About general relativity and quantum mechanics, how to unite.

It is a well-known fact that the general theory of relativity is not to combine with the quantum theory. For a long time I have wandered why and I believe I have the answer.
Einstein developed the theory of general relativity by derivation and the experimental fact that the speed of light is always constant and has the same value for every observer in different coordinate systems moving at different speed relative to each other. That value is c and it is called the speed of light.
Now here comes the first question that came to my mind: why is it called the speed of light?
There are more particles that move with the speed of light, besides the photon: graviton and gluon. They are characterized by the fact that their energy is equal to $E = h.f$ and f, the frequency, means that these particles are actually waves. For the photon, the wave is characterized by the properties of the EM-field (electric charge), for the graviton by the properties of the gravitational field (mass/energy) and for the gluon by the properties of the strong force (colour charge).

So I thought: a better name for it would be vacuum wave velocity.

But now comes the quantum theory in sight. In quantum theory there is one wave that even moves faster then the speed of light: a 'de Broglie' wave, with a phase velocity of c^2/v.
That caught me thinking, why would there be a vacuum wave moving faster then the speed of light and even be infinite as the particle would be at ease? It has to be a vacuum wave as a rest mass particle would never be able to go faster then the speed of light.
Here I have to bring in mind that the quantum theory is based on a postulate that states:
Every particle (massless or rest mass) has an energy equal to: $E = h.f$
That means that every particle is also a wave with a frequency of f (duality particle-wave).
As the general relativity theory is a theory based on derivation, the quantum theory is based on a postulate. Therefore I am looking at the quantum theory for the solution of the problem.

After it was established that the speed of light was constant (the foton clearly has a different propagation mechanism then e rest mass particle), the Lorentz transformations were derived. All reference frames were related to each other through these transformations with a binding factor the constant vacuum wave velocity c. I am not calling it anymore the speed of light, as the derivation of these transformations could not only be done with a light source but also with a graviton source or gluon source. But now we have a problem, if we would use a 'de Broglie wave' source the Lorentz transformations would be completely different!
That is not possible as there is a uniform universe with everywhere the same laws of physics.
This is then the first indication that the theory of quantum physics is based on a wrong hypothesis.
There are more indications:
2) No rest mass particle can move faster then the vacuum wave velocity.
For a massless particle we have: $E/p = (h.f)/(h/\lambda) = f.\lambda = c$ (phase velocity)

For a restmass particle we have: $E/p = (m.c^2)/(m.v) = c^2/v$ (de Broglie phase velocity)

Now in order to explain why a rest mass particle only moves with a speed of v (< c), the wave package was introduced. The wave package is a basic carrier wave with a frequency of f, with a group that moves over the carrier wave with a speed of v. The speed v is called the 'group' velocity. The 'group' is that part of the carrier wave that has a noticeable amplitude and thus carries the mass. In front and behind the group, the wave has a negligible amplitude and therefore is massless and can move with a speed larger then c!

Now is this a correct way of physical reality? The group is still part of the carrier wave; it only has a larger amplitude then the rest of the wave. So why would the 'group' contain mass and the rest of the wave not? It still is part of the same wave! We all know that a rest mass particle cannot move faster then the speed of light and thus also the wave! This means that a 'de Broglie' wave must have the vacuum wave velocity. So c^2/v is not a phase velocity but just a formula that gives the ratio of E and p.

3) Cosmology. We all know that the universe around us is expanding at the moment. For a fixed amount of total mass there are 2 dilution laws with regard to density and the scale factor.
One for non-relativistic matter and one for relativistic matter.
For non-relativistic matter (restmass particles at low speeds): $\rho = \rho_0/R^3$ (normal volumetric expansion).
For relativistic matter (rest mass particles at high speed+ vacuum waves): $\rho = \rho_0/R^4$ (volumetric expansion + wavelength expansion (redshift))
These laws can also be derived thermodynamically
This is weird compared to the quantum mechanical hypothesis that every restmass particle is a wave. Therefore there would be no distinction between relativistic and non-relativistic matter and the dilution law would be for all matter: $\rho = \rho_0/R^4$
But, unfortunately, Cosmology does not do that and indirect says that a restmass particle is not a wave.

