Crashing the Particle Physics Party Line on Neutrinos, Weak Bosons, and Everything Else

In our previous post on this blog we addressed the party line on how an antineutrino accounts for effects observed in the electron decay process. Neutrinos and their antimatter counterpart have come into the panoply of particles by virtue of carrying spin without having a charge or necessarily even having any mass. We must ask why such an elusive entity can take a place among observable and irrefutably inferred submicroscopic particles of nature. But again just as we found with dark matter issues, it is the interpretation of a questionable cause of a real effect that resulted in brilliant scientists embracing questionable deus ex machina hypotheses.

So, let us re-evaluate the free neutron decay process without assuming the existence of the antineutrino. We suspect the total energy and momentum of the pre-reaction neutron was greater than the totals of post-reaction proton and electron dynamics. However, we do not have sufficient evidence to define the mass of the antineutrino, nor therefore it's momentum and energy, other than to say that its mass is very, very small. We do know that a neutron made up of one up and two down quarks would have net spin of ± ½, but the resulting post reaction subatomic particles would have a total spin of 0 or 1. So that is why a nebulous particle with spin ± ½ and very tiny mass and cross section was conjectured.

the alternative new scheme

But let's just say we don't buy it. How might one explain these effects without invoking the antineutrino and the W^- weak boson that converts a negative 1/3 *e* charged down quark into a positive 2/3 *e* charged up particle and at the same (virtually zero) time creates an electron and a particle who's only known property is a spin of ± ½? This is the same category of problem we faced with accounting for effects without resorting to the unexplainable dark matter. The effects in both cases are real; the current explanations are Rube Goldberg mechanisms. In this case by inventing a 'weak boson' whose role is to invert and expand charge, create a charged electron and an elusive spin ½ particle, and then disappear immediately like the emcee of a roadshow.

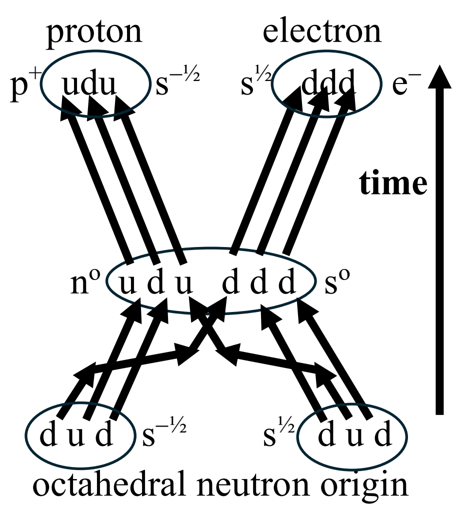


Figure 1: Octahedral neutron decay

Acknowledging the difficulty of this challenge, I am willing and anxious to accept it, bringing forward figure 1 as the alternative to figure 1 from what was previously posted. The previous diagram had the deus ex machina constructs of W^- and antineutrino included in addition to the subatomic particles and their constituent quarks. We include only the real entities with no transmutations or creation ex nihilo. The number of each type of quark and even number of spin ½ particles does not change throughout the decay process. There are two up quarks and four down quarks throughout this process. Once the two neutron-looking particles collide into what I have denominated an 'octahedral neutron' scrambling the six quarks, a significant reduction of energy results.

From disassociation of the quarks into a different two, now-charged particles, of the normal charged proton and a unit-charged, three-down-quark electron, the latter to be justified below. What was not included in the party line diagram of the previous post was the hidden fact of the insignificance of masses of quarks to the mass determination of the subatomic particles and therefore to the conservation laws generally. That was because 98% of the mass of the neutron and proton in that diagram was not in the quarks but in gluons considered to embody the ‘strong force’ that has been presumed to be required to confine charged quarks without convergence into a singularity or expulsion. Masses of the quarks have been assigned masses to account for the differences in total mass of the neutron and proton rather than accounting for the total mass of each which is left to the unmentioned gluon.

digression on the determination of the charge distributions of quarks

Coulomb’s law was established a long time ago when, one must suppose, a dot of a radius of 10^{-14} cm was tantamount to a mathematical point, good enough for government work and for scientific endeavors. But quarks were not bandied about back then; they worked with cat hair and pith balls. But if we are going to understand the nature of quarks, we will need to become comfortable with dimensions less than that. The inverse square relationship that is embodied in Coulomb’s law is as accurate as can be measured in any laboratory, but that does not mean that it has been validated all the way down to a separation of zero. It hasn’t. Certainly above about 10^{-8} cm, but not below that. This led to the assumption that, since the amount of charge was always constrained within the radius of the measured separation of charges, charge isn’t distributed through space but restricted to a narrowed domain – ultimately to a mathematical point. To surmount singularity issues associated with point charges, physicists employed the Dirac delta function

