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9. THE NEW KIND OF STATIONARY STATE OF THE UNIVERSE

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According to the Explicit Equivalence principle, the universe properties are fixed by conservative properties of matter and its G fields, which in turn depend on *linear* relations coming from radiation properties. This leads, inevitably, to *a new kind of steady state* that has fundamental differences with the “big-bang” models. This is because the last ones are supported by nonlinear gravitational theories that presume that the G field is has energy.

9.1 The new global context

Here only an absolute kind of universe expansion may exist, but the relative distances don’t change with the time. Then, practically, the relative universe is rather static. Then *the universe may have an infinite age and it may last forever*. There has never been time restrictions either for the condensation of gas up to the state of black hole, or for the black holes to capture all kinds or radiation’s, up to the limit in which they can explode. Such explosions would regenerate new gas, with new potential energies, that can be condensed over the older stellar remnants traveling around them. In this way, new star clusters and galaxies can be regenerated. Eventually the last ones must return to dense and black states, and so on, indefinitely. Statistically, similar evolution cycles should be occurring all over the universe. In this way, *the average state of the universe, and its entropy, would remain unchanged indefinitely in the space-time.*

This leads to a chain of conclusions that fix the way in which the universe bodies and its radiation’s should be evolving according to the general form of the EP.

1. *The universe is in a new kind of static (steady) state. In it, matter must evolve in closed cycles, indefinitely, between gas and black hole states, and vice versa.*

2. Statistically, in any time, the universe should look the same as it is now, even if the universe were expanding. The relative macroscopic parameters and the local physical laws should remain invariable everywhere.

3. The average values of all of them: the density, the temperature, the entropy, and the Hubble red shifts should not change with the time.

4. Statistically, within reasonably large volumes of the universe intervals, the average energy emitted by the luminous bodies must be equal to the one being absorbed by the black states of matter existing within such volume.

5. The black holes, eventually, after a long time, must explode thus generating new gas that would generate new luminous stars. Eventually the energy liberated by the last ones must finally be captured and stored in other black holes.

6. *To absorb the energy emitted by the luminous bodies, "the number of black bodies must be much larger than the number of the first ones*[1]. *Then* most of the matter in the universe must be in black states.

9.2 The new kind energy source in some stars

From the equation, E7.10 it is inferred that "the gravitational binding energies of the neutrons in massive neutron stars are of a higher order of magnitude compared with the nuclear binding energy in atoms".

1. *The nuclear potential energy of H is a small fraction of the net gravitational energy liberated in a matter cycle*.

2. The gravity energy yield released around a neutron star can be of a higher order of magnitude compared with nuclear fusion of H.

3. The neutron stars can in principle produce "nuclear stripping" reactions. They can liberate high-energy protons from He and heavy elements [Notice that this is done at the cost of the lower G potential energy of the neutrons captured by the new neutron star.].

4. Most of the energy released in a matter cycle should occur around the densest states of matter, mainly in neutron stars and black holes.

From the point *4* and the fact that most the energy comes from stars, it is concluded that:

a) The most powerful stars are likely to have a core in the nuclear density range, i.e., a neutron star (NS).

b) Most of the energy released in the universe should come from regions where the probabilities for the existence of neutron stars and black holes are the highest ones, i.e., from galactic centers and their discs.

c) Heterogeneous stars with a neutron star core should get higher energy yields both from nuclear fusion reactions, generating nuclear neutrons, and from nuclear stripping reactions. The last ones would transform the G potential energy of nuclear neutrons, mainly from He atoms, into high-energy protons.

9.3 The “small bangs” in the universe

For a very long period a massive black hole should absorb and store all kind of radiation. This process would increase the average NL mass-energy of its neutrons. When such value is equal to that of the free neutrons far away from the black hole, the last one should become unstable. This value is just the critical mass-energy that can let the escape the neutrons from the black hole. In such “excited state”, the collective escape can be stimulated by an increase of the radiation’s coming from its neighborhoods. The explosion can also be triggered by a sudden change of the NL refraction index in its boundary, produced by some external body or gas cloud.

Clusters of black bodies orbiting around them would normally surround the massive black holes. Then the explosion of a black hole can be *triggered* by the G field of some massive external body passing close to it, or by another black hole. The decrease of G potential would increase all of then: the NL refraction index of the space, the critical escape angle, and the escape rate of nucleons[2]. The escape of the new nucleons should decrease the G potentials thus producing a further increase of the escape angles. Thus, the escape rate of the neutrons would increase rather exponentially. Then the explosions are likely to start as jets stimulated by the accretion of plasma along the magnetic Polar Regions. The protons have higher probabilities for escaping along the magnetic axis.

The gas ejected during a black hole explosion would come from the decay of the neutrons thus producing rather *clean H*, *rather free of heavy elements*. According to “*the non exchange law*”, during the brief escape of a nucleon from a black hole, its NL mass-energy remains constant with respect to any fixed observer. This is equivalent to say that some of the initial kinetic energy of such nucleon is transformed into potential energy of the same particle. [However, it is probable that matter would escape from the BH in a collective way, as particle fronts.] . Thence such explosion may not emit a very large amount of radiation. Throughout the telescope, it would appear as a gas cloud expanding itself with high speeds. During the brief escape period, the probabilities for a chain of nuclear fusion reactions between the new atoms would be low. Thus, the new “*primeval gas*” should not have appreciable percentages of metals.

The new gas cloud, after flowing through the external cluster of stellar remnants, would transform most its kinetic energy into of rotational energies with randomly oriented angular momentum’s[3]- Thus the new clusters is likely to have a nearly spherical shapes.

9.4 The new ways of formation of celestial bodies

According to the new cosmological context, the celestial bodies can be born more simply with the help of the fields of older stellar remnants that would exist before the generation of the gas cloud. These bodies would absorb, relatively fast, the gas from the space. They would act as *the seeds*[4] for the condensation of the gas clouds. [Such bodies would not come not from a primitive explosion of the universe but from earlier evolution of other celestial objects]. The gas should be preferentially captured by their fields, either on their surfaces or as satellites or rings of particles and planetesimals orbiting around them. This means that:

a) Most of the celestial bodies should come from gas condensed over or around some previous seed *bodies, like planetesimals, rings of them, comets, asteroids, planets and dead-like stars.*

b) Each of them can grow in mass after consecutive steps, either by capturing gas and planetesimals or by capturing to each other. In this way, eventually, they will end as parts of some more massive black hole.

All of this brings out some fundamental changes on the interpretation of many celestial phenomena compared with the conventional ones.

9.4.1 The birth of new satellites or planets

During the increase of gas density in the space around planetesimals, they can capture gas and grow in mass. The more massive planets have stronger G fields and, therefore, they can capture more gas at faster rates. Around them, new bodies can be born after the concentration of particles having nearly parallel orbits. They can get together more easily because the relative velocities between them are at a minimum. In this way, these planetesimals can form *particle rings* that can grow in mass after capturing more gas and other planetesimals traveling rather parallel to them. They would finally condense themselves into satellites or planets[5].

Something similar may happen around planetary systems thus forming new comets, asteroids and planets.

When a small satellite or planet is immersed in a cloud of gas and planetesimals, its G field should capture large amounts of matter. This must be associated with an increase of the central pressures and temperatures produced by the higher G field gradients. In this way, a satellite may become a *low temperature and low-density infrared or red star*.

After radiating the thermodynamic energy liberated from matter contraction it should cool down as a more massive planet, or a dead star, with *a somewhat more massive and dense core of heavier elements in its center*.

9.4.2 The Formation of Planetary Systems

New satellites would be born from condensation of the ring of particles formed around planets. This would occur when the planetary system becomes immersed into a cloud of gas and planetesimals. Of course, other larger satellites may be formed from already made satellites or asteroids.

Let us assume, for example, that our solar system becomes immersed into a cloud of gas and planetesimals coming may be, from some supernova explosion. After capturing gas and planetesimals, with their corresponding “angular momentum’s”, all of its bodies would grow in mass and rings of particles orbiting around them.

Jupiter, due its higher G field, would capture more gas than the rest of the planets. Then such planet may become a new *red giant star* that would increase the average energy density of radiation around it. The higher temperatures would inhibit both the condensation of light elements and the formation of new satellites closer to the New Sun. Thus, the new planets closer to the new Sun would be smaller and denser than the external ones.

Inside of the new sun, the heavier elements would drift towards de central core of heavy elements thus increasing the possibilities for the later formation of a neutron star. The new local energies would increase the internal circulation flows that would progressively transform the red star it into a more massive and bluer star similar to our Sun.