4) Experimental proof that a rest mass particle is not a wave comes from the entanglement experiment. Present day physicists have such a tremendous believe in the current quantum theory that they ignore the proof of the entanglement experiment. That proves without a doubt that there is not such a thing as the superposition of two quantum states.
Unfortunately current physicists keep believing that there is and to explain the outcome of the experiment they come up with information speeds of tremendous speeds well over the speed of light and how is it possible that one particle can find the other one without knowing where it is?
It is all based on the assumption that a particle is a wave and from there were the Heisenberg uncertainty principles deduced. But … a particle is not a wave and therefore also the uncertainty principle is not valid for rest mass particles.
Therefore the entanglement experiment is governed by variables, not hidden, but well known: as the outcome of the entanglement experiments show.
The Bell theorem is only valid for vacuum waves as for those waves indeed the energy is equal to: $E = h.f$
Historically the mistake was made in the assumption that a rest mass particle is a wave. They (at the time) did not think of the other possibility that a rest mass particle could generate a wave in the vacuum energy space, thus causing the wavelike behaviour of rest mass particles ($p.c = h.f \Rightarrow p = h/\lambda$).
With this interpretation of a 'de Broglie' wave, it can also explain the 'resistance' against acceleration as $F = dp/dt$. dp/dt then represents the resistance in changing the wavelength of a 'de Broglie' wave propagating inside the vacuum energy sphere. I get the following formula:
$F = dp/dt = (-h/\lambda^2).d\lambda/dt$. Instead of the variables m and v, we now have only λ! Note that F is a vector and so is a 'de Broglie' wave.
This means that a force can influence the path of a vacuum wave, whether it is a coulomb force, a gravitational force or a strong/weak force.

So now we have 3 solid indications + 1 experiment, that a rest mass particle is not a wave. If I look at indication 2, then what is a 'de Broglie' wave? Obviously, when a particle is 'at ease', there is no wave. But when it starts to move then it will generate a wave in the vacuum that moves ahead of

the particle with the vacuum wave velocity. The particle will follow the wave path. Young's double slit experiment can be explained by the interference of 'de Broglie' waves with the material of the slit and the slits itself. If the particle follows the path of the wave, then charge (electric, colour) can also influence the path of the wave in vacuum (in bound systems and electron microscope).
Now with this understanding of a 'de Broglie' wave, indication 1 can also be satisfactorily set aside as a 'de Broglie' wave also moves with the speed of light and also 'de Broglie' waves can be used to derive the Lorentz transformations and we have a uniform physical theory.
Hence we have:

$E^2 = (m_0.c^2)^2 + (p.c)^2$, not $E = h.f$ but: $p.c = h.f$ ➔ $p = h/\lambda$ (with $c = f.\lambda$) This means that the momentum p is inversely proportional with the generated wave in the vacuum. Therefore cosmology is right to have 2 different dilution laws for relativistic and non-relativistic matter:

