7. Compact matter at great distances

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In this idea, which we pursue here, the formation process of new charge-neutral particles should take place in the outermost sphere exactly at the edge of the universe, as a continuous separation of finitely closed and infinitely indefinite domains. On the one hand, two planes of the size R_e^2 stand opposite each other in the distance R_e, which should be assigned to the electron and define a scale, which is the same everywhere in the universe for particles at their places of origin. On the other hand, two further planes are formed at the same time which lie within the electron planes, also the area of R_e^2, but should have only the distance $d \le r_e$. This distance depends on its place of origin and is only the same on the same universe shell. The plane distance d determines the size of the corresponding mass. In our part of the universe this distance stands for the size of the proton d_p or an associated mass m_P. Particles which are in the same reference system and whose relative velocity to each other is equal to zero have the same mass and the same plane distance. With moving particles, both the distance of the proton planes and that of the electron change according to the Lorenz transformation.

The mass of the particles increases with the velocity, the plane distance and thus the mass size both of the electron and of the proton can be changed stepped in the order of magnitude δ, which is extremely small and lies in the range of $\delta = 10^{-57}\,\text{m}$. This leads to tiny shifts in space, which we perceive as motion and which is due to an increasingly altered mass distribution. A particle that has had an energy-pulse exchange with another particle leaves a small change in the mass information of the other particle. From now on, they are connected to each other at corresponding time intervals, they "see" each other and the spatial attraction of the particles to each other is inherent in this. Apart from the spatial distribution, all particles are always connected to the edge of the universe in such a way that all distributions sum up to the edge, where they appear as if they were still at their place of origin with their original mass. This means that despite the unimaginably large number of particles and particle movements, the regions can network locally from simple, ordered initial conditions to unimaginable complexity, but they nevertheless remain deterministic in an incomprehensible way.

Under the aspect of "black holes", the question arises as to how high can network deterministically connected matter compress. What is the maximum packing density of the particles so that the basic conditions are still fulfilled?

Connected particles have a common motion gradation in the δ range, in relation to each other the smallest displacement size lies in the range of d_P steps. If one asks when two particles can still be regarded as separate, then the answer is that the planes may approach each other at maximum distance d_p for protons and at maximum distance R_e for electrons. After that, the two particles would no longer be independent, which is not allowed because of the closed condition.

A first measure for the maximum possible packing density of matter then lies with orders of magnitude in the range from distances up to the d_P range. An extremely high force, as it occurs, for example, in large mass concentrations, could press a long chain of neutrons arranged linearly behind each other into each other. Then the maximum density of the neutrons from plane to plane would be at a size of one $10^{30} kg/m^3$. If we remain nevertheless in the range of particle volume then this density is far away from a black hole with $10^{55} kg/m^3$.

In the micro range black holes can be excluded. It is something else if individual protons are accelerated ever closer to the speed of light, for example in particle accelerators or even more so by quasars whose particles are found in cosmic rays. Cosmic particles of distant quasars can have a maximum energy of $10^{20} eV$ what corresponds to a mass of $2 \cdot 10^{-16} kg$ or referred to R_e the volume of a density of $10^{28} kg/m^3$ (referred to d_p at present $10^{38} kg/m^3$) it constitutes.

Such single high-energy particles cannot combine and thus, despite their enormous value, they are still far below those of the black hole.

According to this model, there is only one particle that has such a density and that is the very first particle. Since it should belong to this universe, however, it must separate exactly the inside from the outside, - thus represents a border relation, which it has so only in the origin, in the exact zero point of the universe.

It can be assumed that this first particle has moved away from its origin because its position there is weightless, but at the same time any change in its position makes the particle lighter. For example by releasing energies and gaining potential. This particle can also exchange itself with other particles, but this would always result in motion. Each movement would lead these excellent first particles away from the zero position and since the mass differences are still very large here, the amounts of energy involved are also extremely large.

It would be conceivable that the area of the zero point today is rather a void than a large mass accumulation. The matter particles from this area would adapt strongly to the middle area of the rest of the universe with ever larger connections. Thus becoming ever lighter and leaving the area of the zero point with it. The void could then have dimensions of many millions of light-years, thus be very inconspicuous and the particle masses of matter around it would not be noticeably heavier than in the large remaining area of the universe.