In the meantime, the old satellites would become planets orbiting around the New Sun. The particle rings formed around them would form new satellites. Some rings formed around the New Sun may be not able to condense into large bodies due to the proximity of a larger planet. They would remain as asteroid belts.

The gas condensed far away from the New Sun would form comets with orbits in rather random orientations. After exchanging momentum with each other and with the planets, they would fall in the planets and in the New Sun. They would do it faster during the initial period of condensation[6]. They would carry light elements that would help to generate the atmospheres of the new planets.

Then the amount of free particles and gas of the interplanetary system would decrease with the time, altogether with the rate of comets falling into the planets. Only then a stable kind of life will be possible in one or more of the new planets of the New Solar System.

9.5 The New Kind of Stellar Evolution

9.5.1 The color-luminosity or HR diagram

Each star of a cluster of stars is normally represented in a plot in a *color-magnitude diagram,* normally called the Hertzsprung-Russell (HR) diagram, currently called the Hertzsprung-Russell (HR) diagram. In it, the vertical axis may represent either the relative luminosity of the star or its absolute magnitude. They normally are in logarithmic scales. The abscissa (horizontal axis) represents a previously defined color scale that intends to represent the spectrum type of the star. The bluer stars are to the left hand and the red stars to the right one. Another way is to plot the star's surface temperature. Thus, the temperatures increase from the right towards the left. In Plate VIII, the points correspond to stars in a *globular (spherical) cluster of stars.*

9.5.2 Evolution of two kinds of Stars

In a Galaxy, the globular clusters are likely to be formed from condensation of recently formed (proton rich) gas clouds over small seed bodies or planetesimals. It is probable that the gas comes from a rather recent explosion of a BH that existed in the center of such cloud. (This would also account for the angular momentum problem of this kind of cluster). They would not have many MS stars because they were formed, *rather recently,* with materials rich in H and low in metals or heavier elements. Most of them would have not had time enough to generate a NS. The few observed MS stars would come from condensation of gas over older dead stars or neutron stars.

[Some important evolution differences would arise from differences of compositions of the prime materials from which stars would be formed.].

a) The proton rich stars

The smaller planetesimals and satellites, after capturing new particles and gas, would become red or infrared dwarfs. Thus, in the HR diagram they would be piled up in the right corner, downward (See Plate VIII.). They may remain luminous for relatively short time after which they may become new planets or dead stars.

Giant and super giant red stars would be formed by condensation of gas over low-density planets and some of their more massive satellites. Their masses and their volumes would greatly depend on the original masses and compositions of the original materials. They would be piled in the left side of the HR diagram.

According to the general properties of central G fields and thermodynamics, the eventual emission of radiation must produce an inexorable increase of the average pressures and temperatures in the central regions. This would also occur when the temperatures in the central regions are high enough to start nuclear fusion of H. After that, the percentage of He atoms would grow up with the time but without an appreciable production of metals. Thus, the probabilities for the formation of a neutron star would low until that a large fraction of helium (He) has been formed. Only then, the central pressures and temperatures may be high enough to produce a partial collapse of the star with the formation of a small neutron star in its center.

The history of such NS would largely depend on the particular conditions of each collapse. For stars of small masses, the internal collapses may not throw away much matter. Its small NS may remain in the center of the star, maybe oscillating with respect to the external envelope and producing variable stars. For primitive stars of larger masses, the collapse may throw away most of its external envelope, like in Supernovas type I, leaving a rather naked NS.

b) Neutron rich stars

A planet formed by condensation of matter coming from an earlier supernova should have a core of elements heavier than H or He. Something similar should hold for a star formed by condensation of gas over such kind of planets. Such star would start its new lifetime *with a core of heavy elements in its center*. Such core would come from the original core of the planet and of the heavier elements of the gas clouds. The gradients of G potentials should also produce a density gradient, which in turn would also increase both the G potential gradients and the diffusion rate of the neutrons of the heavier elements, towards the center.

[Notice that the core of a neutron rich star would be like a nuclear reactor in which the heavier elements have settled down towards the center. In such region, a further gradient of the atomic masses can also be produced. This is because the neutrons emitted by each atom would be preferentially captured by the downward atoms which in turn would emit even more neutrons that would be preferentially captured by downward atoms and so on. This would produce a chain of nuclear reactions that would concentrate the neutrons towards the center. Thus the optimum conditions to start the formation of a macronucleus are just in the center]

Thus, the neutron drifts must concentrate the heaviest elements towards the center thus producing a further gradient of atomic masses[7]. Then nuclear fusion of H would not start in the center of the star but somewhere *around* the central core of heavier elements. The Helium atoms produced by nuclear fusion would also drift, preferentially, downwards thus increasing the core mass.

Then the higher pressures and the higher neutron densities that would exist in the star center would make possible the capture of neutrons by atoms that already have the highest neutron to proton ratio[8]. This would occur according to the "slow" (s) process.

This process would be highly accelerated during the internal collapses that would occur in *variable stars*. Then it is expected that the consecutive pulses of the variable stars should come from small collapses around some small NS that is growing up in its center[9].

Notice that in a micro collapse occurring under resonant conditions, the energy released in the center comes from the gravity work of the whole star. The energy barriers would be put over during the temporal increases of pressures occurring during consecutive micro-collapses[10].

Notice also that during the NS formation stage from radioactive elements, no protons are transformed into neutrons. The neutrons have been supplied from radioactive elements of the same core. The neutrons would be like a kind of “easy food” for the birth of the baby NS.

Later on, after an appreciable increase of the mass of the NS, the net “gravitational binding energy of its neutrons should also increase”. This would make possible that the NS can be able to produce nuclear stripping reaction with the heavy elements. Thus, nuclear stripping reaction can produce free protons with some energy in excess that would increase the temperature of the center. Thus, in the long run, the neutron star would become an effective “gravity separator” of neutrons from protons[11]. This would be an efficient way for transforming G potential energy into nuclear potential energy, i.e., a new source of energy available for the star evolution.

From E7.10, “*the energy yield of the neutron stripping reactions should increase after an increase of the net mass of the neutron star”*.

In the steady state, the core would absorb neutrons and reject protons. The last ones would be slowed down and mixed up with the heavier elements around the core. This process should decrease the density of the materials around the core thus promoting *convection currents* that would take heat away from the nuclear stripping zone. Such currents would prevent local overheating and neutrino cooling. These currents would transport both kinetic and nuclear latent energies to higher levels. They would tend to increase the surface temperature. In the color-luminosity diagram, this corresponds to a blue shift that would move the star position towards the left side.

The transition between a red giant star and a MS star can occur only when the NS has effectively started the new convection currents. They would transport the energy released in the center, directly, from the star center to the surface. This should produce a relatively fast change of color, toward the blue side. Then the transition period would be relatively fast. In the color-luminosity diagram, this is consistent with the mysterious gap observed between the giant stars and main sequence stars. Just after the transition stage, the renewed star should take some time in order to get into to the new dynamic equilibrium. Thus, the star would not end immediately as a true main sequence star because it needs some time to settle down into a new steady dynamic state.

In the new state of MS star, the rate of neutron stripping events would be close to the rate of generation of neutrons by nuclear fusion. In this way, the relative composition and luminosity of the star would remain relatively constant with the time. In other terms, the lost of nuclear fuel must be somewhat compensated with the partial recovery of free protons and with the higher G energy yields of the neutron striping reactions produced by the NS.

If the star has been formed from a seed body that already had a core of heavy elements, the regenerated star would reach relatively soon the state of main sequence star. This may correspond to the very few percentage MS stars that are observed in globular clusters. This would also correspond for most often case of the stars of *open clusters*. The last ones should come from clouds condensed on some (black) cluster of planets and dead stars. This last case is also consistent with the observation of the birth of new stars inside of gas clouds. From the high content of metals observed in their spectrums, the existence of "neutron rich" materials is obvious.

9.5.3 The new kind of heterogeneous star

[A heterogeneous star would have a core with a better-defined density, of "nuclear matter", i.e., of nuclear density.]

In this new kind of dynamic equilibrium, the luminous power of such star would be due to both to nuclear fusion and to nuclear stripping. The first kind of reactions would generate neutrons out from protons and the second ones would concentrate them into the NS, mainly after gravitational work. About half of the protons would be recycled, thus helping to transport the energy released in the nuclear stripping reaction zone up to more external regions. The nuclear and kinetic energies of the regenerated protons would be transported to upper levels in which they may be cooled down and regenerate new He, by nuclear fusion, and so on. In this way, during the rather steady state of the star, the amount of He generated from nuclear fusion reactions would be about equal to the one used up in the neutron striping zone.

