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An Examination of Unexplained Physical Phenomenon from the Perspective of Acceleration and Gravity

Finding Gravity's effect at every scale

This paper follows the previous paper "An Alternative Perspective on Acceleration and Gravity for Matter in Space." With more and more research being done at supercool temperatures, these and other experiments in physics are finding results that cannot be explained by our current understanding of physics and chemistry. It would be advantageous to science if the Henry Cavendish Gravity experiment was repeated under vacuum with current technologies at temperatures close to zero Kelvin.

By Kenneth Paul Hoffman 27 August 2018

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This paper follows the author's previous paper "An Alternative Perspective on Acceleration and Gravity for Matter in Space." [1]

With more and more research being done at supercool temperatures, these experiments and others in physics are finding results that cannot be explained by our current understanding of physics and chemistry. Examination of some these experiments from the perspective previously outlined in that GSJ paper would give it support.

Acceleration is happening at every scale from atomic to galactic. Acceleration is the rate of change of velocity; velocity being a vector quantity, a change in direction is also acceleration. The dance of quarks in protons and neutrons, electrons in motion around the nucleus, atoms and molecules in motion are all cases where there is acceleration.

Accelerating components within atoms and the acceleration of a collection of atoms and molecules are affected by temperature. There properties and behavior are changed in unpredictable ways. Acceleration and velocity are everywhere at every scale. They give:

- Force = ma
- Momentum = mv
- Kinetic Energy = $1/2\ mv^2$

Acceleration is not distinguishable from Gravity. This acceleration at the atomic level is small but it is always happening; so from that perspective all mass presents gravity from this acceleration. If accelerating mass is present, so is gravity.

With acceleration, particles, their force carriers, and there interaction with each other will be effected. This includes the force of gravity. Gravity may seem to have no effect as its contribution cannot be measured, but nonetheless it could still be having a contribution to the final outcome even if only as a Fluctuation-Dissipation effect.

Many basic properties, the phase, and the behavior of materials, change as temperatures change and energy is either added or removed. This change inevitably includes an acceleration change to the atoms constituent particles**,** the individual atoms, and collection of atoms.

Low-Temperature Phenomena

> …"the behaviour of matter at temperatures close to absolute zero −273.15 °C (−459.67 °F). At such temperatures the thermal, electric, and magnetic properties of many substances undergo great change, and, indeed, the behaviour of matter may seem strange when compared with that at room temperature. Superconductivity and superfluidity can be cited as two such phenomena that occur below certain critical temperatures; in the former, many chemical elements, compounds, and alloys show no resistance whatsoever to the flow of electricity, and, in the latter, liquid helium can flow through tiny holes impervious to any other liquid." [2]

All these types of property and behavioral changes are connected to changes in accelerations throughout the system. These would include changes in the forces of nature; changes in the acceleration of the force carriers. This would include the force of gravity and any existing force carrier as well.

Chemical Reaction Distance

Reported by "Science" on a paper from the department of physics-

…"scientists reported that molecules in an ultra-cold gas can chemically react at distances up to 100 times greater than they can at room temperature." [3,4]

If the theory of acceleration being tied to gravity is correct, then we should see a change in behavior at Supper Cool Temperatures (SCT) because internal accelerations are changing.

Applied to this chemical reaction result, the gravitational force, although very small, was reduced in its interaction with the electromagnetic force, and the EMF reach was increased.

If the Henry Cavendish experiment on gravity to determine 'G' were done in a modern format at SCT under a vacuum, would there be different results due to the change in accelerating atoms and its constituents?

Cooling Water

We know water as ice expands in volume unlike other liquids.

"At present, the state of the matter seems to be that no one really seems to understand the "structure" of water. The water molecule itself is no mystery, but the complicated hydrogen bonded network in the liquid phase is still poorly understood with bonds breaking and forming dynamically, and is hard to treat with molecular mechanics models. Ice is simpler to analyze in terms of hydrogen bonds with every molecule involved in four bonds (except at the surface).