Traditional treatment of electrical charge envisions ensembles of point charges, of however many required electronic charges (4.8 Stat Coulombs) to account for the total charge. That the electronic charge was seen as indivisible was reasonable based on the discovery of the subatomic particles until the further division of charge associated with quarks. So the next question arises: are the units of charge embodied in the up and down quarks distributed within their narrow confines as mathematical points? If they are, coulomb’s law and the Dirac delta function are no longer sufficient to account for forces between them. Thus another force is required to account for their behavior, namely the ‘strong force’ because it must be orders of magnitude greater than even the very strong electric force. So, does that necessitate another particle (the gluon?) to mediate this force to ‘glue’ the quarks together within the subatomic particles? At some point we must say no to all this rhetoric. There must be a fundamental charge distribution and charge interaction function that is not restricted to domains above which research is being conducted. The fact that a measurement has not been made does not imply immeasurability and scientific conjectures must be amenable to adaptation.

In the tradition of Faraday, the effect and its cause should not be conceived as separate. The correct characterization of an effect must characterize its cause at every point in space where there is such an effect. Action at a distance is unacceptable. Such a characterization requires co-location of the electric field and charge distribution as follows and as shown in figure 2.

$\mathbf{E}(\mathrm{r}) = (\mathbf{r}/r)\,\mathrm{q}(r)$ and $\mathrm{q}(r) = q\,\mathrm{e}^{-\alpha/r}/r^2$, where q is the total indivisible amount of charge.

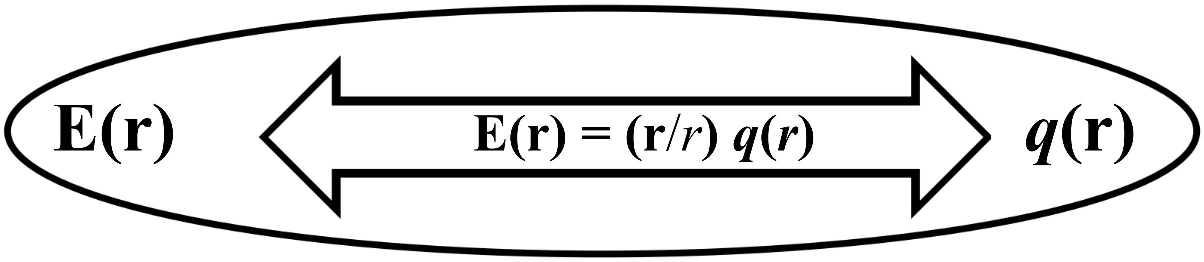


Figure 2: Coexistence of an effect and its cause at every point in space

For values of $r < \alpha$, in the preceding equation solution, the traditional electric force becomes a strong binding force, i.e., the 'strong force'.

This changes nothing in the domain of classical experimental physics, but in the realm of the theory and experimentally with regard to subatomic particle physics everything is brand new. Theoretical physics relies on application of the Poisson equation illustrated in figure 3, which is not just an equation to be solved, but a comprehensive boundary value problem that cannot be solved without the specification of what values must be at every one of the boundaries of a domain for which the solution applies. In physical theory values of any observable quantity cannot be infinite, a boundary value must be set to guarantee this. The problem is that no one had thought to set a boundary at the origin where the traditional inverse square law becomes infinite, and a finite solution must apply between the radial boundaries of zero and infinity.