The mass density required to form a black hole decreases quadratic with increasing radius $\rho_S : 1/R_S^2$. A very large star could therefore, after its death, reach the necessary density. If a burnt out sun becomes denser and denser, a strongly increasing pressure develops in the centre, which allows the atoms to come closer and closer. The temperature rises and the speed of the electrons increases drastically, the atomic shell dissolves and the electrons are increasingly pushed into the nucleus with increasing pressure and density. The energy comes from the self-energy of a star.

With a homogeneous mass distribution the density is constant and it follows

$$E_G = -\int_0^R G \frac{M(r)}{r} dM = -\int_0^R G \frac{M(r)}{\left(\frac{3M}{4\pi\rho}\right)^{1/3}} dM = -\frac{3}{5} G \frac{M^2}{R} \quad (1)$$

Energy decreases linear with radius, however increases square with mass. Just because masses attract each other to Newton and no shielding against gravity is known, the energy increases when a star contracts or accumulates further masses.

A first counter-pressure results from the different phases of nuclear burning up to iron. After the star is burned out, it will continue to contract. This increases the pressure and density of the particles until first the electrons degenerate and the Fermi energy of the electrons increases strongly. If the pressure continues, the system can escape by pressing the electrons into the protons and the star transforms more and more into a pure neutron star.

$$p+e \rightarrow n+\nu_e$$

This will give us a degenerate Fermigas system of nucleons in the ground state. The temperature T is assumed to be approximately T=0. Since, according to Pauli, no two states of fermions may be equally occupied and only the lowest possible states are to be taken, the maximum pulse is followed by the fermi pulse p_F. For each Fermi ion pair we get a volume of h^3 in the 6 dimensional state spaces, in each case as location and impulse space. From this follows for the total number of the possible lowest states

$N=\dfrac{\int_F d^3r \int_{p\le p_F} d^3p \sum_{\text{Spins}}}{h^3}=\dfrac{V\frac{4}{3}\pi p_F^3 2}{h^3}$ (2) and the particle number density

there of $n=\dfrac{N}{V}=\dfrac{p_F^3}{3\pi^2 h^3}$ (3).

The total energy of all states is obtained by the relativistic energy impulse relation to $F(G)=\dfrac{2V}{h^3}\int_0^{p_F} dp 4\pi p^2\sqrt{m^2c^4+\vec{p}^2c^2}$ (4)

The solution of the integral with the substitution u=p/mc leads to $z(u)=\int_0^{u_F} dx x^2\sqrt{1+u^2}=\frac{1}{8}\left[u_F(1+2u_F^2)\sqrt{1+u_F^2}-\operatorname{arcsin h}(u_F)\right]$ (5)

For the relativistic case can approximated for u_F>>1

be written $z(u_F)\approx\dfrac{u_F^4}{4}(1+\dfrac{1}{u_F^2}+...)$.

According to the 1st law of thermodynamics with T=0, the following applies to the pressure

$$P=-\frac{dE}{dV}=\frac{m^4c^5}{\pi^2h^3}\left[-z(u_F)-V\frac{dz(u_F)}{du_F}\frac{du_F}{dV}\right] \quad (6)$$

with $u_F=\frac{p_F}{mc}$ and $p_F=h\left(3\pi^2\frac{N}{V}\right)$

follows $P=\frac{m^4c^5}{\pi^2h^3}\left[\frac{1}{3}u_F^3\sqrt{1+u_F^2}-z(u_F)\right]$ (7) which is relativistic about $P=\frac{m^4c^5}{\pi^2h^3}\frac{u_F}{12}$ (8) with u_F ? 1 gives $P=\frac{m^4c^5}{\pi^2h^3}\frac{u_F}{12}$ (9) for $u_F = 1$ in the nonrelativistic case. For neutrons the mass density is valid $\rho=n_N m_N$. The limit between relativistic and non-relativistic mass density for neutrons is thus $\rho_c=\rho(u_F=1)=\frac{m^3c^3}{3\pi^2h^3}m_N=6\cdot10^{18}\,kg/m^3$ and $2\cdot10^9\,kg/m^3$ for electrons. Depending on the critical density ρ_c we can write for the pressure of the degenerate Fermi gas $P=\frac{hc}{12\pi^2}\left(\frac{3\pi^2}{m_N}\right)^{4/3}\rho^{4/3}$ (10) and in the relativistic case to $P=\frac{h^2}{15\pi^2m}\left(\frac{3\pi^2}{m_N}\right)^{5/3}\rho^{5/3}$ (11) if $\rho=\rho_c$ is.