… you can attribute the lower density of ice as compared to water to that the hydrogen bonds span up a structure that requires more space. There is no natural law saying that liquids have longer intermolecular distances than solids, even though for most substances that is what would happen. Ice has the structure it has because it minimizes the total energy of the system. In fluids, which contain "extra kinetic energy" there are dynamical issues due to that the bonds keep breaking and forming, and the result could be that on average molecules are closer than in the rigid ice structure."[5]

Could this structural change be contributed to the changes in different force interactions due to temperature changes that effect particle accelerations? Could this also help in understanding the presence of two critical density states for supercooled water?[6]

Negative Mass

From Newton's 2nd Law F = ma, we know pushing on an object will result in that object acceleration in the direction of the applied force. However, we now know this is not always the case.

"Washington State University physicists have created a fluid with negative mass, which is exactly what it sounds like. Push it, and unlike every physical object in the world we know, it doesn't accelerate in the direction it was pushed. It accelerates backwards. …To create negative mass, the researchers applied a second set of lasers that kicked the atoms back and forth and ***changed the way they spin***.* [7]

This change in spin is a change in acceleration. Could the change in acceleration be a change in the gravity force reaction?

**Italics and bold added here*

Casimir Effect & Gravity

The Casimir effect is about two mirrors that are drawn together by unknown forces.

"Two mirrors placed a few nanometers apart in a vacuum experience an attractive force. This so-called Casimir effect is a consequence of how the mirrors perturb fluctuations of the vacuum—a state that, because of quantum mechanics, is far from being empty and instead teems with fleeting electromagnetic waves. The electromagnetic Casimir interaction has been widely documented in experiments, ***but the phenomenon could, in principle, occur for any quantized field. If gravity truly has a quantum nature, then gravitational waves should also generate Casimir-like forces as they pop in and out of the vacuum.***" * [8]

This phenomenon can be understood if acceleration is inherently connected to gravity since the constituents of these atoms in the mirrors are experiencing acceleration. Gravity is present.

A stationary or a constant Inertial Reference Frame (IRF) in Special Relativity would not experience Gravity until there is acceleration and then what was always there responds to the change. Space apparently has no visible interaction with an IRF until the introduction of acceleration. The interaction is still not visible under acceleration, but it is there. The force awakens and it is felt. The presence of a 'gravitational field' is just the confirmation of an accelerating mass, whether an Inertial Mass (IM) or a Gravitational Mass (GM). Newton's Laws are best understood when space is brought into the picture.

Acceleration displays nature's connection to the force of gravity from the micro to the macro scale. It is no different for an accelerated nuclear particle or an object in empty space or a planet moving through space. To space all are accelerating masses and the gravitational force is activated. The Inertial Mass and the Gravitational Mass are the same. The large GM could certainly display a different response such as the tidal force[9] if observed closely, but it can still be a collection of accelerating matter moving at a constant velocity through space or the collection as an object could also be accelerating as an IM.

When an object in an IRF is accelerated, there is an interaction with Space. That interaction can be perceived of as what has long been understood as gravity. Gravity emerges as a natural consequence of an object accelerating in space regardless if the object is an IM or a GM moving in an IRF at a constant velocity.

**Italics and bold added here*

Gravity is an inherent property permeating the Universe at one with Matter and Space. It emerges where we find acceleration from the smallest atomic scale out to the galaxies. Space is connected to matter and gravity and is a consequence of that connection. Space is not married to Time.

It would be advantageous to science if the Henry Cavendish Gravity experiment [10] could be repeated with current technologies under a vacuum at temperatures close to zero Kelvin.

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1.) http://gsjournal.net/Science-Journals/Research%20Papers/View/7389
2.) https://www.britannica.com/science/low-temperature-phenomenon
3.) https://www.newscientist.com/article/dn18541-what-happens-at-absolute-zero/
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6.) https://physicstoday.scitation.org/do/10.1063/PT.6.1.20180822a/full/
7.) https://phys.org/news/2017-04-physicists-negative-mass.html
8.) https://physics.aps.org/synopsis-for/10.1103/PhysRevLett.114.081104
9.) http://www.einstein-online.info/spotlights/equivalence_principle.html
10.) https://www.youtube.com/watch?v=2PdiUoKa9Nw