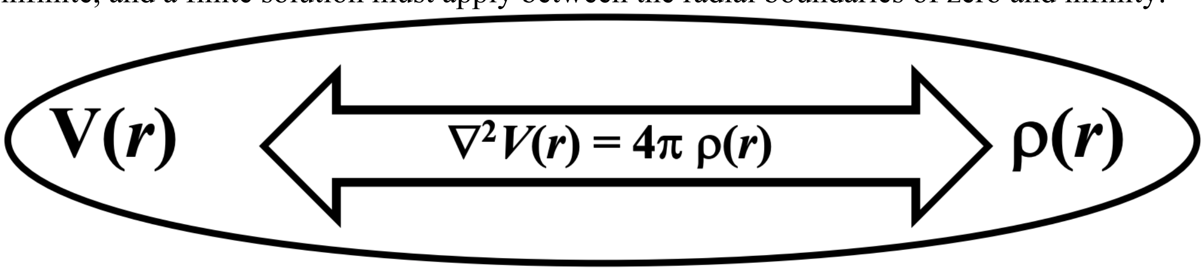
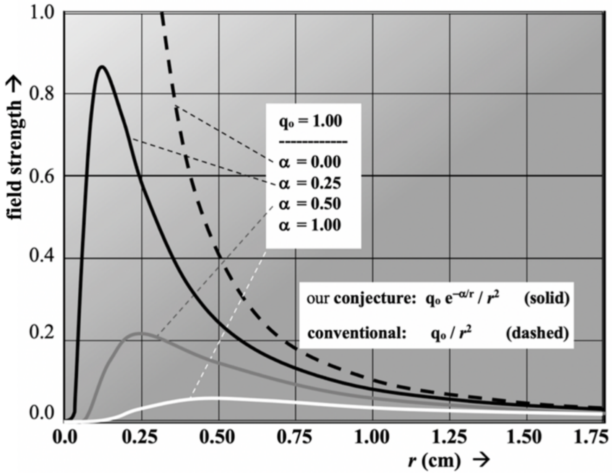


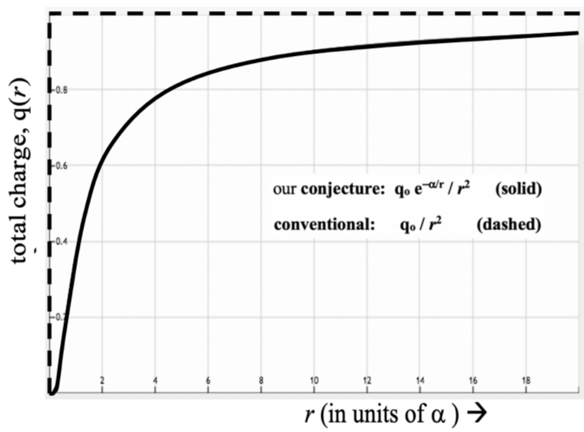
Figure 3: Poisson equation relating potential energy and charge density

The specification of boundary conditions can be any one of several types: Potential values having been specified throughout the infinite spherical surface of a domain including all of space refers to Dirichlet boundary conditions. The field vector component that is normal to the boundary surface (outward force) being defined everywhere on the boundary refers to Neumann boundary conditions. A Cauchy boundary condition is one for which both the Dirichlet and Neumann conditions are specified on all boundaries. Once a complete set of conditions is defined at every boundary, it is significant that a single unique solution will result.

The equation is just an inhomogeneous second order differential equation backed up by Maxwell's equations, Stoke's theorem, and a bunch of other theorems and corollary details of classical field theory. Once we have set the condition that there is zero potential at the center of an indivisible charge which is the previously unacknowledged boundary condition, then its field strength will be at a maxima or minima at the origin. The solutions $E(r) = q\ e^{-\alpha/r}/r^2$ and $q(r) = q\ e^{-\alpha/r}$ shown earlier are plotted in figure 4. Comparison of potential V(r) against the traditional solution is shown in figure 5 below. Note the increasing agreement for $r > \alpha$.

