The Nature of Gravity and Strong Nuclear Force

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Abstract

Strong nuclear force increases when density of nucleons increases inside a nucleus. Additional strong nuclear force adds to the mass of the nucleus. When a star collapses to a neutron star, the increased density of the nucleons will increase the total strong nuclear force of the star and the mass. Because gravity is proportional to mass, we can deduce that the density of the nucleons increases the gravity of the object. If the earth ever turns to a point size object, it will exert more gravity due to increased density of the matter. Definition of mass and the concept of mass defect hides the effect of density of nucleons on the gravity. Elimination of these two concepts unifies all physical forces. This new theory explains many of the observations without hard to imagine concepts like spacetime curvature and dark matter.

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Introduction

We feel the pull of gravity on our bodies, yet the dominant theory says that it is not a force. If gravity's pull is a reality, then what is the source of energy that drives the gravity? To answer this question, we must first consider the following three scenarios.

Scenario One: Fission of Uranium atom

Fission of Uranium-235 atom with a neutron is described as follows.

$$^{235}U + n = {}^{236}U$$
$$^{236}U = {}^{92}Kr + {}^{141}Ba + 3n + \text{Energy} \quad \text{— Eq. 1}$$

If number of nucleons on left hand side (LHS) of Eq. 1 is equal to n_1, then

$$n_1 = {}^{236}U = 236.$$

If umber of nucleons on right hand side (RHS) of Eq. 1 is equal to n_2, then

$$n_2 = ({}^{92}Kr + {}^{141}Ba + 3n) = 236$$

Here, we see that $n_1 = n_2$.

If the amount of matter (number of nucleons) on RHS and LHS is the same, then where did the energy on RHS of Eq. 1 come from? The current understanding is that the energy on RHS came from the mass defect in uranium-236 atom which got converted to energy according to the mass energy equivalence principle of $E = mc^2$.

One question remains in this scenario is that: where was the released energy stored in the uranium-236 atom? According to the present theories, released energy is part of the strong nuclear force (SNF) within the uranium-236 nucleus - which means SNF is part of the mass of uranium-236 atom.

To start, U-236 already has a deficit when compared to the total mass of nucleons in its nucleus. The result of the reaction is a change from less deficit in mass in U-236 nucleus to more deficit in mass in resultant components - and the difference in mass got released as energy. That brings up another question: when does a nucleus lack deficit? A densely packed nucleons (ex. hydrogen plasma) will have more SNF, and this excess SNF contributes more towards the mass of the plasma, resulting in less deficit in mass.

Scenario Two: Fusion of Hydrogen atoms

Strong nuclear force between the protons in hydrogen plasma releases as energy when two protons form as deuterium nucleus as shown in Eq. 2. The amount of energy released will be equal to the deficit of mass between two protons and deuterium nucleus.

$$^{1}H + {}^{1}H = {}^{2}H + \text{Energy} \quad \text{— Eq. 2}$$

Nuclear reaction of hydrogen plasma in the sun is more akin to fission than fusion, because of the ejection of two protons from rest of the condensed hydrogen plasma.

Protons are closely bound together in hydrogen plasma compared to the nucleus of deuterium atom. That means, condensed nucleons holds more energy and measures more mass compared to its counterpart in the form of nuclei of different elements. Moreover, nuclei of elements occupies more space compared to the condensed nucleons.

Hydrogen plasma in the sun has more SNF associated with it because of attraction of two protons to rest of the plasma. Therefore a reaction in the sun releases more energy than the fusion of just two protons. This might be the case for cold fusion experiments not able to release significantly more energy than it consumes.

Scenario Three: Ionization of an atom

Energy is required to eject the electron in the top most shell of an atom. When an atom acquires an electron, it releases the same amount of energy that is equal to the ionization level of the shell in which the electron was captured. If the captured electron does not posses the energy equal to the amount of energy that got released, then how and from where did this excess energy get released?

