in the same direction as the dust and gases inside the proto-star disk because they originally were part of surrounding plasma field that was affected by the passing MSO. The smaller planetary systems along with the new proto-star still have very strong electromagnetic properties that either align the spins of the planets, flip their opposing rotation to become aligned, or eject the un-aligned spinning planet from the star system. The Nebular Hypothesis does not adequately explain how planetary spins become aligned with their orbital vectors.

In section XVI a direct comparison between the Supernova Seeding (SNS) process and the competing Nebular Hypothesis is made. Refer again to the major differences of each process. The SNS provides a much better explanation for the following parameters needed for proto-star disk, star, and planetary formations:

1. A better point source for beginning the attraction of materials is provided by electromagnetic phenomena and highly magnetized spinning orbs (MSOs).
2. Proto-star disk formation makes better sense by combining plasma and the concepts of Faraday's Dynamo than a so-called gravitational collapse of widely dispersed cold molecules.
3. The hierarchical systems of "stars and planets" and "planets and satellites" being formed separately is more consistent for SNS; the Nebular Hypothesis relies on accretion processes existing inside other accretion processes to create the outer planetary systems. Not enough

material can be accreted over a known time for a typical proto-star disk in the outer regions of the solar system. The SNS process has an unlimited reservoir of materials as the MSO passes through circum-stellar materials of a progenitor star.

4. The alignment of planetary spins and orbits cannot be explained by accretion and gravity alone. The SNS provides a definite known mechanism of magnetic circuits to cause such an alignment for both the planets and the satellites.
5. The gravitational collapse of cold materials into a thoroughly homogeneous proto-star disk provides no mechanism for the separation of elements and compounds into well differentiated planets and satellites especially in the outer colder regions. The SNS process already provides iron cores and well differentiated molten orbs prior to being gathered into orbits around a star.
6. The Nebular Hypothesis explanation is very weak in explaining why proto-star disk materials falling from distances 10 or more AU do not transfer most of the angular momentum of the system to the Sun. The SNS addresses this issue directly by having the falling material spiral opposite to the newly forming rotating star thus stopping it and reversing its spin direction. The planets already have gained their angular momentum by being captured from the outer perimeters instead of being formed inside the proto-star disk.
7. Unusual star systems such as a red or brown dwarf with a planet are difficult to explain by the Nebular Hypothesis since not enough gravity is available for a typical collapse of a molecular cloud. The SNS can most certainly explain a myriad of systems by the randomness created from a series of eruptions and a supernova from a single progenitor star.

Although inductive reasoning provides the major impetus for this new SNS hypothesis Secton XVII summarizes the observational proof. Current modeling of supernovae types supports the SNS due to new ideas of how evolving massive stars shed their materials. Types Ib and Ic SNs are known to have stripped layers of hydrogen and helium. The SNS supports the idea that these primordial materials are blown off first into the CSM to be later gathered by MSOs to form smaller 2nd generation stars. Stars from 130 to 250 $M_{\odot}$ are modeled to create pair-instability and release all their core-burning products. This model directly supports SNS since it supplies the final core-burning material, iron, for producing MSOs or seeds for future stars and planets. Stars from 100 to 130 $M_{\odot}$ are modeled through partial pair-instability to shed their outer layers to become Type II SN. Of course, Type II SNs shed their outer materials similarly either by slow eruptions or more energetic burps depending on their masses prior to a final explosion.

Current stellar nucleosynthesis provides further proof for the SNS process. The sequence of expelled synthesized elemental products is congruent with observed materials within supernova remnants and with materials that end up within planets and their satellites. The predicted time spans for each type of nuclear burning are also congruent with the synthesize products found at various measured velocities and distances from the progenitor star. The data although meager does cover different points of time spans and predicted star masses.

The observational studies of supernova remnants (SNRs) continue to support the SNS. Computer modeling of supernova explosions recently suggests that a progenitor star's outer layers of synthetic materials are mostly blown away prior to the final explosion.