If we take as an example a 1.5 times solar mass, which is to be treated as a cold neutron gas of a neutron star, then we have $N=1.8\cdot10^{57}$ particles. Since all free electrons are in the nucleus, the identity of the iron atoms disappears and we get a uniform neutron star. Than the density raise to the value of $\rho=10^{18}\,kg/m^3$ the Fermi pressure of the neutron gas. Each neutron should be in the lowest possible energy state, but this means that each particle must have a different energy value due to the Pauli prohibition.

The total number of states for T=0 from p=0 to p=p_F is $n=\frac{V(p_F^n)^3}{6\pi^2h^3}$ (13). With J=1/2 and each Fermi gas state is then occupied by two protons or two neutrons and $N=\frac{V(p_F^n)^3}{3\pi^2h^3}$. From this it follows for the Fermi impulse with $(p_F^n)^3 = \frac{3\pi^2 h^3 A}{V \cdot 2}$ or

$$p_F = \frac{h}{R_0}\left(\frac{9\pi}{8}\right)^{1/3} \quad (14).$$

For the minimum radius of a neutron star the result is $N = \frac{Vp_F^3}{6\pi^2 h^3}$ with V as volume of the neutron star, for the Fermi impulse of the cold neutron gas $p_F = \left(\frac{9\pi N}{4}\right)^{1/3} \frac{h}{R}$, where R is now the radius of the neutron star. For the mean kinetic energy per particle it is

$$\langle E_{Kin} / N \rangle = \frac{3}{5}\frac{p_F^2}{2M_n} = \left(\frac{9\pi N}{4}\right)^{2/3} \frac{3h^2}{10 M_n R^2} \quad (15)$$

The mean potential energy per neutron of a star of constant density is $\langle E_{Kin} / N \rangle = -\frac{3}{5}\frac{GNM_N^2}{R}$ (16). If one now searches for the minimum radius of the total energy from potential and kinetic energy per particle, one obtains $R = \frac{h^2 (9\pi/4)^{2/3}}{GM_n^3 N^{1/3}}$ (17) via the derivative.

For our example this would mean that the minimum neutron star radius is 12 km. With a star of mass $1.5M_e$ and a radius of 12km, each state of each particle is occupied exactly once. The space is energetically full. No further particle can be absorbed within this volume, because all possible energy states are occupied.

This should not only be valid for the quantum states, but it should also affect the gravitation. If all states are occupied and in the ground state and no more change is possible, in particular an excitation of the particles within the system and are further in the ideal case all positive and negative charges bound in the neutron, then the electrical charge distribution is limited to the respective neighbour particle. Thus there is no far-reaching electric field, no electric interaction, except in the immediate near range. For gravitational attraction, on the other hand, the opposite is true: gravitational exchange within the star is no longer possible, precisely because space is energetically full. One can also argue that each particle has a different velocity and is therefore not visible to another particle within the neutron star. Gravity therefore remains only the outside, the area into the free outside space to the matter around it, which is not yet bound. This leads to the fact that the particles in the system do not attract each other any further and the pressure to the inside decreases decisively. The law of gravity in its simple $1/R^2$ dependence, which is not shieldable, only works as long as the matter does not compress too much. To the extent that the freedom of quantum states in quantum space decreases, the gravitational behaviour of matter deviates from classical law, something like a counter-acceleration occurs.

The restriction by the Pauli prohibition probably has its reason in the unity of the universe as a whole. This leads to the fact that particles deep inside a neutron star only get through freely to the edge if no second particle has the same location/impulse state. If a maximum densely packed space would nevertheless continue to compress as usual, two separate particles would no longer be distinguishable. The connection would be interrupted and the universe as a whole would no longer be closed.

A further cycle of the three possible ones concerns the gravitate relationship of the particles to each other, that are as big as the electrical connections from the effect steps, but distributed disorderly statistically and are smaller thereby with maximum 10^{23} Pulses/s around the factor 10^{38} times in its effect. If two masses approach each other unilaterally, the number of connections increases accordingly and we feel an attraction. Far-reaching connections mean that matter is transparent enough for gravity. The atoms between the distant exchange particles then need different energy states so that the more distant regions can be reached.