Notice that in this kind of star, the burnt out materials generated in the nuclear fusion reaction zones, like He and heavier elements, turn out to be the most effective fuel for the nuclear stripping reactions occurring below. On the other hand, the new H regenerated in the last zone would prevent that the He percentage of these stars can grow up with the time. Otherwise, the increasing He would decrease the rate of the nuclear fusion reactions.

In the star dynamic equilibrium, the rate of generation of neutrons by nuclear fusion must be nearly equal to rate of capturing neutrons by the neutron star[12]. This would keep nearly constant the average nuclear composition and the rate of energy released by the star. This accounts for the steady state and the relatively uniform percentage of He and H in these stars.

The transformation of G potential energy into nuclear latent energy of protons is most important because this one would prevent the development of too high local temperatures around the neutron star. Otherwise, if the temperatures were too high, photons would produce neutrinos that can escape more easily from the star. This process would cool down the central regions of the star. It would take away radiation that was partially supporting the external weight. Thus, the star may collapse. This kind of "neutrino cooling" is currently called the *"urca" process*[13].

Due to its core of higher and better-defined density, this type of star should be more compact. Thus, the G field of the NS is likely to fix the global star structure. Consequently, this kind of star should have a better-defined mass-luminosity relationship compared with the rest of the stars.

They should also have higher densities, higher superficial temperatures and higher luminous powers. The last one would come from *two main energy sources: gravitational and nuclear one*. Its luminosity is likely to be fixed by the rate of generation of He, after nuclear fusion, which would provide the neutrons to be disrobed by the neutron star.

The above properties and the theoretical mass-luminosity relationship derived below, fit well with the ones observed in "*main sequence (MS)* stars.

Something different would occur in regions of lower G potentials that already have more evolved stars and gas clouds contaminated with heavy elements. This would occur in the disk of galaxies. Such clouds can provide new gas shells for dead stars and planets, which should turn into new stars. This process would be faster due to the existence a core of density closer to nuclear density. Effectively, most of the MS stars are located near the galactic planes, i.e., just in the places where they should be. This is why *the open clusters, rich in MS stars*, are normally found in the galactic discs.

9.5.4 Stellar collapses and oscillations.

Primitive stars made up of rather clean H should evolve according to the conventional models. In the end, the more massive ones should finally collapse as supernovas of the type I. they would normally produce a NS.

On the other hand, the stars that were made up with heavier elements must have higher probabilities for the formation of a central core of nuclear density, a neutron star (NS), after gradual and partial collapses. In this way, the NS in formation would be permanently liberating G potential energy with increasing rates during small collapses. The last ones may be called "micro collapses". They would occur during internal oscillations of the core with respect to the external envelope, or vice versa, most probably occurring under resonant conditions. Thus during short time intervals the temporal pressure increases can be of a higher order of magnitude than the average one thus making possible small collapses of the matter between the external shell and the central core. The period between collapses would be fixed by the time interval taken for the reflected waves to come back to the original site of collapse. This would account for the characteristics of *variable stars*.

Notice that the most important point here is that neutron stars should be growing up inside of some stars, rather gradually, either after neutron-stripping, or after collapses of variable magnitude. Thus, the supernovas, novas and variable stars should be just different ways according to which neutron stars would be growing up inside of stars. During the collapses, the neutrinos of would throw away variable fractions of the external envelopes of the stars. Thus the final star-like products may range form a rather naked NS, a pulsar, a white dwarf or a partially recovered star with a somewhat more massive NS inside it, i.e., a MS star.

From angular momentum conservation applied to the neutron star formation, it is inferred that a neutron star would be normally rotating with high speeds. Such high speeds would put some limit to the amplitudes of the oscillations of the core, with respect to the external shell, and vice versa.

The amplitudes of the axial and of the spherical oscillation modes of the external shell can have non-null amplitudes under resonant conditions. They may produce important external (periodical) effects. Thus, the axial oscillations are consistent with the *solar sunspot cycles*[14]. The second ones can produce temporal increases of the power released in the neutron star interface.

Some bodies travelling around the star can also feed up amplitude to the spherical oscillation modes and cause, finally, some internal explosions (or small star-collapses). Depending on their magnitudes, they can produce external visible effects ranging from variable (periodical) stars and stellar explosions. Due to the small and well-defined surface of the NS, they are likely to eject rather spherical fronts of matter. They may correspond with the *planetary nebulas*.

When the NS of a heterogeneous star becomes too massive compared with the stellar envelope, the relative accelerations between them can produce overheating in the interface, thus producing neutrino cooling. This may produce partial collapses of the external shell because an appreciable fraction of the energy released in the interface escapes from the star in the form of neutrinos. Such energy escape would reduce the internal radiation’s pressures that were preventing the star collapse. A partial collapse would result in either the ejection of a fraction of the external envelope, leaving a denser star. Finally, collapses that are more complete could produce the ejection of the rest of the envelope, leaving a *rather naked neutron star (NS).* This last kind of star should be of “older”, in the strict sense of the word, i.e., it should be more “evolved”, made up with higher percentages of heavier elements.

They would correspond with the *supernova's type II*. Such explosions may not eject the whole external envelope so that the star could also explode again.

Explosions produced by axial oscillations of the core with respect to the external envelope can throw the core in a direction opposed to that of the shell. The “asymmetry” of the explosion would be obvious. The impulse given up to the core, in the opposite direction may throw the NS away from its envelope. This would account for *the higher velocities of the pulsars* left over after some supernovas. Such supernovas should by highly asymmetric.

On the other hand, the spherical oscillations of the gas shell would leave the star in the center of some expanding shell that may correspond to a variable fraction of the original one. Thus, the star may not end its luminous lifetime.

The material ejected by a supernova must be highly contaminated with radioactive materials coming from conversion nuclear reactions occurring after high pressures and temperatures. They would have high nuclear potential energies. It should also have high-energy protons coming from nuclear stripping produced by the NS. This would be the prime material for the later formation of new stars with older materials.

On the other hand, the heavy materials generated during micro-collapses have better chances for being deposited over the planets that are closer to the corresponding stars. Thus soon after the formation of a new MS star the steady conditions for the existence of human life are likely to be fulfilled.

From above it is concluded that the NL mass of a NS would grow both during the luminous lifetime of "host star" and during the stellar explosions. Then the supernovas occurring at the end stages of MS stars would be powered by the neutron star that was present much before the explosion. This would also account for *the bluer progenitor star of the supernova SN1987A.* In this case, most of the energy of contraction, from gas up to a NS state, has already been released during the MS lifetime. This is why such explosions are less powerful than the supernovas type I. [The existence of a NS in the center of the progenitor star is obvious from the well-defined fronts of matter going away from the star. Notice that some early supernovas put on relief several spherical fronts of matter travelling away thus showing that the progenitor star has recovered is star heterogeneous form between the two or more explosions.].

Minor collapses are likely to occur on a neutron rich star under “resonant conditions”, i.e., periodically. They can in principle account for variable stars and for fronts of rather spherical ejection of matter diverging from stars (novas, planetary nebulas). They would come from micro collapses probably occurring in the neutron star interface. [Notice that the well-defined fronts of ejected matter would be a rather clear consequence of the well-defined surface of the NS in which the collapse has occurred.].

A more powerful kind of explosion should occur when the primitive star is made up of H rather free of heavy elements. In such case there is no a well-defined core that can start the mechanism of formation of a NS. Thus, the star may reach an unstable state for longer periods until collapse can occur. In a galaxy, this kind of explosion is likely to occur in regions of low concentration of heavy elements. They would correspond with the Supernovas type I. The differences of energy between supernovas type I and supernovas type II would come from the energy released during the gradual collapse occurring around the central NS. The last energy has been released, by the effect of the intense field of the NS, much before the explosion.

9.5.5 Rather naked neutron stars

The rather naked neutron stars left over after some interstellar plasma of relatively small density would normally surround some supernovas. By collecting new gas from the external plasma, this one may become a source of cosmic jets, as shown below. If a NS it becomes surrounded by a dense gas cloud, it may collect a spherical shell of gas and become a new MS star.