Cosmic rays of unusually high energy levels with an occasional high velocity iron nuclei and synchrotron radiation not fully explained by pulsars can both be explained by the predicted magnetic spinning orbs (MSOs) of the SNS process.

Recent radio and X-ray spectroscopy surveys of SNRs have isolated SN ejecta from the general ISM. An upper limit of 2.2 parsecs for the radius of circum-stellar nebula is consistent with the observations of LBV and WR stars' expelled materials. This information which is predicted by the SNS corroborates progenitor star ejection velocities and time intervals between ejections.

Refer to Table F – Major Phases of an Archetypical Evolving Super Massive Star. This tabulation best illustrates current data for supporting the SNS. The data comes from observations of various SNRs and knowledge of interstellar matter. The collected data is placed into 10 phases of the evolution for a super massive star predicted by SNS. These phases are:

1. Expulsion of Hydrogen layer
2. Expulsion of Helium layer
3. Expulsion of Carbon (mixed with Oxygen and Nitrogen) layer
4. Fast core burning eruptions
5. Supernova (largest brightening)
6. Iron plasma forming into MSOs
7. Free expansion of ejecta
8. Sweeping up of CSM (strong X-rays)
9. Outer shell cooling (H recombining)
10. Shell interior cooling and envelop edge dissipating

Data is supplied as best as now exists for the various phases for ejecta velocity, radius of shell, time span for shells, temperature of shell, density of shell, state of hydrogen, state of iron, and projected mass-loss ($M_\odot$). The data closely matches predictions of the SNS hypothesis.

According to the SNS process, the majority of stars are formed very closely after larger stars explode and to create a CSM. Of course, all subsequent stars must be smaller. So an interesting question led to possible new ideas for the evolution of all stars, the evolution of galaxies, and the source of dark matter. If all stars began at 250 or less $M_\odot$, and were short-lived, why does the universe still have large massive stars, although far fewer today? Elliptical galaxies are well known to have mostly older Population II stars, while spiral galaxies have Population I stars as well as Population II. Only spiral galaxies have large regions of H II star forming regions with starburst activity. And, of course, these spiral galaxies have the super-massive stars that should not have formed due to the CNO cycle that interrupts stars from becoming too massive.

The SNS hypothesis explains these questions by reasoning that elliptical galaxies came first. Then these older galaxies collided with each other to form spiral and irregular galaxies that created the new star forming regions. Studies of deep sky galactic collisions and near misses in various stages confirm for the author that this is the case. However, where does the primordial material of hydrogen and helium without higher metals come from to produce the observed super-massive stars? This question led to a clue. Could the primordial material be hidden? Could this material be dark matter? This line of questioning led to where dark matter resides and why it resides where it does. A reason is developed for why it cannot be seen; further proof of this reason is still forthcoming.

It is hoped that some credible referees will step forward to further advance the idea of the Supernova Seeding Hypothesis which should eventually replace the Nebular Hypothesis. If you read all the material for this hypothesis, I hope you are as excited as I am about eventually knowing how Creation was built.

This paper ends with addenda that display some mathematical treatments to further corroborate Table F- "Major Phases of an Archetypical Evolving Super-Massive Star". More and more data is being collected every day from space probe and space telescope missions that surely can further enhance this aspect of the SNS hypothesis. Other addenda and mathematical cases are currently under development and will be added to the these journals as they are completed.