Two particles that exchange each other have the same location and the same state for a short time. Beginning and end are extremely short, equal or entangled. Therefore all intermediate states must be different; otherwise they do not reach each other.

Two isolated elementary particles attract according to Newton with the force $F(\vec{r}) = G\frac{Mm_s}{r^3}\vec{r}$ (18). M and m_s are heavy masses. This gravitational force leads to an acceleration of the inert mass m_t: $G\frac{Mm_s}{r^3}\vec{r} = m_t\ddot{\vec{r}}$. It turns out that one can set the inert mass equal to the heavy mass and we obtain an accelerating radially symmetrical field around M, which is independent of the size of the second mass.

According to Einstein, the equation of motion of a structurless single particle has the form $\frac{d^2x^j}{dx^2}+\Gamma^j_{kl}\frac{dx^l}{ds}\frac{dx^k}{ds}$ (19). In it, gravitational fields can be described by space-time geometry. Thus a coordinate system can be found for any metric a space-time so that the equation of motion is reduced to $\frac{d^2x^j}{dx^2}=0$ (20). Thus all bodies remain in this system independently of their mass in a uniform acceleration-free movement, without the inert mass having to be set equal to the heavy mass.

In quantum mechanics, the interactions are determined by bosons, which connect the fermions via a field. For gravity, it is assumed that this is the graviton. But the movement in space can also be explained with the plane model. An approximation would then be such that the two particles are at a multiple distance of R_e from each other and approach each other by one R_e or d_p in the corresponding time span. Ideally with two protons this distance $n=l/d_P$ times, whereby the distance l decreases by one d_p each time. The entire distance would then be $\underline{s}=\frac{1}{2}\frac{l^2}{d_p}-\frac{1}{2}$ (21).

If we have only two isolated particles and look at the motion sequence in space according to the plane model, then we see that the motion does not correspond to that of Newton’s.

For large mass accumulations, large quantities of particles are in the close-up range. Thus the blur plays no role and the inert mass can be regarded as a heavy mass. However, if we only have one single particle, i.e. if most of the particles are at a great distance, the blur has an immediate effect. The particle jumps correspondingly to the distant particles. This leads to a distribution function of the location, but also to the fact that two particles each see themselves as two inert particles, which attract each other in this environment, but do not as heavy mass. They then move towards each other more slowly according to the size of the mass and the movement decreases quadratic with the distance to each other. Now one sees much more clearly the inertia of the masses.

Two particles interacting with each other must have the same velocity in order to see each other. Since the particle velocities are in the delta range and are Fermi distributed, a suitable pair of particles is always found for a large number of particles. Nevertheless, single or few particles are dominated by inertia and only with large particle concentrations can the gravity be set equal to the inertia.

So particle movements are of two kinds: On the one hand a blurred movement, Δv and on the other hand a centre-of-mass movement v_s. The centre-of-mass movement then corresponds to the inertia, it determines the planes distance of each R_e and d_p of an atom. The delta motion is related to the contacts to the other particles. Only particles that can assume the same state for a short time exchange themselves. Matching to this, always same packages are delivered into statistically each direction of space, which then are transferred to δ changes of planes and centre of gravity movements v_s. Electrical connections depend on the centre of gravity of the movement, which must match. For example, in an atom the proton, as well as the electron, has the same centre of gravity movement. The movements lie on top of each other and thus the nucleus is always visible to the electron. The exchange takes place via identical energy packets, which bring the electron one R_e-step and the proton one d_p-step closer. The attraction depends on the distance, since the path for the packets increases with s^2.

Particles do not see each other in the gravitational cycle if the velocities are different. The measure is the motion of the centre of gravity which lies in δ-region, but not every δ-step has to be used. Thus the gravitation can be very far-reaching.