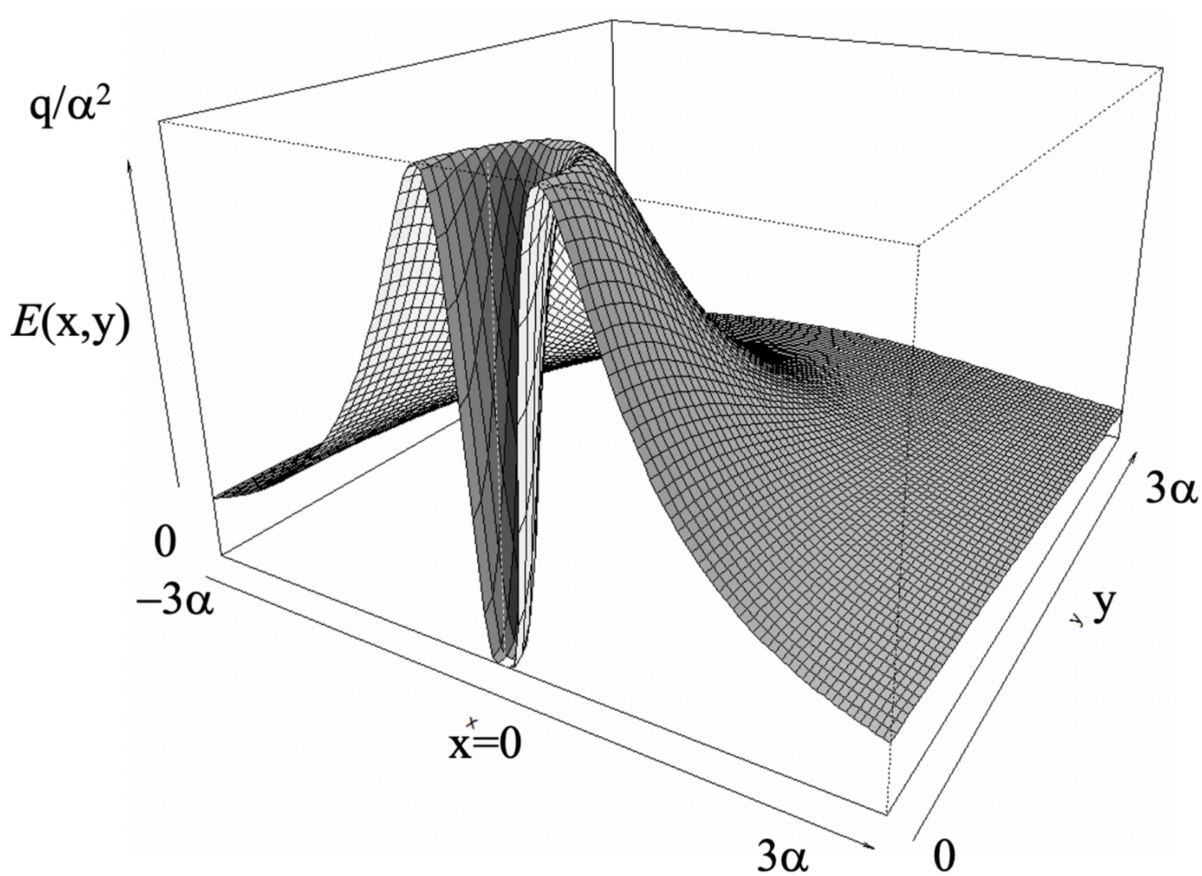


Field strength $E(\alpha,r)$ – conventional and current view



Total charge in the current conjecture

The dependence on the variance α of experimentally measurable quantities



The form of the experimentally measurable field strength

Figure 4: Poisson equation solutions for a quark field strength and charge

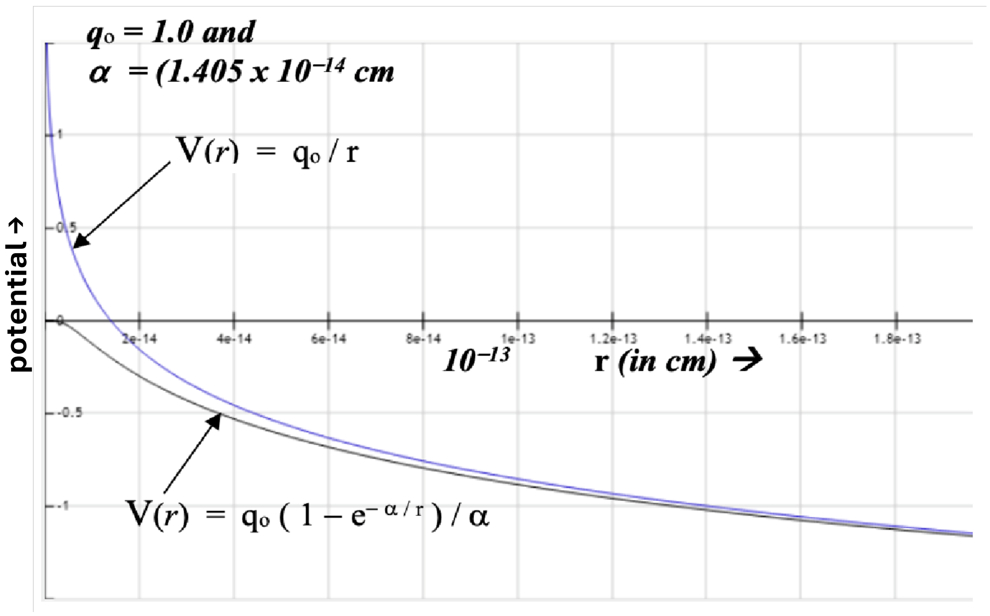


Figure 5: Comparison of potentials for a down quark as a function of radial distance (for $r < 2 \times 10^{-13}$ cm)