Case Study: A-030512 – Verification of Congruency of Velocities of Expelled Materials With the Time Intervals Between Progenitor Star Eruptions

The following assumptions are made:

1. Major hydrogen erupted layers are expelled at about 700 km/s and slowed to 250 km/s; the mean velocity for this shock front is (700 + 250)/2 = 475 km/s.
2. Major helium erupted layers are expelled at about 2000 km/s and after colliding with the hydrogen shell slowed to 250 km/s; the mean velocity for He's shock front is (2000 + 250)/2 = 1125 km/s.
3. Eruption rates of the faster core-burning fuels are about 5,000 km/s; the mean velocity for this shock front that is slowed to 250 km/s is (5,000 + 250)/2 = 2625 km/s.
4. The final eruption rate is 10,000 km/s obtained from SN observations that ejects the heaviest core-burning products of silicon, nickel, cobalt, sulfur and iron. It mean velocity after also slowing to 250 km/s is (10,000 + 250)/2 = 5125.
5. The shell radii where shock fronts intersect are between 0.1 and 2.2 parsecs (0.32 and 7.19 light years respectively).
6. The times between eruptions of fast core-burning fuels is anywhere from 3 to 1000 years. Hence, these eruptions for astronomical purposes are considered to almost occur simultaneously.
7. The times between major eruptions of the outer layers of hydrogen and helium do not correspond with their core-burning times of 10 to 100 million years. Stellar winds steadily emitted mass-losses, but the amount of mass, frequency of eruptions, and ejection velocities are largely guesswork.

This study assumes the ejection velocity is comparable to known eruptions on the Sun's surface. The amount of mass-loss of the outer layers is a very large fraction of the total mass-loss of the star's total hydrogen and helium. The frequency of first eruptions increased near the end of the helium burning process when most of the outer layer mass-lost occurred. The instability of the helium burning process near the end of its availability as a fuel at certain hydrostatic pressure levels could have burped large amounts of hydrogen and helium two or more times possibly 1000 years apart. The burn time for the carbon and the subsequent onion-like layers is determined to be about 1000 years for a 25 M_0 star. For a super-massive star this burn time is estimated to be ½ this time.

\----------------- t_1-------------{ }------------------------→ 475 km/s for H
\<-------t_{be}----------->\-----------t_2-------{ }-------------→ 1125 km/s for He

Distance = $d_1 = d_2$ or $v_1t_1 = v_2t_2$ where $v_2 > v_1$ and,
$t_2 = t_1 - t_{be}$ or $v_1t_1 = v_2(t_1 - t_{be})$ and,
$t_1 = v_2/v_1\ (t_1 - t_{be})$ or $t_1 = (v_2/v_1 \times t_{be}) / (v_2/v_1 - 1)$

The motion equation for the first and second eruption intersection with 1000 yrs between the eruptions follows.

mean v_2/mean v_1 = 1125/475 = 2.4 and,
t_1 = 2.4 (1000 yrs) x (3.1 x 10^7 s/yrs) / (2.4 -1) = **1714 years** or 5.3 x 10^{10} sec
d_1 = 475 km/s x (5.3 x 10^{10} s) = 2.5 x 10^{13} km x (1 ly/9.6 x 10^{12} km) = 2.6 ly
d_1 = 2.6 ly x (0.306 parsecs)/1 ly = **0.807 pc**

The motion equation for the second and third eruption intersection with 1000 yrs between the eruptions follows.

mean v_2/mean v_1 = 2625 km/s / 1125 km/s = 2.33 and,
t_1 = 2.33 (1000 yrs) x (3.1 x 10^7 s/yrs) / (2.33 - 1) = 5.4 x 10^{10} sec or **1752 years**
d_1 = 1125 km/s x (5.4 x 10^{10} s) = 6.1 x 10^{13} km x (1 ly/9.6 x 10^{12} km) = 6.35 ly
d_1 = 6.35 ly x (0.306 parsecs)/1 ly = **1.94 pc**

The motion equation for the third and fourth eruption intersection with 500 yrs between the eruptions with the fourth eruption considered as the SN follows.