If the amount of matter recollected is large enough, the NS would recover its form of star. [This is obvious in Eta Carinae and in SN1987a. The pictures currently show expanding envelopes from previous explosions].

The fall of mater over a naked NS can produce high-energy particles, according to the neutron stripping reactions. In the case of neutron stars of low mass, most of the energy released during the fall would be dissipated in regions close to the star, mainly in some shell of gas that may occasionally exist around the NS. In such case, the G energy released would contribute to the average luminosity of the star.

Due to the well-defined boundary conditions of the NS and of its three main fields, the plasma fall can eventually occur after collective discharges. This can only occur under resonant conditions, i.e., at well-defined frequencies.

The plasma discharges would be preferentially driven by the magnetic fields towards the well-defined magnetic polar targets. Then they can occur in a way similar to the discharges of a well-defined *LC* circuit or, in a way analogous to the discharges of water in a hydraulic ram.

The pulsed discharges of atomic nuclei can produce higher energy yields compared with nuclear fusion of H. This is due to both to nuclear stripping and to the eventual differences of rotation velocities between the falling particles and the NS. These pulsed discharges must be separated to each other by well-defined relaxation time intervals.

The pulsed ejection of protons that can also impact on the external plasma and generate a wide range of highly polarized radiation. In relatively Low Mass shells, this kind of mechanism is likely to account for the high energy and the relative stability of the periods of the *pulsars*. The same holds for the wide range of radiation's emitted by them, and for their polarizations.

When the NS of a MS star has lost most of its external envelope, after some explosion, it may become a star of smaller size and absolute luminosity. This seems to be consistent with some particular kinds of "*white dwarfs*".

If a NS is naked in an *empty space*, it would be cooled down and it could not be detected in ordinary telescopes. However it may eventually capture particles, or planetesimals, thus producing *showers (or bursts) of cosmic rays and gamma rays*. Such bursts should often found at the end of a luminous galactic period, [and for a small period after that]. Thus, they should occur around quasars and black galaxies that are relatively short distances with respect to our galaxy.

If a rather naked NS becomes immersed in a dense gas cloud, it can recover an external envelope of gas and become a new star object with a NS inside of it. This one would look as a MS star.

In general, the mass of a neutron star should always increase with the time. This would occur, rather hidden inside of some stars and nearly naked neutron stars surrounded by low-density plasma. It may eventually strip the gas of other stars, or collide with other neutron stars. It may eventually end as a massive black hole[15].

[Curiously, some international editor rejected my first work submitted for publication in 1974 just because the referee could not believe in that neutron stars could exist! Today it is unlikely that somebody can deny the existence of such stars,]

9.6 The new way for star cluster formation

[According to the new cosmological context, and to the contrary of rather conventional models for star formation, there are not stars coming directly from some "big-bang" of the universe. The actual materials of the galaxies should come from a rather periodical evolution of galaxies that have existed before. Today, such galaxies should be in different stages of evolution. Thus most of the new stars of a galaxy should be formed from condensation of gas and particles coming from other bodies that existed before.].

Globular star clusters, for example, are likely to be formed mainly from the gas ejected from the explosion of a BH and from planetesimals and dead stars that were travelling around. Due to the previous existence of such "seed-bodies" (gethers?), this process would take relatively short time compared with the one of conventional models. This would account for all of them: the low densities, the low temperatures, the low metal contents, and the high average densities of randomly oriented angular momentum's of globular clusters. A similar process would account for the regeneration of stars in clouds of recycled gas coming from stellar explosions and other star ejections.

In general, most of the new stars should be formed by condensation of gas and planetesimals over older stellar remnants

The existence of a previous nucleus of condensation during the star formation can produce fundamental differences on the way after which the new stars would evolve later, compared with the conventional models. Their histories should largely depend on the size and composition of the original seed body and gas.

For example, the explosion of a *black hole* occurring within a cluster of stellar remnants must generate a large number of stars and planets made up of rather clean H, i.e., without heavy elements. The explosion and the flow of gas through the bodies should also generate *large amounts angular momentum's of random orientations with respect to each other*. According to angular momentum conservation law, the rather small "net" angular momentum of the system should be conserved[16]. Thus, due to the high density of randomly oriented momentum's of the new star cluster, compared with the net angular momentum, the new star cluster should have a rather *spherical shape* that is consistent with those of *globular clusters*. See Plate VI. [Notice that globular clusters cannot possibly be formed by a "slow process", because the randomly oriented angular momentum's would be cancelled out during the formation.].

Due to the different kinds of seed bodies, and to their different masses, the new star cluster would have bodies with a wide range of masses and temperatures. Due to the low initial densities of such stars, most of them should have rather low superficial temperatures. This would account for the red color of such clusters.

The less massive stars formed by condensation of gas over small satellites, for example, would have low internal gravity fields and, therefore, high surface to mass ratio. Thus the rate of energy generated would be low and rate of energy lost per energy unit of mass would be relatively high. Then they would become red dwarf stars and new planets relatively fast.

The somewhat more massive seed bodies, after entering a new hydrogen cloud, may give out giant and super-giant red stars that can sustain nuclear reactions. They would correspond to the branches of red giant and super giant stars, to the right hand of the color-luminosity diagram in Fig. 9.1[17].

The more dense seed bodies, with cores of heavy elements, would give up more dense giant stars bluer than the previous ones. [Due to their higher central G fields and nuclear fusion reactions, they should keep a more compact form with increasing temperature and pressures in their centers until a NS can be formed in its center.]. This kind of stars may correspond with the rather horizontal branch of the giant stars.

With the time (age) and with the aid of nuclear fusion reactions, the red giants should release energy enough to become more compact and bluer stars. In the HR diagram, they would get closer to the MS region.

With the time, the inevitable contraction would increase the central pressures and temperatures up to some critical values in which the star may collapse, either gradually or explosively, with the formation of a NS in its center. This would convert the giant star into a "main sequence star". In the HR diagram, the relatively fast transition between giant star and MS star should correspond to the gap between red giants and the MS line. Once that the new stars has reached a rather steady state, the new star should be in a more compact form, with higher temperatures, most probably a main sequence (MS) star.

[Since the first stages of formation of a NS would be endothermic, it seems probable that the transition stage of some giant stars of Low Mass can also occur rather steadily, without spectacular collapses. This is because some of the energy released by the contraction of the star can be used up for the formation of the NS. Thus, the first steps of the gradual collapse may not produce a radical change of external temperature. Changes that are more radical would occur when the density of the materials around the NS, produced by nuclear stripping, is low enough to start the convection currents. The last ones would increase the superficial temperature of the star. In the HR diagram, this would produce a fast displacement to the left. This would account for the "*gap*" between the red-giant region and the main sequence one.]. Thus, "*the new main sequence stars would normally be the end product of evolution or red giant stars*".

[Notice that the existence of a NS in a MS star would prevent the possibility for explosive "helium burning" event. This one would be most important for the probabilities of the existence of human life].

The neutron stars and dead stars that existed before the formation of the globular cluster would recover new gas envelopes from the external supply. They would become, relatively soon, new stars more massive and bluer than the original ones. In the globular clusters, they would correspond to the very small number of blue stars.

Thus, it is probable that our Sun was a red giant star before becoming a MS star. This would be consistent with the color change that can be observed in the bodies of the asteroid belt. This radius may correspond to some earlier boundary that the Sun would have had before the transition stage. This would also be consistent and with the higher density of the planets that are inside of such radius.

This evolution model can also account for the global results of a work that has recently appeared in Physical Review Letters (31/3/97), entitled "Star dust with red giant finger prints". In it is read that "*The observed and calculated abundance's of heavy elements agree when they are calculated on the base of the "s (slow) process*". "This is done "by addition of one neutron at a time".

9.6.1 The age dilemma

According to the present theory, the universe of today should be the result of the rather periodical evolution of different kinds of bodies. They would be evolving, rather indefinitely, between luminous and dark states. Thus, a luminous cycle should start with the vaporization of a BH thus producing a new kind of "primeval gas", non-contaminated with metals.

[Here, a really new star should be the one produced by condensation of this gas, may be around a small planetesimal. Such star would begin its lifetime as very low density and low temperature star. This one may a red giant of low luminosity. Then this kind of star should be considered a "*young star*", just like a baby is young because it is in its first period of evolution. However, in current literature these kind of low-density stars are normally called "old" stars. Here I call them "primitive stars".