digression on the determination of the mass of quarks

The self-energy of a point charge distribution is indeterminate. So the encapsulated energy of a charged particle, and therefore its mass could not be determined. With this correct solution to the Poisson boundary value problem for an indivisible particle, that has changed. The self-energy of a charge distribution as was defined above is $q^2/2\alpha$. Thus, using the mass energy equivalence, for a fundamental particle A, one obtains:

$m_A = q_A^2/(2\alpha_A c^2)$

There is experimental evidence that the cross section of a proton and therefore an upper bound on the values of α_{up} is on the order of 10^{-16} cm. We know its charge, and from that we can obtain an order of magnitude estimate of its mass: $m_{up} \sim 10^{-24}$ gm. Taking constituent quarks of a disassociating octahedral neutron as more massive than the proton by virtue of having of its having three more down quarks, a down quark must have a mass m_{down} of on the order of 10^{-27} cm. These are order of magnitude estimates ignoring a reduction due to binding energy of the combined quarks in a hadron. Having dispensed with a separable strong force, we can compute precise energy involved in quark combinations and thereby determine the respective masses of the up and down quark.

discussion of the three-down-quark electron

The apparent problem remaining is, what about the three remaining down quarks that are released in the alternative decay process? And more specifically why would we be willing to denominate this an electron? At first glance it appears to violate the Pauli exclusion principle which applies most notably to electrons. But acceptable quark combinations are determined based on the R-G-B tri-color rule for which a three-down-quark electron is in compliance. A second, perhaps the even more persuasive counterargument is the fundamental indivisibility of electrons, i.e., if they can be constructed, shouldn't they be able to be deconstructed? It is generally understood that once an electron, always an electron. But that is not a rigid rule. In 'electron capture' reactions a proton and electron are converted into a neutron – the inversion of the neutron decay reaction. So why not? By superimposing the three down quark charge distributions, we use the same variance α_{down}, with three times the charge, providing nine times the self-energy and mass. And now we can solve for the variance and mass of the up and down quarks precisely.

The remaining question with regard to the electron is, why would the three quarks of the same charge adhere? There is no reason in what we have discussed so far. In fact, there is no reason any such charge distribution would remain intact when by dissemination the net energy would be significantly reduced. The resolution to that issue is in gravity. Since the mass of a particle is just the self-energy of the distribution, that mass has a force associated with it too – gravity. But like the electrostatic inverse square law has had to be replaced, so also does the gravitational force. The same Poisson solution applies gravitation, but now repellant charges have a binding force that exceeds the repulsion if the particles are brought into sufficiently close contact. This force, without altering the long-range gravitational force, can be shown to be arbitrarily extreme by a variance that is arbitrarily small. This becomes like the button that holds two legos together. So the significance of the octahedral neutron is that the collision of the dipole conton neutrons forces four down quarks into extremely close proximity when separating the two stronger up quarks from each other. Upon disassociation three of the down quarks by virtue of their compatible colors snap into superposition by their mutual intense gravitational strong force. Refer to figure 6.