$m_0.c^2 \approx \rho_0/R^3$ and $p.c = h/\lambda \approx \rho_0/R^4$

With this understanding it becomes also clear that I need to define vacuum. What is vacuum? Obviously we live in a 3D world. Suppose that there is no matter and no energy. Would there be space? Einstein says no, space is created by density. Is that correct? As there is matter presently observed, and the universe is expanding, what would be outside at the edges of our universe? Nothing? Hard to believe that at the edges of our universe there would be no space. I would say, at least empty space, a space without any form of density (energy or matter). Some physicists who talk about parallel universes more or less also acknowledge this: between these parallel universes would be empty space.
If there would be empty space past the edges of our universe, then what is inside the universe? If the universe started with a big bang, what did the big bang consists of? As it concerns expanding material it could be only vacuum energy that started the big bang, as matter would cause only contraction. It is known that vacuum energy only causes expansion. So if the big bang started with only pure vacuum energy it could expand with a speed larger then the vacuum wave velocity as no matter was present. In my model that starting speed can be exactly calculated at the value of $\sqrt{3}.c$, from the Friedman equation.
Now when the expansion speed reaches the value of c and below, matter can be formed and the expansion will be slowed down due to the contraction property (gravitation) of matter.
The Friedman equation describes the expansion of the universe caused by density. This density can be energy but also matter. So if the big Bang started with the expansion of vacuum energy then the vacuum energy density would be proportional to R^{-3} (only volumetric expansion as there are no waves involved). Here I assume that the vacuum energy is dividend over space homogeneous and isotropic (no rotation of the vacuum energy sphere. This is presently confirmed with analysis of the cosmic background radiation). The Friedman equation can be solved quite easily for an expanding vacuum energy universe down to the expanding value of c. See my big bang article.
When the expanding speed decreases past c, then matter can be formed out of vacuum energy, (which is expanding). I would therefore say that matter is 'riding' on vacuum energy. Not space is expanding but vacuum energy is expanding, pushing matter (galaxies) away from each other. This is confirmed by the redshift of light emitted by 'far away' galaxies. The light wave is propagated in vacuum energy, which is expanding. Therefore one could say:
Vacuum energy is expanding in space and matter is formed only within that vacuum energy sphere (with a radius r). Our universe is thus a vacuum energy universe and our galaxy is expanding with it.
(This is a bit contrary to what is said about the GRT of Einstein, which says: space is expanding. But actually, vacuum energy is expanding <u>in</u> space)

This would bring into question what would happen if a light wave would hit the edge of the expanding universe? Would it be able to enter empty space or would it bounce back? I would say, it bounces back as it cannot propagate in empty space as the speed of light is determined by the constants ε_0 and μ_0 : $c^2 = (\varepsilon_0.\mu_0)^{-1}$. Since empty space is empty of everything, there is no vacuum energy and thus no light wave possible to propagate.
If a restmass particle follows the path of a 'de Broglie' wave, then also a rest mass particle will bounce back from the edges of the universe as a 'de Broglie' wave will bounce back and thus the particle.
I have concluded that matter particles will bounce back from the edges of the universe and hence there will be an internal pressure P. Thermodynamically this can be calculated as one can find in cosmology books.

Now that I have concluded that the big bang started with vacuum expansion, what has happened before the big bang? The opposite of expansion is contraction but contraction can only happen when there is matter in the universe. This is intriguing: would the big bang consist of a tremendous conversion of matter into vacuum energy? The Friedman equation is the answer to that. It is possible to solve the equation for both situations (vacuum energy expansion and matter contraction).
This means that there is an evolution going on in our universe: vacuum energy is being transformed to matter and when that process is completed a new big bang occurs.
The Newtonian derivation of the Friedman equation gives an insight as to how the Friedman equation has to look like when we assume this scenario.
I have come to the following adjusted Friedman equation:

$H^2 = (8\pi/3).G.\rho(t) - (k.(E_{mat} - E_{vac})/E_0).c^2.R(t)^{-2}$ (1)

H = Hubble constant (which is not actually a constant)
ρ = density of vacuum energy and/or matter (a function of time and/or scale factor R)
G = gravity constant
R = scale factor
E_0 = total amount of vacuum energy that starts the big bang. Is equal to the total amount of matter after the full conversion of vacuum energy to matter.
E_{vac} = Amount of vacuum energy during the process of conversion.
E_{mat} = Amount of matter present in the universe during the process of conversion.
At any time during the conversion the following equation is valid: $E_0 = E_{vac} + E_{mat}$
k = Gaussian curvature, that represents the curvature of the universe. In a homogeneous and isotropic universe the 'curvature' will be a sphere and for that $k = r^{-2}$. r is the radius of the sphere.

I have to stress that present day cosmology uses the cosmological constant Λ to represent the vacuum energy (Λ represents the constant vacuum energy density). That violates conservation of energy in an expanding or contracting universe: how can the density be constant ???
In my model, the conservation of energy is preserved!