Starting with a "primitive star", some long evolution period is required to get a more dense star with higher concentrations of elements heavier than H. This means that in order that the original star can become a main sequence star, it needs very large periods for radiating the energy for contraction and for producing heavier elements after nuclear fusion. Thus, the last kind of stars are necessarily bluer, more compact, and with higher contents of heavier elements than the above ones. Consequently, the last kind of star is necessarily older. *This fact is in obvious disagreement with the current saying in that the bluer stars are younger than the red ones*.

Paradoxically, the stars formed with old ingredients, like dead stars and old gas contaminated with metals are systematically called young stars.

[The origin of this paradox seem to come from the fact that some bluer stars have been discovered in some dark clouds of old gas contaminated with metals. This observed fact makes believe that such gas has been condensed by itself into new stars. However, such condensation would not be possible within reasonable times unless that some previous massive object, like a dead star or a massive planet, can capture the old gas. Thus, the apparently new star is not a really new one. It is the next stage of evolution of some “older” object and older gas.].

To say that this kind of star is a young star is equivalent to forget all about the previous history of both, the earlier object from which it was formed and of the gas that has covered it.

“*This is as absurd as to estimate the age of a woman by the time that she used his last dress, no matter how old the woman and the dress are”*.

Such kind of age is, certainly, ambiguous and misleading.].

Here, a really “new” globular cluster would have zero age when their new stars have been just formed by condensation of really “new gas”, free of metals. Thus their bodies would start their lifetimes as voluminous bodies with the lowest densities and temperatures, i.e.; they would be red (or infrared) bodies of low densities. However, again, such clusters are currently assumed the “oldest” ones.

On the other hand, in the *open clusters* should be older than globular clusters because the fist ones were formed from older components like (dead) stars and older (already contaminated) gas envelopes that already had a long history. However, the conventional age of the open clusters is just in the opposite way. Conventionally, the open clusters are assumed younger than the globular clusters.[18].

This puts into relief that it is rather urgent to use a more self-consistent definition of star ages, or to avoid to talk about ages. Because in the literature everybody is talking about young and old stars, which are concepts that are tied up to some particular evolution model that is not necessarily the last word. Properties that are more objective can typify the stars in a form more independent on particular models.

9.7 A galaxy cycle

According to ordinary physical laws, it is inevitable that, in the long run, a galaxy must run out of available energies, i.e., it must end up his luminous lifetime as a “black galaxy”. This one should be made up of black holes, neutron stars and planetesimals travelling in rather stationary states, i.e., without radiating gravity waves. Thus, the global properties of a black galaxy would be similar to that of a black hole. Thus, for long time it would absorb energy from the rest of the universe until it can explode. Finally, a chain of black hole explosions would give place to a new luminous galaxy. Some luminous stages are roughly represented, individually, in plates VII, VIII, IX and X.

9.7.1 The end of a luminous period of a galaxy

During its luminous lifetime, most of the galaxy would contract itself after emission of radiation and the progressive cancellation of randomly oriented angular momentums. In the meantime, the most external stars, that would have captured less gas, would become dark first. They would form a dark halo around the luminous regions of the galaxy. The spherical bulge of stars with randomly oriented angular momentums should be contracted with faster rates compared with disk stars. The last ones would have most of the net angular momentum of the galaxy, which remains constant. They would be made up of stars orbiting in rather parallel orbits near the equatorial plane. Notice that the last set of stars would be in a more stable region with the virtual form of a disc.

The disk stars would end in rather stable orbits near the galactic plane, in a way *similar to the Saturn rings*[19]. In the strict sense of the word, such stars would be “older”, i.e., with less percentage of available potential energies. Then the disk stars should normally become dark first.

Due to the faster contraction of the spherical region, produced by random angular momentum cancellations, this one would end as a central bulge of luminous stars. The dead stars of the earlier disk should surround this one.

The central bulge of less evolved stars would last more because they have not used up much of its G energy. The luminous fraction of the central bulge would become black when most of the gas and the G energy has been used up. [In this stage, the last luminous region of the bulge would emit light strongly “red shifted” by effect of its very low G potential.]. Thus, finally, the galaxy would become a more dense *black galaxy* (*BG*), rather invisible to normal telescopes.

9.7.2 The black period of a galaxy

During the black stage of a Galaxy, its black holes and black bodies would absorb most of the radiation crossing the black galaxy[20]. Such radiation would be rather focused towards the center by the gradients of the NL refraction index of the space. In this way, the black galaxy would be similar to a larger sized black hole; it would recover the energy lost by it during its luminous period.

Due to the small energy flux of the space around a black galaxy, “*the energy recovery period of a black galaxy should be of a higher order of magnitude than its earlier luminous period*”. This means that, statistically, “*most of the galaxies in the universe should be in their black states”*.

9.7.3 The birth of a new luminous galaxy

The final explosion of the central black holes of a black galaxy should produce large volumes of gas that would permeate the central regions of the galaxy. This would produce a rather huge star cluster that would increase the radiation energy density coming mainly from the capture of matter over old dead stars and planetary systems. Such radiation would accelerate the recovery rate of the closest black holes in the neighborhoods. Such energy would trigger the explosions of the closer *black holes* and so on.

The expansion of a black galaxy would happen within a relatively small time interval compared with that of the long lifetime of a galaxy. Thus, in a way similar to the Huygen's principle for the propagation of light, these chains of *black hole* explosions are likely to propagate themselves as *spherical fronts of new* *luminous clusters, centered on the one that exploded first*. Each explosion would be triggered by the radiation from the previously formed clusters. This would give place to a rather *spherical* set of low density and low temperature (red) stars non-contaminated with metals.

The last configuration corresponds with the main properties of ‘’*elliptical galaxies*’’. Thus, the “*new*” elliptical galaxies should be just the really new ones, i.e., the ones “recently formed” with the rather “new” and fresh kind of “primeval gas” rather clean of old elements like metals.

9.7.4 The new luminous period of a galaxy

According to NL angular momentum conservation, [if a galaxy has not exchanged angular momentum with other galaxies] the net (original) angular momentum of a galaxy should remain constant during all of the galactic cycle. On the other hand, the randomly oriented angular momentum’s generated during a cycle should be canceled out with the time. [The most important difference between the two kinds of momentums is that the random ones are temporary. However, the last ones fix the luminous decay period of the galaxy]. Notice that the cancellations of angular momentum would be faster for orbits traveling in random orientations compared with those of bodies traveling in parallel orbits. Then, *in the end, most of the net momentum of a galaxy must be rather concentrated in the bodies orbiting in a disk perpendicular to the galactic axis*. In more detail:

a) Since the rate of cancellations of the random angular momentum would be larger for stars in randomly oriented orbits, the rather spherical bulge of randomly oriented bodies would contract itself somewhat faster than the first kind of star system. The stars formed in the peripheral regions of this bulge should have received less gas and, therefore, they would have lower masses and higher surface to mass ratios and, therefore, they may not be able to sustain nuclear reactions. They would form a dark halo around the galaxy.

b) Most of the net angular momentum of a galaxy should be rather concentrated in bodies travelling with rather parallel orbits, near the equatorial plate. Since such momentum remains constant, during a galactic cycle, then such stars are likely to be conserved during the black periods of galaxies. Thus they would normally be older (more massive and with higher metal content) than the bulge stars.

From the points a) and b), the shape of the galaxy may take, progressively, a *disc shape* with a *rather spherical bulge* of stars of random angular momentums. Consequently, *the bulge radius would decrease at faster rates compared with the disk radius*. This would account for forms and the smaller sizes of disk and spiral galaxies, compared with the rather spherical (elliptical) galaxies.

During galactic contraction the average number of “*dead stars*” (non-visible bodies) should also increase with the time. This is a kind of “*black galaxy*”, around the luminous one, would be virtually growing up the cost of the blackening of the most external luminous stars. However, the effects of their gravity gradients on visible bodies can indirectly detect such black bodies. This is also consistent with *the low luminosity to mass ratio found in galaxies*.