Outward pull of electron shells on the nucleus of a positively charged atom will be less compared to the inward pull of protons. As a result, nucleon density will increase in a

positively ionized atom compared to its neutral counterpart. At the same time, SNF will increase between the nucleons of the positively charged atom because they are closer to each other. Any additional SNF will slightly increase the mass of the nucleus. Nucleus of a positively charged atom returns to normal structure by releasing the excess SNF as energy when it captures an electron. In other words, deficit of mass occurred in positively charged ion that got released as energy.

Splitting or fusing the nuclei are not the only ways to access nuclear energy — a minute increase in distance between the nucleons is capable of doing the same. Chemical reaction is an exchange of electrons between atoms of different elements, some atoms receive energy and release the electrons, and the other receive those electrons and release the energy. The difference in release and intake of energy determines whether that reaction is exothermic or endothermic.

Analysis

As pointed out in the above scenarios, densely packed nucleons measures more mass than when they are further apart. An object with fixed amount of material (nucleons) measuring two different amounts of mass goes against the definition of mass. According to the definition an object with fixed amount of material measures same amount of mass irrespective of its size, shape or form.

Allotropes are another example for how the same amount of matter measures different amount of mass depending on the distance between the atoms. One of the carbon allotrope, buckminsterfullerene has 60 atoms in its molecule. If we take same number of carbon atoms in the form of diamond, graphene and buckminsterfullerene, do they all measure the same amount of mass or different? An object with densely packed atoms measure more mass than the one in which the atoms are placed further apart. Atoms in buckminsterfullerene molecule are placed further apart compared to diamond therefore it measures less mass than diamond object with 60 atoms.

Aerogel of carbon weighs less than the carbon used to make that product. This is because the particles in aerogel are placed further apart from each other. Aerogel and allotropes of carbon, and the deficit of mass in nuclear reactions clearly indicates that the density of matter plays a role, at nucleus, atomic and particle level in determining the amount of mass an object measures.

Definition of mass changed over centuries. Initially, it was considered as the amount of matter in an object, later just inertia of the object, and finally it is partially taken the form of SNF. This changing nature of the definition of mass does not capture the essence of the physical universe. Phenomena such as mass deficit in nuclear reactions and mass difference in allotropes were clearly invalidated the definition of mass. Instead of throwing away the leaky concept of mass, physics community placed a patch of deficit of mass over it, and by doing so unknowingly restricted the progress of physics.

Measurement of mass in a balance scale is a comparison of the strength of gravity of the object being measured to the object of standard measurement. Earth keeps pulling an object on its surface in a wide angle. If the earth ever becomes a point mass, all of its matter pulls the object in a straight line and gravity of the earth will increase tremendously even on an object kept at the present surface. Even the differentiation of the earth into layers would have increased its gravity because of the accumulation of heavier elements at the center. Therefore, two objects measured equally on the present earth, will not necessarily be the same when earth turns to a point size object. All the above analyses indicate that the mass of an object is circumstantial, and not a standard property of the object.

Hypothesis

Density of matter, both within the nucleus and between the atoms, appears to increase the mass of an object. Because the present measurement of mass is a comparison of strength of gravity, all that applies to mass will also apply to gravity. From the above analysis, we can deduce that the gravity between objects will increase with the increase in density of the matter within the interacting objects.

When a star collapses to a neutron star due to imbalance in gravitational pull of its core to rest of the star, total SNF in the star increases because nucleons are closer to each other. Additional SNF adds to the mass of the star. Gravity is proportional to mass of the object therefore a neutron star exerts more gravity than it was before the collapse. Gravity collapses the star and increases the SNF, and that additional SNF increases the gravity of the collapsed star. Does this give a clue to anything?