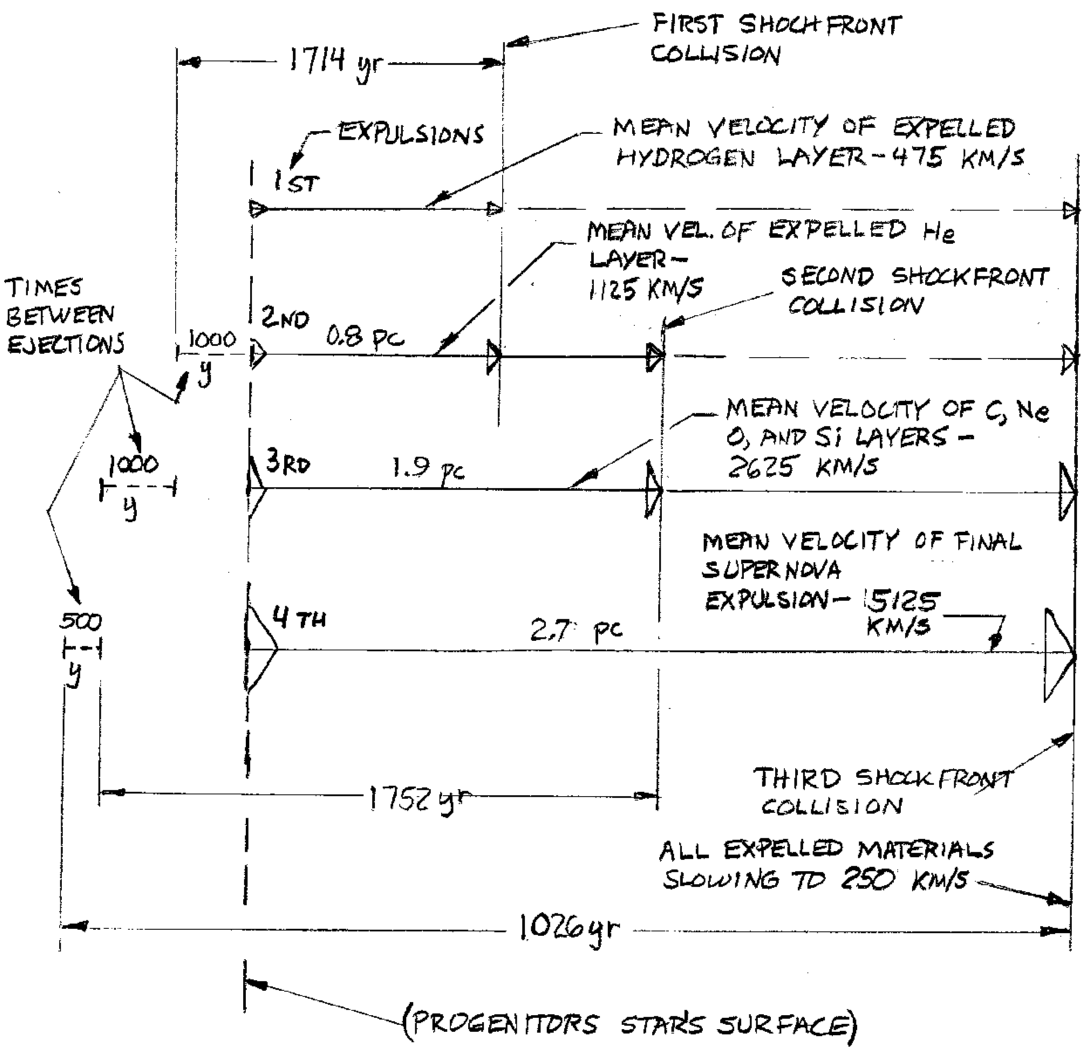
mean v_2/mean v_1 = 5125 km/s / 2625 km/s = 1.95 and,
t_1 = 1.95 (500 yrs) x (3.1 x 10^7 s/yrs) / (1.95 -1) = 3.18 x 10^{10} sec or **1026 years**
d_1 = 2625 km/s x (3.18 x 10^{10} s) = 8.35 x 10^{13} km x (1 ly/9.6 x 10^{12} km) = 8.70 ly
d_1 = 8.70 ly x (0.306 parsecs)/1 ly = **2.66 pc**

Conclusions:

The results agree very well with observed SN and SNR ejecta velocities, observed radii of shock front envelops, time spans for shock fronts to collide, and predicted time intervals for core-burning processes of a star's nucleosynthesis. The overall average velocities of each colliding shock front reveal a clear relationship of each subsequent eruption being more energetic and faster than the previous one. A diagram of expulsion kinematics for the typical evolution of a star greater than 100 solar masses is depicted from the previous results.