Let us study with some more detail what is likely to occur in the two main regions of a galaxy

a) The galactic disc

According to angular momentum conservation applied to the net angular momentum of a galaxy, the region near the galactic plane should be populated with more evolved bodies in somewhat more stable orbits. Due the existence of a higher average density of matter, they would be travelling in a region of lower *G potential*. Thus they can form kinds of gravity channels that may let flow the gas coming from other regions, like those coming from the galaxy center. This gas would increase the probabilities for the regeneration of new stars. These gas channels would rather fix the spiral form of these galaxies. Its gas density can increase with the gas coming from stellar ejection's and *black hole* explosions. Thus, this "recycled gas" can be condensed faster in regions of higher densities of cool stellar remnants. The last ones may be dead stars clusters altogether with its planets and planetesimals. In these clouds, the more massive and more luminous stars can be formed from condensation of rather "old gas" (already contaminated with metals) over dead stars and planets. Then the disk must have higher densities of recycled matter and lower G potentials. Therefore, in the average, they should have higher temperatures and bluer colors. They would be more contaminated with metals. A large fraction of such stars should be main sequence stars. They would account for the *open clusters and planetary systems.*

Since, in the average, the disk and spiral stars should be in higher evolution states. Then the probabilities for the existence of neutron star cores inside of them should also be higher. Thus, the stronger fields of the NS would account for the higher densities and luminosities of the stars in the spiral and disk regions. Thus, due the additional source of energy, coming from gravitational energy, these stars may eventually remain luminous for longer time compared with the current estimations based on nuclear fusion energy

The stars of the disk and the spirals should have most of the rather net angular momentum of the galaxy would, which is constant. Then they should end as dark rings relatively far from the central galactic bulge. These ones would be similar to Saturn rings. When these galaxies are seen edgewise, the dark rings observed to cross the field of the central luminous bulge, [You can see them in the pictures of "Centaurs"].

b) The central luminous bulge

When the disk stars run out of available energies, they would become black ones.

On the other hand, the rather spherical bulge with randomly oriented angular momentum would contain less evolved stars, richer in light elements. The global luminosity of the bulge would last longer because their stars will also be able to release G energy after the formation of new neutron stars and the regeneration of H after nuclear stripping. Thus, in the long run, they would produce higher G energy yields thus producing gas ejections and stellar explosions. They would correspond with the "*Active Galactic Nuclei*" (AGN).

On the other hand, *the central bulge of a galaxy would contract faster but its* luminosity would last longer. This is mainly due to the additional energy coming from gravity contraction, after neutron stripping. Since such energies are of higher orders of magnitude, "*this would account both for the higher luminosity of the central bulges and for their higher lifetimes*".

Furthermore, at the end of the luminous period, the stronger central field would remain collecting gas from the rest of the galaxy. Some of this gas may eventually come from the last stellar explosions. This kind of internal energy recycling would also increase the luminous lifetime of the luminous bulge.

It is interesting to observe that: During the luminous period of a galaxy, some black hole may eventually exist in the center. Due to the high density of radiation in such place, such BH can also absorb radiation at higher rates. Then it may eventually explode during the actual luminous period of a galaxy, thus regenerating[21] new *H*. This process may be called "internal energy recycling". These explosions may eventually explain *the flow of fronts of H going away along the spirals of some galaxies, including in our galaxy*. Such explosions would increase the luminous lifetime of the galaxies. [Notice that the energy absorbed by the galactic black holes and black bodies is likely to account for the fact that the net luminosity of galaxies is less that the sum of the power emitted by their stars.]

Near the end of the luminous period of a galaxy, the massive neutron stars and black holes of the central bulge can regenerate powerful jets of free protons, according to the neutron stripping reactions described above and below. Such jets can be rather strong sources of radiowaves. Those ejected by the central *black holes* would produce narrow *particle jets that are consistent with the jets observed in central regions of galaxies and quasars*[35].

The jets flowing along the galaxy magnetic axis would be normally captured by the rather spherical the halo of black remnants that would exist around the luminous bulge. They are likely to form new clusters of stars.

A typical case occurs in *Centaurs A* (*NGC 5128*). In it both the black shadows of the disk stellar remnants and the high activity observed in the central bulge are outstanding[35]. In this case, the observed jets emitted in the galaxy center, observed in radiowaves, go far away from the luminous region of the galaxy. Most probably, such galaxy is not a truly elliptical galaxy but an old spiral galaxy seen edgewise. The black remnants of the disk would form the dark lane crossing the luminous field of the central bulge. This picture puts into relief that many galaxies classified as elliptical ones may be just the central luminous bulges of galaxies whose disk stars have become black star remnants.

In the cosmic jets of the galaxy M84 (NGC 4374; 3C 272.1), the entire radio structure is contained within the visible galaxy located at 30 million light years away. In this case, the sharp difference of velocity between the jet and the falling matter has been detected from Doppler effect after a detailed scan. (See more details in the plate VI. in which the existence of a cloud around the black hole is obvious).

9.7.5 The "Noisy Quasars", the ends of the luminous

Near the end of the luminous period of a galaxy, most of its light would come from the last luminous region of the central bulge. Such region would be surrounded by the *black galaxy* of rather dead stellar remnants. The light emitted by its atoms would be strongly *red shifted* by the effect of the very low G potential that should exist in the center of the light sources. The last ones would be contaminated with metals coming from the last stellar explosions. Notice that some scattering red shift would also be produced during the light trip throughout the rather *black galaxy* that may exist around the central luminous region. [Notice that such scattering would be equivalent to that occurring during a large trip between the source and the observer, thus making believe that the source is at a cosmological range of distances.]. The spectrum would reveal *metal contamination*, due to the highly evolved (old) materials in such luminous region [Such metals are not compatible with the cosmological hypothesis of quasars.].

Due to the small absolute luminosity of the last luminous region of these galaxies, the relative luminosity changes L/L caused by the last explosive events would be large. [On the other hand, the neutron stripping reactions occurring around rather naked neutron stars would produce jets with "strong radiowave emission", compared with the quasar luminosity.]. All of the above characteristics clearly correspond with the so-called "*quasars*".

[To make a difference with normal galaxies of high red shifts, the noisy quasars may be called the "*noisy quasars*". This name makes just one fundamental difference with normal galaxies of high red shifts. Because the last ones could not possibly emit radiowaves in the proportion observed in the first ones. Thus the radio-quiet galaxies should be called QSOs, and should be not confused with the rather radio-noisy quasars.].

It is reasonable that at the end of the luminous period of a galaxy, most of the "net" angular momentum of the central bulge is likely to become stored into some binary black hole at the center. Then it is reasonable to find some *binary quasars that, y chance, may have different masses and G red shifts.* Notice that, during the next luminous period of the galaxy, such black holes are likely to account for the origin of the new spiral arms.

Due to the decreasing radius of the luminous bulge at the end of a galactic cycle, its absolute luminosity and its luminous radius would be very small compared with an ordinary galaxy. On the other hand, the G potentials of the observed region would also decrease thus increasing the G red shift of the observed light. Then most of the observed red shift should be gravitational one and the quasars of higher red shifts are likely to have smaller sizes and smaller absolute luminosities. Thus, the quasars of high red shifts that we can observe should be relatively close to our galaxy.

This is also consistent with the fact that the apparent luminosity of quasars effectively decreases after higher red shifts. This means that, effectively, *the true quasars of higher red shifts do have lower absolute luminosity*. Consequently, only those relatively close to our galaxy can be observed. In such case, the contribution of the Hubble red shift to the one observed in quasars would be negligible. This is also consistent with the work of M. Bell and D. Fort that shows that "*the red shift-luminosity correlation of quasars is highly improved if it is assumed that its absolute luminosity is intrinsic but not cosmological*[23].

Statistically, according to the rather cyclic evolution of the different parts of the universe, all of the evolution stages of these parts should be present in the sky. They should be present in a way proportional to their lifetimes. Thus, the end periods of the galaxies should be able to be detected by the proportion of quasars of increasing red shifts. Thus, the existence of some upper limit of the quasar red shift clearly means that the last luminous body of a galaxy ends rather explosively. This phenomenon, of course, could not occur in galaxies of high red shifts, according to the cosmological hypothesis of quasars.

On the other hand, the small luminous region of a quasar would be also collecting residual gas from the rest of the galaxy. Such gas would prolong the quasar lifetime. This would be refueled for longer periods due to the large volume of residual gas falling towards the center during galaxy contraction. Thus, the quasar luminosity must drop rather suddenly after the last star has run out of energy. Thus the number of with similar red shifts is would suddenly drop for the red shift corresponding to the G potential in just the center of an ordinary black galaxy. This is what really is observed[30]. Such sudden drop is not compatible with the cosmological hypothesis of quasars.