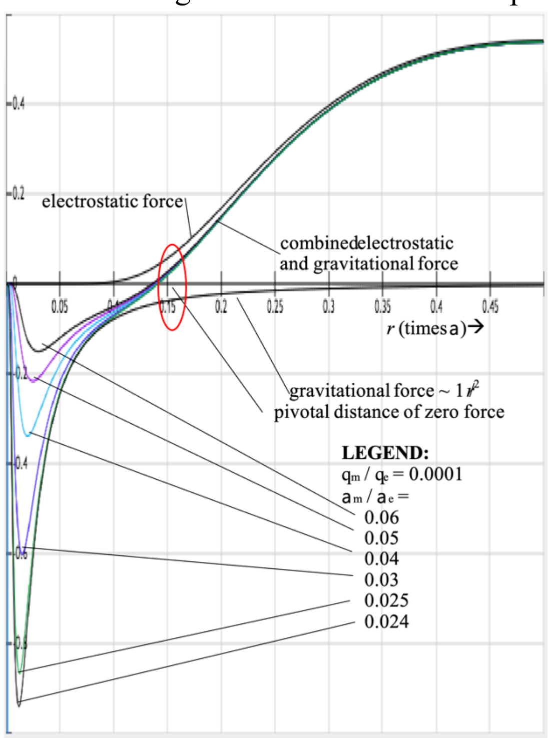


Figure 6: Combined electrostatic and gravitational forces to bind quarks

It goes without saying that the merging of electrostatic and gravitational forces demands significantly more discussion. Much of that is handled in the novel Some Matters of Gravity available on this site. When electric charge and mass are united as a complex quantity there is a meaningful resolution to the merging of two significant fields of physics.

from a quark soup to the universe as we know it

An obvious question about the diagram in figure 1 is, where did the octahedral neutron come from? It's obviously not one of the accepted panoply of particles, but I think you'll agree that its justification is more straight forward than how the standard model accounts for emergence of hydrogenous plasma as the right half of figure 7. They don't explain how we get from a universe of quarks – gluons too if that will help – to a universe of subatomic particles. You just can't do it. So their explanation of how one gets from the proverbial quark soup to the current predominantly hydrogenous plasma universe is just kind of… what? I see no reason to be sneaky about such a significant transition from quarks to subatomic particles if one really believes it. Part of the problem of course is that the quote "standard model" refers both to cosmology and particle physics united by a big bang – if it happened. But the scenario of extant particles as functions of stable temperatures is presumed to involve also a functionality of time, which isn't what the associated research asserted. Nonetheless, whether at Cern, the center of a galaxy cluster, or supernova at a given temperature those are the particles that are present in that abundance.