According to the general theory of relativity mass changes the geometry of space. Each mass particle bends a little the space structure. One assumes intuitively from the fact that the space is something and that masses can change the space, take up energy, in timeless and continuous form. On the one hand, it is not at all clear how gravity comes about and on the other hand, a structure of space of any kind has not yet been proven. For large mass accumulations there is no doubt about the validity of the equations and as numerous experiments have shown, for large masses the equations of motion behave quite as expected. Nevertheless, relations in details can develop quite different, which in turn leads to different results under certain boundary conditions. The gravitational force is so extremely small that independent measurements on a few isolated particles are not possible. Conversely, all gravitational measurements involve so many particles that no conclusions can be drawn about the exact form and nature of the gravitational exchange. We rightly assume that gravity cannot be shielded and conclude this from the fact that, for example, we are attracted at the Earth's surface with a force which corresponds to an attraction to all particles of the Earth. This we transfer further on to mass accumulations, which are still by many orders of magnitude heavier, than those of the earth or the sun. But is that really so? Can the masses condense boundlessly or accumulate boundlessly?

Compared to the average density in the universe, the density of our Earth is very high, but it does not seem to lead to any measurable conspicuities at least on Earth. It looks as if every single mass particle bends the space and this total bend add up to the surface. And yet it cannot be like this, if only because a single particle cannot be located so precisely. In addition, the forces are mediated by gauge bosons and probably also by gravity. This in turn would mean that the movements would only change quantized and the energy states in space would also change in quantized structures. But does space change? Does space have to change at all if gravity is regulated by exchange particles? Does the space between the particles exist at all or is there dualism in the description of the particles? Or are space and time only auxiliary variables to better describe the contradiction between timeless exchange and finite time variables in space of slowly moving masses?

So far we have compared the gravitational forces with the electric forces, with the difference that charges are concentrated on two particles, but gravitational exchange should take place statistically to all normally distributed particles. The space itself then has no special meaning. Particles do nothing with space, so space can also be empty or only make sense as an abstract construct. In addition to these connections, the condition should now be added that particles see themselves gravitatively only if their plane distance is equal and their distance is a multiple of this plane distance. Only then they see each other and when they see each other, they approach each other in a short-term entangled way. For a very short moment, there is no space between them until they are one unit closer to their old position. Short exchange connections between particles show no aging process. They can be as far away as you want, at the moment of the connection no information is lost to space or anything else.

With this condition, the particles would not only act on the immediate environment, but would also be able to establish connections to each other over very large distances. This is also the case if the density increases extremely. However, the reverse is also true, that there is then a maximum boundary for the degree of compaction. If the density in a star increases to the core density, e.g. if all particles are close to each other with almost the same plane distance, in integer distances to each other, then the gravitation would only reach the nearest neighbour. Nothing could add up and the inner particles would no longer have access to the outside. However, this is absolutely necessary because of the closed condition of the universe as a whole. As a consequence, all particles would have to have a different plane distance, or to express it with Fermi, they have their own quantum state. Only then would the matter around it be transparent for the innermost particle and the basic condition, which in the first cycle the particles inside connect with the antiparticles at the edge, be fulfilled for each individual particle. This makes the condition that gravity cannot be shielded obsolete. At least in the Fermi state, the particles no longer attract each other because they can no longer see each other and the gravitational force is increasingly directed outwards. As a consequence, the force that contracts the star and its associated potential energy would be smaller than that of the Fermi energy, which wants to remove the particles from each other as far as possible. The star thus seeks a new equilibrium with a correspondingly larger star radius.

In the third cycle mass particles exchange each other, which lead to the fact that they come closer each time around a small unit. Thus gravity seems to be only attractive. The closer the particles come to each other and the more particles are in the vicinity, the more often the particles therefore exchange themselves in the near range and correspondingly less with particles in the far range. However, this process has a counter-process in the micro range. If particles get closer and closer, the number of free states becomes more and more limited. This increases with the number of particles and with proximity. So with increasing density the number of the particles that still see each other changes, because their distance and their direction to each other has exactly the correct multiple. More and more particles do not see each other anymore, because the number of possible quantum states in space becomes more and more limited. If a particle does not find a suitable partner in the star during a time process, it continues to the extremely thinned out outer region, i.e. inevitably to compounds in large distance.