Gravity is a strong force at the point mass level but there is no known strong force other than SNF at point mass level. Variation of mass in allotropes and aerogel indicates the effect of SNF at atomic and particle levels. Strong nuclear force generates mass at nuclear level and gravity generates SNF in neutron stars. And again mass is a comparison of gravity. All these similarities suggest that SNF probably is gravity itself. Strong nuclear force pulls an object inward, and force of gravity pulls the objects closer to each other. Resistance within the objects makes them release internal energy by disintegration when objects are pulled closer. The amount of energy consumed in each of the gravitationally bound objects will be equal to the amount of gravity between them. The force within the object pulls it inward and the force between the objects disintegrates them but both these forces are the same, only the principles describe them are different.

Gravitational self energy (GSE) is cumulative strong nuclear force of each particle to all other particles in the object. Gravity of the earth is gradually reducing by spending GSE to keep the moon revolving around it. Similarly, the moon is also spending its internal GSE in pulling the earth. All objects gravitationally bound around the earth are utilizing the GSE of the earth, and are simultaneously disintegrating themselves and reducing their own GSE. If there is no object around the earth, then energy will not be consumed. Therefore gravity is not a force field that appears around earth no matter

whether or not there is an object in its vicinity. Gases, liquids and a pile of dust particles lack collective GSE therefore they can't interact gravitationally as a single object, instead each individual component will act as a separate object.

Gravity of the earth appears weak on the surface because the total force acts in a wide angle. When multiple forces act on an object, the displacement of the object equals to the resultant of all forces. When all the forces act on a line, then the resultant force will be equal to the total of all forces acting on the object. Gravity is total force acting between the objects but what we see on the surface of the earth is only the resultant force.

In the first scenario, U-236 GSE is more than the resultant components combined. In the second scenario, GSE of two hydrogen plasma particles is more than the deuterium nucleus. In the third scenario, GSE of positive ion is more than that of the neutral atom. In all these cases, excess GSE got released as energy.

For a space craft at the edge of the solar system, the sun looks like a point mass object. Therefore all of its gravitational pull acts on a single line, and increasing the pull of gravity. Pioneer anomaly appears to be due to this additional pull of the sun. The same applies with the anomaly observed with the galactic rotational curves where the stars on the outskirts of the galaxy revolve faster than expected. That is because the galactic core appears as a point mass from the outskirts of the galaxy thereby exerting more gravity on these objects.

The theory presented in this article eliminates the need for concepts like deficit in mass, dark matter and spacetime curvature to explain the observable universe. It presents a unified explanation for gravity and SNF, showing that they are the two sides of the same coin. Apparently Occam's razor still holds sway over scientific theories.

Conclusion

Summary of the theory presented in this article is as follows -

1. Deficit of mass does not occur in an object. Amount of mass an object measures changes with the density of the matter within the object.
2. Definition of mass needs to be revised incorporating the density of the object.
3. Gravity is nothing but the strong nuclear force itself. It works at nuclear and cosmological distances.
4. All the energy interactions, including radiation, gravity, chemical and electrical, are nuclear energy generated by the variations in density of the nucleus.

The devise of "deficit of mass" is the greatest mistake the physics community has ever made. Mass deficit occurs in an object when the particles were pushed apart. An object measuring different amounts of mass, as shown in nuclear reactions and allotropes of carbon, invalidates the definition of mass. Mass of an object, as we are measuring it today, varies with the density of the object.

Continuous adoption of flawed definition of mass left many observations unexplained. The physics community continued with patches and unreasonable extensions to the theories wherever they could when an anomaly was observed. If the observations fell outside the dominant theories, then they were described as fringe science. Physics is considered as the mother of all sciences but it certainly did not guide other branches of sciences in the right direction — leaving many branches of sciences as isolated islands of knowledge without any interconnectedness.

Is this the discovery physics community is looking for? This new theory presents a simple explanation for the nature of gravity and strong nuclear force, paving the way for their unification. It also shows a clear path for future research, not just in physics but for science as a whole.

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References

This article is an update of the theory presented in the following two references.

1. K Marasakatla, Gravity from a new angle, 2009.
2. K Marasakatla, What causes the mass to be deficit inside a nucleus?, Prespacetime Journal, Vol 1, No. 9, 1418-1424 (2010).
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