Now if one starts to solve the Friedman equation for matter first (contracting universe) I get interesting results. That's why I start first with the contraction. I am putting my coordinate system at the centre of the sphere. So there is a preferred direction: r, the radius of the sphere.
$E_{vac} = 0$ (all vacuum energy is converted to matter)
$E_{mat} = E_0$
$k = r^{-2} = (r_0.R)^{-2}$ (r_0 is the radius of the big bang, not a point!!! At r_0, $R_0 = 1$)
$\rho = \rho_0.R^{-4}$ (relativistic matter)

ρ_0 = density of sphere with radius r_0)
$H^2 = (R^{-1}.(dR/dt))^2$

The Friedmann equation becomes:

$H^2 = (R^{-1}.(dR/dt))^2 = (8\pi/3).G.\rho(t) - (k.(E_{mat} - E_{vac})/E_0).c^2.R^{-2}$

$H^2 = (R^{-1}.(dR/dt))^2 = (8\pi/3).G.\rho_0/R^4 - (r_0.R)^{-2}.c^2.R^{-2}$ (2)

$(dR/dt)^2 = R^{-2}.(8\pi/3).G.\rho_0 - (c/r_0)^2)$

$dR/dt = \pm R^{-1}.\sqrt{}(8\pi/3).G.\rho_0 - (c/r_0)^2)$ (the – sign stands for contraction)

This is already a very interesting result as the root form gives a condition: it needs to be positieve! The smallest contraction speed will be zero: there is equilibrium between the gravitational force and internal pressure. In the void between the particles there is no room for further contraction. An example is a neutron star or a black hole or an electron! This condition of a contraction velocity of zero yields immediately the Schwarzschild radius!

$(8\pi/3).G.\rho_0 - (c/r_0)^2) = 0 \Rightarrow \rho_0.(r_0)^2 = (3/8\pi).c^2/G$. With $(4\pi/3).(r_0)^3.\rho_0 = m_0$, I get:

$\Rightarrow m_0/r_0 = c^2/2G \Rightarrow r_0 = m_0.(2G/c^2)$ (3)

The same formula can be used to calculate the radius of an electron:
$r_{elec} \approx 10^{-32}.10^{-11}.10^{-17} = 10^{-60}$ (m). One can truly say that an electron is a point.

Now there is a second condition and that is that the maximum velocity of a rest mass particle cannot exceed the vacuum wave velocity c. I am now looking at this condition: v = c

I have the Hubble formula which states: $v^2 = c^2 = H^2.r^2$, in which v is the contraction speed and r the radius of the universe. I am using the Friedman equation for H^2:

$c^2 = R^{-2}.(8\pi/3).G.\rho_0 - (c/r_0)^2).r^2$, with $r = r_0.R$, I get: $c^2 = (8\pi/3).G.\rho_0.(r_0)^{-2} - c^2$

$\Rightarrow r_0 = m_0.(G/c^2)$ (4) ,
Note that this is half the Schwarzschild radius and that the radius of the big bang is proportional to the mass it represents. It makes it immediately clear that the radius of the big bang is not that of the size of a grapefruit, orange or apple! It will be more in the range of billions of light-years, depending on the total amount of m_0! This will immediately solve the flatness problem in present day cosmology.

The next question comes immediately up: If a body with the Schwarzschild radius cannot contract due to all the void spaces being taken, how can it further contract? At a contraction speed of c, when the radius of the big bang is reached, a conversion of matter to vacuum energy occurs and a new big bang appears on the horizon. But how can that happen?
It took me some time to figure that out and here comes into play a Bucky ball. All the mass of this molecule is concentrated on the outside of its radius. Relativistically one can calculate the angular momentum. The Formula for L (angular momentum, rotation through the centre of the Bucky ball, major axis; see www.theorievanalles.nl) is:

$$L = \frac{1}{2\omega}\left(Mc^2 - m_0c^2\right) + \frac{1}{2}\omega.R^2.M$$

ω = angular velocity
R = radius of the Bucky ball
M = measured mass of the Bucky ball molecule (rotating)
m_0 = mass of the Bucky ball without rotation.