As long as the particles are not particularly compacted, this is only secondary. But the more the particles compacted in space, the more a counterforce is shown, which on the one hand counteracts the acceleration of mass towards the centre of the stars, and on the other hand also in an additional force to particles which are distributed far outside the mass accumulation. Thus distant masses are attracted with a stronger force than would result from the normal Newton´s equations of motion. This means on the one hand that stars may not be able to compress to the pure neutron state, and thus not at all, that matter disappears in a black hole. On the other hand that matter observed at a greater distance around an apparent black hole is attracted with a higher force than after the classical formulas. In particular, extremely large mass aggregations as in galaxies, where not only the highest density of matter is located in the centre, but where supermassive black holes are suspected in every galaxy in the centre, would show this increased counterforce in the outer areas, the galaxy arms. These masses would have to be attracted more strongly than could be explained by the Newton´s dynamics alone. The masses in the outer area would have to rotate faster for an equilibrium - which is also the case. One could even transfer this to the whole space in the universe. The outer galaxies may not have enough mass to find a counterpart for all particles from the interior, so that the increasingly empty space will continue to pass through. The more matter from the originally evenly distributed form concentrates on larger and larger density accumulations, the further an increasing cross-linking reaches on ever larger and more distant area of the whole. An equilibrium state would thus not result from the conditions of the bodies in the immediate vicinity, but it would be superimposed by ever more distant masses from the most diverse regions. Here, too, distant galaxies seem to move much too fast for the state of equilibrium. For the normal redshift calculations, which are interpreted as an escape movement, the increased attraction must now be added up, which has an ever stronger effect with increasing distance.

Although this additional force is related to Fermi energy, it is not limited to the near range due to the nature of the particle exchange - Fermi energy forces the particles to move not only to higher velocities, but also to particles at greater distances. This gives us an independent additional force in the third cycle, which does not necessarily decrease proportionally with $1/R^2$, but probably only works off at mass objects.

In addition, a second additional force from the first cycle is still to be built up by the fact that particles move away from their original place of origin during contraction. For the universe as a whole, the sum of all particle masses increases up to the edge so that at R_U the universe is exactly closed, i.e. no information comes in or out. Here lies the actual event horizon that separates the inside from the outside. If the particles move away deep inside, the path between the particle and its edge is always somewhat longer, which is only allowed if the time is stretched, i.e. a small retroactive acceleration acts on the individual particle towards its origin. At the edge the gravitation must present itself as if everything was still in the origin, here one learns nothing about the many connections and movements in the interior. These accelerations are therefore extremely small in relation to the distance to the edge, but can increase measurably for a large number of particles and in extreme cases, together with the increase in counter-acceleration at high densities, hold up a collapse of matter.

In order to be able to connect the quantities with each other concretely with numerical values, we proceed from a simple, linear connection of an increasing density ρ in comparison to an initial density ρ_0 for a r_e-acceleration a in relation to an initial acceleration a_0 from $\frac{a}{a_0}=\frac{\rho}{\rho_0}$. In addition, the initial acceleration a_0 belonging to ρ_0 should be zero for $\rho=\rho_0$. Then $a=a_0\left(\frac{\rho}{\rho_0}-1\right)$ (22) it must apply. If we also assume that the mass remains constant when matter contracts from a cloud to a dense star, then we can also write $a_1=a_0\left(\frac{R_0^3}{R^3}-1\right)$(23). The acceleration increases proportionally $1/R^3$, which is not noticeable because the density also changes when contracting with R^3. But now we have, as mentioned, a second additional force. Therefore we have to introduce a second acceleration or change the basic acceleration. This acceleration should increase only linearly with the decreasing radius.

To each area, from which the matter contracts, there is always a neighbouring area, with which the mass has condensed also to the sphere. To these neighbouring suns then a connection should exist further, that does not decrease any more quadratic with the distance, but it should be a direct connection, that becomes weaker consequently only linearly with the distance. Also here we can assume an additional acceleration increase of $a = a_1 \frac{R_0}{R}$ (24) approximately from the original size of the space area R_0 up to the radius size of the star R. Together with (23) $a = a_0\left(\frac{R_0^3}{R^3} - 1\right)\frac{R_0}{R}$ (25) follows altogether.

The one can generally be omitted, so that follows $a = a_0 \frac{R_0^4}{R^4}$ (26), thus an increase of the acceleration with the 4th power.