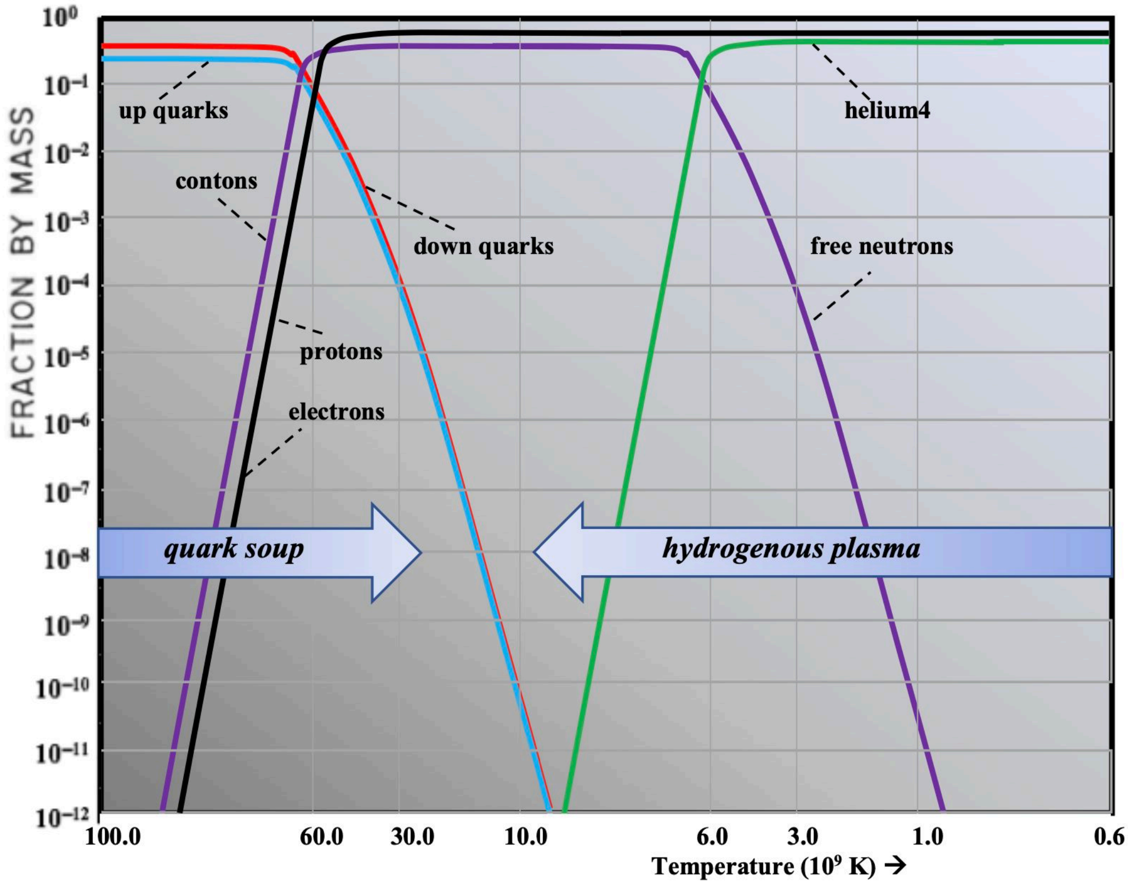


Figure 7: Fundamental particle abundance estimates that would be realized – as a function of temperature in a 'quark soup' up through current hydrogenous plasma

Let us start with the primordial quark soup of inchoate matter at temperatures above 10^{10} K. As temperatures cool, up and down quarks adhere in association more typically than they disassociate, giving off energy in the process in accordance with the Q value of the reaction. Here $Q_{LR} = (\Sigma m_{iL} - \Sigma m_{jR})\, c^2$, and m_{iL} is the i^{th} particle on the left of the reaction; m_{jR} is the j^{th} particle on the right side. The ratio of numbers of left and right-side particles is given by:

$N_L/N_R = e^{-Q_{LR}/k\,T}$

But d-u particles still have a charge of +1/3 *e* electronic charge and so as temperatures further drop, they further associate into d-u-d neutral structures that one must presume are relatively stable constituents of the soup since they are neutral and have again given off energy in the process. At lower temperatures, it becomes increasingly a dud rather than quark soup. The conservation laws and chromodynamic color schemes are all satisfied. This is illustrated in figure 8. Which combination of quarks predominate at each temperature depends on the Q value of the reaction from which the combination derives as shown in figure 7.