Diagram D - Expulsion Kinematics for Typical Evolution of Star > 100 $M_\odot$

DIAGRAM OF EXPULSION KINEMATICS
FOR TYPICAL EVOLUTION OF STAR > 100 $M_\odot$



OVERALL AVERAGE VELOCITY OF COLLIDING SHOCKFRONTS:

	$1 \to 2$	$2 \to 3$	$3 \to 4$
AVERAGE VELOCITY =	$\dfrac{2.5 \times 10^{13}\ \text{Km}}{5.3 \times 10^{10}\ \text{s}}$	$\dfrac{6.1 \times 10^{13}\ \text{Km}}{5.4 \times 10^{10}\ \text{s}}$	$\dfrac{8.4 \times 10^{13}\ \text{Km}}{3.2 \times 10^{10}\ \text{s}}$
=	472 Km/s	1130 Km/s	2625 Km/s

XIX. Endnotes

[a] Wikipedia; Interstellar Molecular Clouds
[b] Wikipedia; Herbig-Haro Objects
[c] Wikipedia; Faraday's Dynamo
[d] Wikipedia; Magnetohydrodynamics (MHD)
[e] Wikipedia; Ampere's Law
[f] College Physics (Schaum's); Magnetic Fields of Currents; Force Between Two Parallel Conductors
[g] College Physics (Schaum's); Magnetic Fields of Currents; Magnetic Field of a Current
[h] College Physics (Schaum's); Magnetic Fields of Currents; Magnetic Field of a Long Straight Wire
[i] College Physics (Schaum's); Magnets and Magnetic Circuits; Magnetic Field Intensity for a Toroid
[j] Wikipedia; Lenz's Law
[k] College Physics (Schaum's); Magnets and Magnetic Circuits; Permeability (inside a ring solenoid)
[l] Electricity Made Simple; Induced Electromotive Force; Self Inductance and Mutual Inductance, p115
[m] College Physics (Schaum's); Magnetic Fields of Currents; Force on Conductor in Magnetic Field (Ampere's Law)
[n] College Physics (Schaum's); Self-Inductance and Mutual Inductance; Energy of a Magnetic Field
[o] College Physics (Schaum's); Self-Inductance and Mutual Inductance; Self-Inductance of a Solenoid
[p] College Physics (Schaum's); Magnetic Fields of Currents; Torque on Coil in Magnetic Field
[q] College Physics (Schaum's); Magnets and Magnetic Circuits; Magnetic Field of a Pole
[r] College Physics (Schaum's); Magnets and Magnetic Circuits; Magnetic Moment of a Coil
[s] Wikipedia; Uranus, the Planet
[t] Wikipedia; T-Tauri Stars
[u] Wikipedia; Supernova, Supernova Type Ia, Ib, Ic, and II
[v] Wikipedia; Stellar Nucleosynthesis
[w] Wikipedia; CNO Cycle, page 6
[x] Wikipedia; Elliptical galaxies, Spiral galaxies, irregular galaxies
[y] Wikipedia; Pair-instability supernova
[z] Wikipedia; Hypernova: SN 2006gy
[aa] Wikipedia; Photodisintegration
[bb] Wikipedia; HII and HI Regions
[cc] Wikipedia; Population I and Population II Stars
[dd] Wikipedia; Timeline for the Big Bang
[ee] Wikipedia; Nucleosynthesis: Supernova, Stellar, and Big Bang Nucleosynthesis
[ff] Wikipedia; Solar winds
[gg] Wikipedia; Tycho supernova
[hh] Wikipedia; Population III Stars
[ii] Wikipedia; Electron Degeneracy Pressure
[jj] Wikipedia; Triple-Alpha Process
[kk] Wikipedia; Eta Carinae
[ll] Nathan Smith and Owocki in the July 1st - Astrophysical Journal Letters
[mm] Cowen, Ron: Science News; Vol. 170; Sep 23, 2006; "Temperamental Monsters"
[nn] Wikipedia; Luminous Blue Variable (LBV) Stars
[oo] Wikipedia; P Cygni Supernova
[pp] Hillebrandt, Wolfgang; Janka, Hans-Thomas; Muller, Ewald: Scientific American: September 18, 2006; "How to Blow Up a Star"
[qq] Wikipedia; Wolf-Rayet Stars
[rr] Wikipedia; Wolf-Rayet Nebula Types
[ss] Wikipedia; H-alpha Line
[tt] Stasinska, G.; "Abundances in H II Regions and Planetary Nebulae; http://ned.ipac.caltech,edu/level5/March02/Stasinska
[uu] Crowther, MNRAS 290, L59, 1997
[vv] UCL Hot Star Group; http://zuserver2.star.ucl.ac.uk/