If we assume the original density on our universe shell $R_1 = 3 \cdot 10^{24}\,\mathrm{m}$, then this density lies at $\rho_0 = \frac{M_{U_0}}{4\pi R_1^2 R_e} = 5,7 \cdot 10^{-24}\,\mathrm{kg/m^3}$

At this density, the mean distance of two atoms is at $R_s = \sqrt[3]{\frac{M_N}{\frac{4}{3}\pi\rho_0}} = 0.04\mathrm{m}$.

The mean density on earth is 5400 kg/m³, the density of the sun is 1400 kg/m³. During swing-by flights, counter-accelerations of about $a = 5 \cdot 10^{-5}\,\mathrm{m/s^2}$ occurred, which could not be explained. If we estimate that a counter-acceleration of about a=0.01m/s² (see below) is possible on the solar surface with (24), which would not be noticeable any further, then the value follows for the basic acceleration $a_0 = 6.4 \cdot 10^{-38}\,\mathrm{m/s^2}$.

If we look at the energy that is put in per particle from its origin with an increasing compression of the particles, we get for the energy related to a particle

$$E/N = \frac{1}{N}\int_{R_0}^{R} F ds = \frac{1}{N}\int_{R_0}^{R} M_W a_0 \frac{R_0^4}{R^4} dr = -\frac{1}{3} M_N a_0 R_0^4 \left(\frac{1}{R^3} - \frac{1}{R_0^3}\right) \quad (27) .$$

Since R_0 is very large compared to R, the term $1/R_0^3$ can be neglected.

Together with the repulsive Fermi energy of
$\langle E_{Kin}/N \rangle = -\frac{3}{5}\frac{\rho_F^2}{2M_n} = \left(\frac{9\pi N}{4}\right)^{2/3}\frac{3h^2}{10M_n R^2}$ (28) and the potential energy per particle $\langle E_{Pot}/N \rangle = -\frac{3}{5}\frac{GNM_n^2}{R}$ the total energy results in

$$\langle E_{Kin}/N \rangle = +\left(\frac{9\pi N}{4}\right)^{2/3}\frac{3h^2}{10M_n R^2} + M_N a_0 \frac{R_0^4}{3R^3} - \frac{3}{4}\frac{GNM_n^2}{R} \quad (29)$$

From this a minimum stable radius of 5000 km of our sun can be calculated by the derivation, i.e. only to the current size of the earth and not to the Schwarzschild radius of only 3 km.

For the heaviest known sun R136a1 with a mass of about $M = 300M_e$ the same calculation results in a last, minimum stable radius of about 12,500 km, which is still far away stars than R136a1 are known. We may have found a maximum size for a closed subsystem here. Particle accumulations might not be able to contract from arbitrarily large space-areas.

Nevertheless, it is possible that closed mass systems such as individual suns first attract and then connect as a whole system. This time however, perhaps no longer accords to Newton's $1/R^2$ law. This law is possibly designed for comparatively homogeneous particle distributions in the relative close-up range.

So if we limit the gravitational law according to Newton even further and postulate a limited directional dependence of compacted matter, then masses at the surface would no longer be attracted statistically by all other particles, but there is a one-sided orientation. Also, as already mentioned above, space itself should no longer be able to absorb the gravitational energy, but only particles within the star or masses in the closest possible near range. The parts of exchange particles, which were not bound in the star, then do not pass through the space isotropic and homogeneous. They do not weaken thus, since the space is supposed to be structureless but they concentrate on the next neighbouring stars. Only here the additional energy should mainly decompose. Both the energy of the neighbouring star should be absorbed and the own excess energy should be released in the opposite direction.

So if we free ourselves from the idea that space is metrically curved and replace this with a connection related to masses, then we can also look at distances from the point of view of the exchange particles without time or space and obtain force shares that are oriented to the spatial distributions. On the one hand, at great distances, there are rather chain-like connections; on the other hand, at the stars themselves, for great densifications, there are also counter-forces to gravity.

If, we look for example at the next sun of comparable size at a distance of four light years and claim that the energy mainly decomposes at the neighbouring suns, then the acceleration decreases probably only linearly with the distance. The open particles are mainly concentrated on suns and the energy does not flow into space. It can be assumed that the acceleration decreases, because with increasing distance, the connection information units have disappeared longer and longer in the interspace. An acceleration on the solar surface ($R_S = 7 \cdot 10^8 \mathrm{m}$) of a_S=0.01 m/s² and the distance of about R_N = 4 Ly to the next comparable neighbour sun leads to an acceleration of $a = a_S \frac{R_S}{R_{NS}} = 1.8 \cdot 10^{-10} \mathrm{m/s^2}$. This value is of the same size as the value resulting from the movement of the sun in relation to the centre of the Milky Way ($1.8 \cdot 10^{-10} \mathrm{m/s^2}$).