Present day quantum mechanics postulates that the energy of a molecule is equal to E =h.f = ħ.ω
And that a particle is a point: R = 0
If I insert that in the above formula ($M.c^2 = \hbar.\omega$; $m_0.c^2 = 0$ ($\omega = 0$) ; R =0 :

$L_z = ½.\hbar.\omega/\omega = ½.\hbar$; this is exactly the quantum mechanical spin value of present day quantum mechanics. When one calculates relativistically the angular momentum of a massive sphere, then the spin value is 5/4.ħ .
A correct model of an elementary particle would then be a hollow sphere, similar to a Bucky ball. Having this knowledge, it becomes evident that a further contraction will be possible if all the hollow spheres collapse. When this happens under massive gravitational force, an unstoppable collapse starts until it reaches the contraction speed of c: the origin of a big bang. When the contraction speed of c is reached then the contraction will stop suddenly as it is not possible to fill up anymore void space between the particles. The sudden stop will cause a tremendous shockwave through the sphere, probably causing the big bang: the conversion of matter to vacuum energy.

I have also thought about mini big bangs, is it possible that we can observe those? And indeed I believe there are. The annihilation of matter and anti-matter can be classified as a mini big bang. To trigger a mini big bang one has to find a way to collapse both hollow spheres of, for instance, the electron and the positron. Gravity is not enough (neutron star) but the EM force can trigger the collapse of the 2 hollow spheres.
We have then the following scenario:
Collapse of the 2 hollow spheres, conversion of rest mass to vacuum energy, expansion of the vacuum energy to the radius where the expansion velocity reaches c, the creation of 2 opposite γ-photons.

Then I will continue now with the expansion of vacuum energy at the time of the big bang.
I again turn to the Friedman equation.
$E_{vac} = E_0$ (All matter is converted to vacuum energy)
$E_{mat} = 0$
$k = r^{-2} = (r_0.R)^{-2}$ (r_0 is the radius of the big bang, not a point!!! At r_0, $R_0 = 1$)
$\rho = \rho_0.R^{-3}$ (volumetric expansion, ρ_0 = density of sphere with radius r_0)
$H^2 = (R^{-1}.(dR/dt))^2$

I get: $H^2 = (R^{-1}.(dR/dt))^2 = (8\pi/3).G.\rho_0/R^3 + (r_0.R)^{-2}.c^2.R^{-2} = (8\pi/3).G.\rho_0/R^3 + r_0^{-2}.c^2/R^4$ (5)

One can see the difference with equation 2. The second term has changed the sign, from negative to positive.
Now I will turn to Hubble's equation $v^2 = H^2.r^2$ and fill in formula 5:

$v^2 = H^2.r^2 = (8\pi/3).G.\rho_0/R^3 + r_0^{-2}.c^2/R^4).r^2$; with $r = r_0.R$

$v^2 = (8\pi/3).G.\rho_0.(r_0)^2/R + c^2/R^2$; with $(4\pi/3).\rho_0 = m_0/(r_0)^3$

$v^2 = 2G.m_0.(R.r_0)^{-1} + c^2/R^2$; use now formula 4 (radius of the big bang sphere)

$v^2 = 2.c^2/R + c^2/R^2$ (6) . At the time of the big bang (t = 0), the scale factor will be 1,

The starting velocity of the big bang will be: $(v_0)^2 = 2.c^2 + c^2 = 3.c^2 \Rightarrow v_0 = \sqrt{3}.c$, which is larger then c!

I can now also calculate the scale factor at which the expansion velocity reaches the vacuum wave velocity c. I use formula 6:
$c^2 = 2.c^2/R + c^2/R^2$; this equation has the solution $R = 1 + \sqrt{2} \approx 2{,}41$

We can apply this to the radius of the electron-positron annihilation. Formula 4 gives the radius of the meltdown of the 2 particles $\approx 2.10^{-60}$. After this radius has increased to the value of $2{,}41.2.10^{-60} \approx 4{,}82.10^{-60}$, the 2 γ-fotons are created.
Suppose that the radius of the big bang is about 1 billion light-years, then matter can be formed after the scale factor has reached the value of about 2,41. The radius of the universe will then be about 2,41 billion light years and after that time matter will be formed simultaneously all over the volume of this huge sphere, and will continue to do so as expansion continues. Expansion will stop and change to a contraction mode after 50% of the vacuum energy is transformed into matter. This transformation will continue also in the contraction mode until all vacuum energy is transformed into matter and a new big bang occurs.
Note: matter will only be formed within the boundary of the vacuum energy sphere. The radius of the universe is that of the vacuum energy sphere, within that radius matter will be formed.