9.7.6 The quasar dilemma (Quasar gravity tests)

It is normally assumed that the red shift of quasars is due to cosmological red shift. According to such hypothesis, they should be huge galaxies located within cosmological ranges of distances. Of course, the present interpretation of the true quasars turns out to be opposed to the current quasar interpretations[22]

The current hypothesis on quasars is not consistent with the present theory and with fundamental physics, as follows:

1. The observation of relatively large percentage changes of luminosity of quasars, within small time intervals is incompatible with the cosmological hypothesis. Because according to it, the size of the galaxies would be larger than ordinary galaxies. Since any explosive event cannot propagate itself faster than the speed of light, this puts a limit for rate and the amplitudes of the luminosity changes. For example, the luminosity changes observed in *QSO 3C-345, in June 1965*, are clearly consistent with that of supernovae. Such changes are not compatible both the magnitude and with the rate of luminosity changes that a galaxy may have This means that some supernova has occurred in the last luminous region of some nearby galaxy[22]. Thus, the absolute luminosity of such quasar should be relatively small.
2. In the literature there is a large number of peculiar variations of the sizes and on the structure of quasars that are incompatible with fundamental physics[33, 34].
3. There is an appreciable lack of homogeneity in the quasar distribution in the universe. This can only be compatible with the one expected for objects within short-range distances but not for cosmological ranges of distances[31].
4. The sudden drop of the number of quasars with red shift larger than 3.5 is incompatible with the uniform distribution of galaxies expected in cosmological ranges of distances. However, it may be compatible with some lowest limit of G potential that can exist in the center of luminous regions of black galaxies.
5. In the current literature there are large lists of *quasars of different red shift that are somewhat connected to each other*. This fact is not compatible with the hypothesis on the cosmological nature of the quasar's red shift. However, it is compatible with G red shift. Normally, *the smaller quasars, are the ones with the higher red shift, just in agreement with the G red shift hypothesis.* This is obviously due to the smaller volume and to the lower G potential of the light source. Other interesting cases are those of *the galaxy NGC4319 and the quasar Markarian 205.* The galaxy[32] has a rather small red shift but the quasar has a red shift eleven times of that of the galaxy. However, the small and rather spherical quasar has a clear bridge with the galaxy. The quasar strong field is obviously sucking gas and stars from the companion galaxy. The galaxy is more voluminous but less massive and, therefore, it may be orbiting around the quasar. The galaxy is clearly the last stage of a spiral galaxy whose arms may be orbiting around the quasar. Only the small trails of them remain luminous. In fact, they may correspond to the last stage of a "*binary quasar*" that is likely to come out after the condensation of the galaxy into a binary black hole in the center of a black galaxy.
6. Something similar occurs with the quasar-like object, with $z = 0.044$, that is silhouetted in front of the elliptical galaxy NGC 1199[32]. The quasar is obviously more compact and shows a halo of dark stellar remnants around it. Such halo clearly decreases the luminosity of the galaxy behind it. This would prove that the first object is an object closer to us, compared with the galaxy that has $z =$

0.009

7. The jets emerging from quasars can feed up new fuel to light up some black galaxy remnants that are far away from the luminous quasar. This is most evident in the luminous track of the jets observed quasars 3C273 and M87[32].
8. The host black galaxies observed around quasars. The plates IX and X show that the quasars of relatively high red shift are surrounded by partially luminous regions of the rather black remnants left behind from the galaxy contraction. The legends of these plates give more details about them.
9. Highly evolved (old) materials, like metals, have been recently detected in the quasar spectrums. This demonstrates, most clearly, that *they are not new galaxies but the last luminous regions of old galaxies*.

9.7.7 Black galaxy evolution

At the end of its luminous period, a galaxy should turn into a compact *black galaxy* made up mainly of black holes, neutron stars, dead stars, planets and planetesimals. The first ones would also absorb radiation coming from the last ones, i.e.; they would cool down the rest of the black galaxy.

In a black galaxy, the internal gradients of the NL refraction index would deviate light towards central regions where there is a higher efficiency for capturing and storing most of the radiation into the central black holes[23]. On the other hand, the large number of black bodies and planetesimals orbiting around the black holes would also be cooled down by them and by the rest of the universe. These bodies would also contribute to scatter and reflect radiation, preferentially, towards the black holes. Thus, the center of a *black galaxy* would have global properties somewhat similar to that of a massive black hole. It would have a larger absorption cross section.

To make a gross estimation of the fraction of matter in black state in the universe, it is necessary to take into account that the average rate of energy absorbed by an average black galaxy. This one is several orders of magnitude lower compared with the one emitted by its luminous bodies. Then, in order that the energy absorbed by all of the black galaxies in the universe can be equal to the one emitted by all of the luminous galaxies, "*the number of the **black galaxies** must be of higher order of magnitude compared with the number of the **luminous ones***".

This conclusion is consistent with *the higher order of magnitude of the average density of the universe* derived above from the constants *G* and *H* compared with that estimated from its luminous galaxies.

This is also consistent with *the higher order of magnitude of the masses of the clusters* currently derived from the velocities of its luminous galaxies, as compared with the sum of the masses of its luminous galaxies. Something similar occurs in each galaxy, thus putting into relief that there is a large fraction of dead stars, neutron stars and black holes that are not normally detected by ordinary telescopes. Such missing mass that should correspond to the *large number of bodies that should become dark during the luminous galactic period*

Notice that *the missing mass problems of astrophysics* are no problems for the present theory. Just to the contrary, they turn to be fair tests *for it.*

At the end of the black period of a galaxy, the *black holes* in its center should be in more advanced stages of energy recovery. They would have captured more energy per unit of mass and, therefore, they would be the first ones to be ready to explode.

The explosions of the first black holes would trigger *a chain of other black hole explosions* occurring in their neighborhoods. These chains of explosions would propagate themselves as a rather *spherical* front diverging from the galactic center. Such explosions would practically expand the galaxy by converting the kinetic energy of free protons into G potential energies and rotational energies. They would also generate large proportions of random angular momentums compared with the net one of the galaxy. These additional momentums would produce the expanded form of the galaxy, which is likely to occur rather symmetrically, in all directions.

Then *the primitive shape of a new galaxy is likely to have a rather spherical form. It should be made up of low-density stars rather free of metals.* The random angular momentum generated during the explosions would prevent the immediate contraction of the new galaxy. Such momentum should keep the expanded form of the galaxy for long time compared with the relatively small luminous rise time of the galaxy.

The new gas generated from BH explosions would be free of metals. Most of the metals would be produced later on from nuclear fusion occurring in more advanced stages of contraction. Then the newest galaxies should have the minimum percentages of metals.

Notice that, the form and composition of a *new* galaxy are consistent with those of the "*elliptical galaxies*"

The short rise time of the luminosity of a new galaxy would be very small compared with the high luminosity and long lifetime of the luminous period of a galaxy. Then the relative probability for observing the first stages of a new luminous galaxy would be very low. Notice that the expansion of a black galaxy should be rather adiabatic, according to NL mass-energy conservation and gravity expansion. I.e., it should not emit unnecessary radiations. Thus, no spectacular energy display would be observed.

9.8 Larger scale structures

For larger (cosmological) space-time scales, a luminous galactic cycle would look like a chain of *black hole* explosions, with a very short rise time, followed by a very long luminous decay period.

The energy emitted by a new luminous galaxy would increase the recovering rate of the closest black galaxies. Then, in a cluster of black galaxies, chains of the *black galaxy* explosions are likely to occur. They would start, most probably, from the explosion of some more massive black galaxy. They would form clusters (of galaxies). Something similar is likely to occur, in a less defined way, for larger sized structures.

This is consistent with the work of Anne L. Kinney, of the Space Telescope Science Institute[37]. She reported that "*the nearby rich clusters are made up predominantly of elliptical galaxies*", *i.e.*, of new galaxies rich in new H. "*The richer the cluster, the fewer the spiral galaxies that reside in the cluster*". "*In contrast the poor clusters are made up of much higher percentages of spiral galaxies*", *i.e.*, of older galaxies, with smaller volume of luminous stars, and a higher percentage of black ones, not visible. The field stars are almost exclusively spiral galaxies, i.e. partially black galaxies.

Then the apparent *voids* in the universe are likely to correspond to clusters of *black clusters*.

Then *a large fraction of the black universe would be in the voids between luminous clusters. Most probably, they are made up of very large number of "black clusters" that occasionally become luminous ones, and vice versa*. This seems to accounts for the rather " *bubble*" structure of the universe, in which the luminous galaxies would be in between them.

It may be concluded that the different kinds of structures in the universe, like star clusters, galaxies and clusters of them, would have rather periodical cycles evolving from *black and luminous stages*.