It also fits to this idea that the star density increases towards the centre, which leads to an increase in acceleration due to $a = a_S \frac{R_S}{R}$, but is compensated again with a smaller radius towards the centre. The velocities of the stars thus remain approximately constant, independent of the radius.

If the too high velocity were not due to the dark matter, but to the direct exchange between the suns, then the too strong connections could be attributed to chain-shaped connections between the stars. The inner, relatively starry bulge would pass on its rotational motion via chain-like connections to the increasingly outer stars, which stabilize in spiral arms. On Earth we have found a_0=0.00005 m/s² which is repulsive and cannot be explained by the law of gravity. It would also be conceivable here that this value comes from the sun, as a small part of the energy which already degrades something at the earth. If we use the same formal connection as that to our neighbour sun, then follows with $a_S = a_E \frac{R_{S-E}}{R_S}$ from it an amount for the acceleration at the solar surface of $a_S = 0.01 m/s^2$ which we have already used above.

Matter accumulations in star systems of large galaxies with central masses of up to 17 billion solar masses probably do not have exactly the same boundary conditions as those for mass concentrations of single stars. In principle, individual stars can also remain statically at the location of the original particles. However, if stars merge into systems, if closed systems merge with neighbouring systems, then they can fall spirally onto each other or stabilize on orbits. If they stabilize in their movements, only the directional energy exchange remains relative to each other, which leads to stronger connections than those with Newton. If they move towards each other, two systems approach which are already very dense in their space. Seen as a whole, the distribution of space leaves ever larger voids on one side and accumulations of matter on the other. If many of these stars concentrate on one area of space, then they leave behind a huge void of corresponding dimensions. It is hardly imaginable that in an originally homogeneously constructed universe, such energy accumulations can accumulate in ever smaller areas of space without the build-up of rebounding counterforces and influencing the contraction process. Simply from the larger void which leaves a huge mass concentration behind. Ultimately, the boundary condition always remains that particles must not disappear, i.e. an event horizon must not set itself. Probably, in an increasingly full quantum space, the particles will not only switch to ever higher velocities, but Newton's law will also change to the same extent. Particles will no longer statistically connect to other particles according to $1/R^2$, but will increasingly switch to the now very close neighbour suns. The near suns are attracted more strongly, but the own sun cannot hold its atoms so strongly any longer. It expands again and that with burned out very dense suns much stronger than with active suns. The density decreases, whereby the quantum space would increase nevertheless by the increasing number of the approaching neighbour suns. If we start from the centre of this increasing mass accumulation, then the Newton law, starting from the centre, would weaken increasingly, because here most of the particles have already become invisible to each other. Although they are no longer visible to each other, they still have connections to areas further out. Nevertheless, there is a shift in energies when particles inside increasingly take up their connections to atoms further outside. We then again have an excess of energies that cannot be dissipated into the large void but extends along the filaments. The more stars and particles flow in, the stronger these distant connections become. These compounds stop the compression and stabilize the quantum space. Due to the Fermi energy, particles in masses of several billion solar masses sometimes move at very high speeds, simply because there are an insanely large number of particles in a comparatively small area of space. Nevertheless, the particle density is not excessively high, because the space area must be larger than that of the Schwarzschild radius, which is, for example, 17 billion solar masses at $R = 5 \cdot 10^{13} m$. This corresponds to a particle distance of $s = 1.8 \cdot 10^{-9} m$ a density of 0.06 kg/m³ and is thus far below the density on our sun.

A development of the universe from the outside to the inside and from an ordered initial state to a more and more interconnected complexity could lead to small back accelerations, which increase with increasing interconnection, dependent on density, up to a limit value, which cannot be exceeded. Conversely, the contact of large mass concentrations changes over long distances, in a thinned out space. Perhaps the law of gravity according to Newton is even spatially limited and at great distances cohesion of the structures only shows up from object to object. This would explain on the one hand the filamentary arrangement of the mass systems and on the other hand the too large amount of force connections.