Presently with the use of current models, 5% is visible matter, 26% is dark matter and 69% is still vacuum energy. So one can assume that still vacuum energy is being transformed into dark matter as the temperature of the universe is about 3 K (too low to produce visible matter).

So after the scale factor reaches the value of 2,41, matter can be formed and the conversion process starts turning vacuum energy into matter. This can be visible matter but also dark matter.
For me, the difference between visible matter and dark matter is very simple: visible matter particles carry charge (electric and/or colour) and dark matter particles are chargeless.
If we look at the lepton family of particles then we have the electron, the muon and the tau. Each has its dark matter counterpart: the electron neutrino, the muon neutrino and the tau neutrino.
If we look at the 6 particles that carry electric and colour charge, we can expect the same similarity: 6 chargeless counterparts. That means that there would be at least 3 + 6 = 9 dark matter neutrino's.
Would there be more? I doubt it. If so, then each dark matter neutrino would have had their charged counterpart created during the relativistic period of matter creation (shortly after passing the c limit). I could be wrong if there would be also very heavy chargeless rest mass particles (too heavy to add charge).
So initially visible matter particles are produced and when the temperature has dropped significantly only dark matter will be produced.

Anyway, the next question is: where does quantum mechanics comes into play in this story?
Answer: it does not.
One immediate comment would be: what about Planck length, Planck energy + all the other invented Planck units?
Well, Planck's constant was introduced in a formula to describe the energy of a photon, or more general: the energy of a vacuum wave.

To describe the speed of the vacuum wave velocity, different formulas were developed:

For the photon: $c^2 = (\varepsilon_0.\mu_0)^{-½}$

For the graviton/'de Broglie' wave: $c^3 = G.h/(l_p)^2$

Now the Planck length shows up in the formula for the speed of the Graviton. As it concerns a wave in vacuum energy, the Planck length could be a wavelength.
What wavelength are we talking about? Probably the minimum wavelength a vacuum wave can have. It is a physical boundary at which a wave is possible! That means automatically that there is also a maximum frequency (also a physical boundary) and thus also a maximum energy that can be associated with a vacuum wave. For the graviton we have:

We have: $c^3 = G.h/(l_p)^2$ (7) , $c = f.\lambda_p$ (8) and $E_{pl} = h.f_p$ (9) I combine these 3 formulas and for the graviton we get:
$E_p = \sqrt{(h.c^5/G)}$
$f_p = c/\lambda_p = \sqrt{(c^5/(h.G))}$

I am using Planck's constant and not Dirac's constant as the energy of a vacuum wave is $E = h.f$.

E_p is then the Planck energy and is the maximum energy a photon (graviton/gluon/de Broglie) can have. If a single 'de Broglie' wave has a maximum energy, then the velocity of an elementary particle is also maximised. It can be calculated:

$p.c = h/\lambda_p$ ➔ $m.v.c = h/\lambda_p$ ➔ $m_0.v.c/(\sqrt{(1-v^2/c^2)}) = h/\lambda_p$; from this equation I can isolate the velocity v and I get:

$v^2 = c^2/((m_0)^2.c.G/h +1) \approx c^2$ (for elementary particles, as the term $(m_0)^2.c.G/h << 1$.
Single 'de Broglie' wave).

It is interesting to look at the Bucky ball molecule (it is a rel. large molecule that produces an interference pattern and thus a single 'de Broglie' wave). The term $(m_0)^2.c.G/h$ becomes:
$m_0 \approx 10^{-24}$, hence $(m_0)^2.c.G/h \approx 10^{-48}. 10^8.10^{-11}.10^{34} \approx 10^{-17}$. This means that even for a Bucky ball, the limit would still be $\approx c$.
However, it means that for an object like a neutron star, there would be a limit. This would be difficult to calculate as the generated 'de Broglie' wave would not be a single wave as a neutron star would for sure not generate an interference pattern!
Quantum mechanics comes only into play when you lock up a particle; you constrain its movements, either in a box or in a bound system. The generated 'de Broglie' wave becomes a standing wave and thus momentum and energy are quantized.
The universe is way too large to consider a particle locked up. Perhaps only at the edges of the universe there could be some standing wave effects.