[ww] Wikipedia; Ring-type Nebula
[xx] Wikipedia; Main Sequence; Lifetime
[yy] Ricci, L.; Robbero, M.; Soderblow, D.R. (2008); "The Hubble Space Telescope/advanced Camera for Surveys Atlas of Protoplanetary disks in the Great Orion Nebula"; Astronomical Journal 136 (5); 2136-2151.)
[zz] Wikipedia; H II regions; origin and lifetime
[aaa] Wikipedia; Magellanic Bridge, and Magellanic Stream
[bbb] Wikipedia; Large Magellanic Cloud, and Small Magellanic Cloud
[ccc] Wikipedia; Dark Matter
[ddd] Wikipedia; Low Surface Brightness (LSB) Galaxies
[eee] Wikipedia; Supernova Remnants (SNRs)
[fff] Wikipedia; Synchrotron radiation
[ggg] Wikipedia; Crab Nebula
[hhh] Wikipedia; Vela SNR
[iii] Wikipedia; Cassiopeia A SNR
[jjj] Wikipedia; RCW103 SNR
[kkk] Wikipedia; 1998S SNR
[lll] Wikipedia; 1987A SNR
[mmm] Wikipedia; Eta Carinae Nebula
[nnn] Wikipedia; Supernova 2006JC
[ooo] Powell, Devin; Science News; March, 2011; "Origin of cosmic rays questioned."
[ppp] Wikipedia; SNR 1988s
[qqq] Wikipedia; SNR 1978k
[rrr] Wikipedia; SNR RCW 86
[sss] Wikipedia; Interstellar Medium
[ttt] NASA's Astronomy Picture of the Day (APOD); May 18, 2006; "Shell Game in the LMC" credited to John P. Gleason.
[uuu] NASA's Astronomy Picture of the Day (APOD); January 18, 2012; "Cygnus X: The Inner Workings of a Nearby Star Factory"
[vvv] "Investigating Supernova Remnants"; http://chandra.harvard.edu/edu/formal/snr/
[www] Anne Decourchelle; Service d'astrophysique; CEA Saclay, France; "Elemental Composition and Distribution in Supernova Remnants: X-ray Spectroscopy"
[xxx] Carles Badenes; "X-ray studies of supernova remnants: A different view of supernova explosions"; Proceedings of the National Academy of Sciences; April 20, 2010.
[yyy] Gruendl, Robert A. and Chu, You-Hua; "Narrow lines in Type II supernovae: Probing the circumstellar nebulae of the progenitors"; The Astronomical Journal, 123:2847-2856; 2002 May
[zzz] Masai, K., Haykawa, S, Inoue, H., Itoh, H., & Nomoto, K.; "Circumstellar matter of SN 1987A and soft X-ray emission"; Nature 335, 804-806; October 27, 1998