On the other hand, statistically, even in their luminous stages, a variable fraction of their bodies would be in relatively black and denser states that would be nearly invisible to ordinary telescopes. Such non-visible bodies are consistent with the abnormal velocities of the objects currently observed either in galaxies in clusters of them.

9.9 The low temperature cosmic background

From *Fig. 8.1*, it is inferred that most of the low temperature cosmic radiation background must come from black galaxies located within a thick shell between R and $3R$. Only a very small fraction of it may come from the relatively local galaxies. Due to the high number of cool bodies involved, such shell would have an apparent temperature nearly isotropic[24]. This is consistent with the low temperature cosmic radiation background discovered by Penzias and Wilson[20]. Most of the observed temperature anisotropy's should be due to the lack of homogeneity existing within distances shorter than $2R$. They may come from density differences between luminous and black clusters.

Since most of the universe would be in the state of black galaxies, then its low temperature radiation background would be roughly fixed by the radiation emitted by its black galaxies. Such radiation should also be effected by the correction factor due to the Hubble red shift, which is about e^{-2}. Then the black body radiation of $2.7\ K^o$ corresponds to *an average temperature of the black galaxies of about* $20\ K^o$. This one is reasonable because they should be cooled down by their own local black holes and by the rest of the universe.

From above, *the small inhomogeneities of the radiation background* are likely to come from distance ranges of less than 2R.

According to the conventional interpretation of the low temperature cosmic radiation background, this one would come from some relic radiation coming from some initial explosion of the universe. However such model, depends on a large list of rather ad hock assumptions that, most probably, cannot possibly be tested with observed facts. [Above it is shown that such model is not simultaneously consistent with the experimental facts]

Here, to the contrary, the low temperature cosmic radiation background is a natural consequence of the new cosmological context fixed by a more general form of the Equivalence Principle. Such principle is the only one that can account, simultaneously, for all of the observed facts. For such reason, the new principle leaves no space for ad-hock assumptions. Notice that this the new cosmic context also solves, simultaneously, other fundamental problems of conventional models.

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[1] This conclusion comes from a gross mass-energy balance and the fact that the emission rates of luminous states of matter are much larger than the absorption rates of the black states.

[2] Notice that this would be a phenomenon of frustrated reflection can also occur after a change of c(r).

[3] Let us remember that during the formation of a neutron star or BH, the randomly oriented momentums have been canceled out. The net angular momentum per unit of NL mass of the black holes should be very low compared with the sum of the randomly oriented momentums of the stellar systems from which it was formed. Vice versa, the new gas generated during black hole explosions should also have low net angular momentum density as compared with the random ones generated during its initial outflow throughout the stellar remnants.

[4] This is an important difference with conventional evolution models.

[5] If the angular velocity of the satellite is lower than that of the mother planet, the last one would transfer angular momentum to the satellite after the tides induced by the satellite. Then the satellite would be pulled away from the mother body thus becoming a more independent and stable satellite or planet. The opposite happens if the satellite condenses below the synchronization orbit, like in the case of Phoebes, a Mars's satellite. The satellite would transfer angular momentum to the planet until the last one would fall into the planet. In this case, the satellite rotates at faster rates as the planet surface. Thus the satellite gives up momentum and energy to the star tides at the cost of its own ones. Thus soon or later Phoebes must fall over the surface of mars.

[6] The study of the surfaces of our planetary system reveals that just after formation, the surface of the planets was bombarded by a high number of comets. The number has decreased rather exponentially with the time.

[7] Such diffusion of heavy elements would prevent the excessive contamination of the external envelope and of the nuclear fusion reaction zone with He or heavier elements. Thus, these stars should show an apparent composition rather free of heavy elements and rather constant He composition. Such core should grow up in mass at the cost of the nuclear fusion of H coming from the external H rich envelope.

[8] They are the inverse reactions of the atomic bombs

[9] In the new global cosmic context, the most powerful stars should get most of its energy from condensation of matter up to its densest states, like neutron stars and black holes. In principle the formation of a neutron star inside of a star should occur, in one way or another, during the inexorable matter contraction associated to the energy emission of massive stars. Whatever may be the mechanism, in the end the star should get a small central core of nuclear density, i. e., a neutron star (NS). This one

may occur either steadily or explosively, depending on the initial conditions

[10] The process is similar to a large number of match boxes piled up one over the other. The last one below would collapse after the work done of all of the boxes in the column.

[11] This kind “neutron stripping” reaction has been already applied in Section 7.2. In principle it can transform G potential energy into free protons of high nuclear latent energy and, also, of high kinetic energy. Thus, this reaction provides a unified mechanism for a large number of phenomena in the universe.

[12] Below it is shown that these stars would correspond to the main sequence (MS) stars whose luminosity depends, grossly, on just its mass. Thus, these stars would have a high stability. This is why, in they have a well-defined mass-luminosity function and they are along a rather well defined line along the color-luminosity graph, or Hertzsprung-Russell (HR) diagram. This is why, around this kind of stars, human life can exist.

[13] Indeed the idea of a neutron star inside of a star was first proposed by Landau[21]. Such idea was abandoned because it was thought that such kind of star would collapse due to the “urca” process. According to it, the high temperature produced in the neutron star interface would generate neutrinos that would travel more easily through the stellar envelope. Such neutrino cooling would produce collapse. However, the nuclear stripping reactions would prevent such high temperatures by transforming G potential energy into nuclear potential energy, a more cool process that prevents collapse.

[14] Solar sunspots and its cycles would be a direct consequence of them and form the neutron star axial oscillations.

[15] In the collisions between neutron stars and other bodies of lower external gradients of G potential, the neutron star may form binary systems in which the neutron star would end by stripping material from the other one.

[16] Notice that a black hole would be formed from cancellation of the random angular momentum’s of matter traveling around it and, therefore, its final angular momentum density would be relatively low compared with the ones of bodies traveling around it. Observe that this model for star cluster formation has not the angular momentum problem of current models.

[17] It is interesting to find in plate V a consistent proportion between the above-cited kinds of bodies.

[18] The lack of consistency of conventional ages is clear in the case of globular clusters non-contaminated with heavy elements compared with those contaminated with metals. The metals are the result of high G fields that can come out only after long evolution time. Paradoxically, the first clusters are called old clusters and the last ones are called the younger ones.

[19] Due to the lower G potential in the galactic plane compared with other ones parallel to it, this one can in principle collect enough residual stellar gas from the rest of the galaxy. This gas cloud makes possible the permanent regeneration of planetary systems in which human life can exist. It is reasonable that this may also occur even during the dark period of BGs. In the last case, it is also reasonable that during the black states of galaxies, some black holes close to this plane may also collect enough radiation to explode and to keep the galactic plane with some permanent gas. This is an interesting

possibility for the extension of the conditions for the human life even during the worst conditions, in rather dead galaxies.

[20] Below, a gross estimation of the mean temperature of BGs, assuming that most of the observed low temperature radiation background comes from BGs with an average distance 2R, is about 20 OK

[21] Due to the higher density of radiation around central black holes of a Galaxy, it is reasonable that some black holes can recover its energy in shorter time scales and, therefore, they can explode within a galactic cycle. Then some internal mass-energy recycling, more effective than the intergalactic one, can occur within each galaxy. Indeed any kind of internal energy recycling like this can in principle extends the true lifetime of the galaxy. The internal absorption of energy would decrease the net energy given away. This would account for the low luminosity of galaxies compared with the sum of the luminosity of its stars. I am sure that I have read somewhere that this lower luminosity of galaxies has been effectively detected.

[22] It is normally assumed that quasars are new galaxies formed within cosmological distances. Their distances are currently determined by assuming that the observed red shift is of cosmological nature. This is another reason for which I have avoided to call it “cosmological red shift”. It is assumed that such red shift has to do with universe expansion. Such interpretations are incompatible with several observed facts. For example, the changes of luminosity within short time intervals are incompatible with the huge sizes estimated from the erroneous interpretation of the G red shift of the quasars. The same holds for the changes of form occurring within minor intervals. Absurdly, matter would be propagating itself with speeds several times higher than that of light. Furthermore, the spectrum of such quasars shows old materials that could not possibly exist in really “new” galaxies formed from clean primeval gas.

[23] The larger density in the central regions of a galaxy should increase the probability for collision between different kinds' bodies. Then it is reasonable that super massive black holes can be formed in the galactic center.

[24] The average frequency of radiation coming from such shell would be red shifted by a factor of about exp(-2).