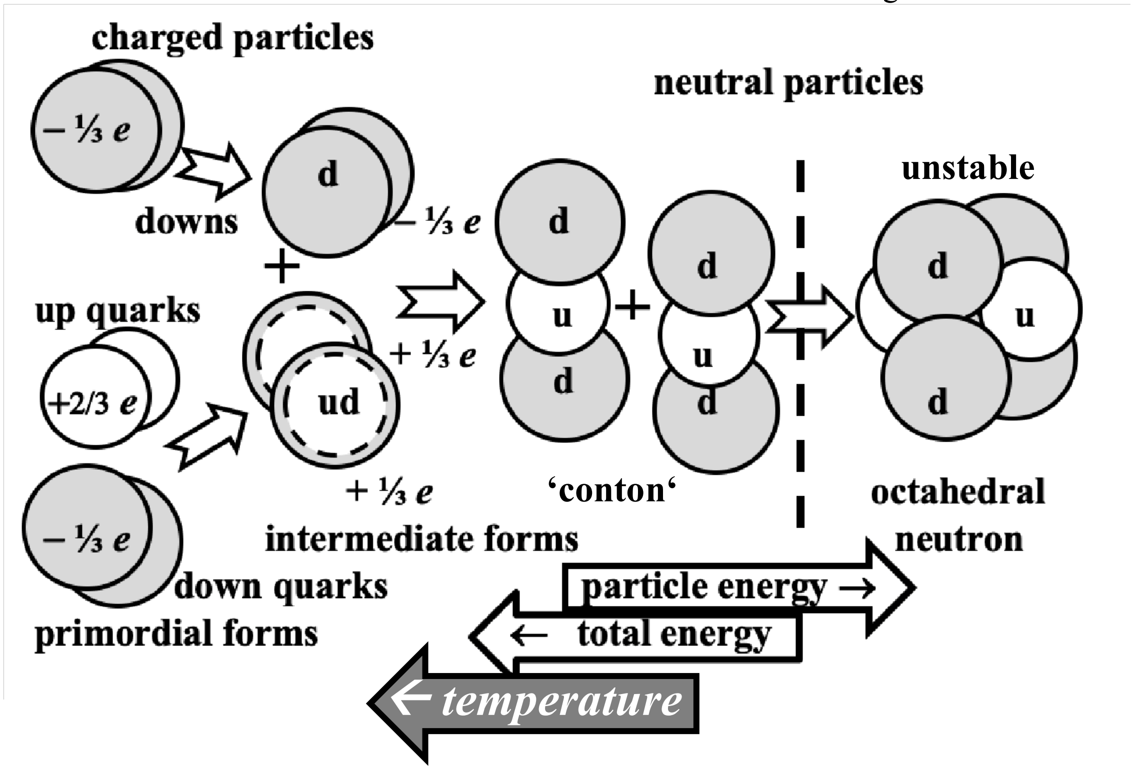


Figure 8: The thermodynamics of a quark soup

But these duds are now the entities that get involved in thermonuclear collision interactions with multipole forces aligning down quarks to minimize the repulsion of the greater up quark charges. This results in a further reduction of total energy. These forces tend to conjoin two of these contons in tandem – into what I have called an octahedral neutron – resulting again in the reduction of energy. But into a product that is unstable for several reasons. Once quarks have tended toward a merger to this form, disassociation becomes the path forward for the further reduction of energy. This time a major reduction. The collision of two duds becomes an exothermic thermonuclear reaction that reassigns quark groupings and with it charge, spin, and color. This is illustrated in figure 9.

This brings us ultimately to neutron decay reactions, which is where we started. We have found no wimps or neutrinos, and neutron 'decay' may not rely less on spontaneity of decay more on the collision of contons, the impact of which contributes varying amounts of internal energy and momentum. With its untrackable neutrality, the energy content of an octahedral neutron has a degree of variability that would be reflected in the right-hand products of the reaction.

As a final note: I would enjoy it if the students from Tianjin offered me some feedback on the ideas they glean from my posts.

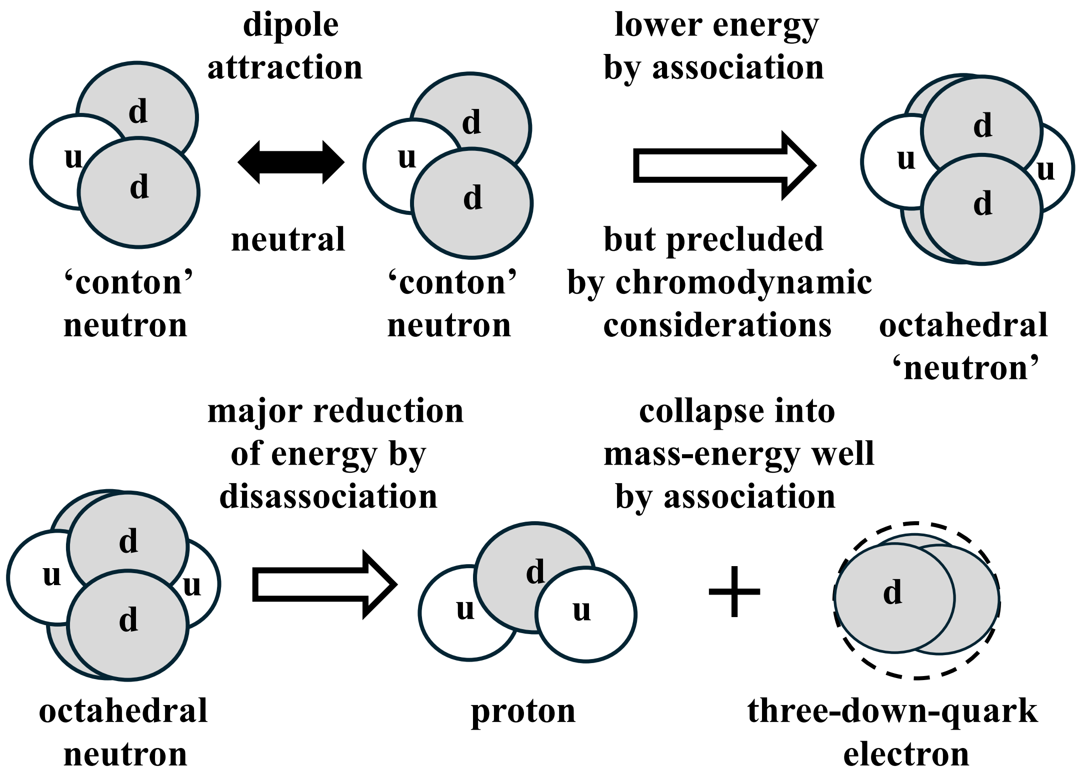


Figure 9: The thermonuclear neutron decay process