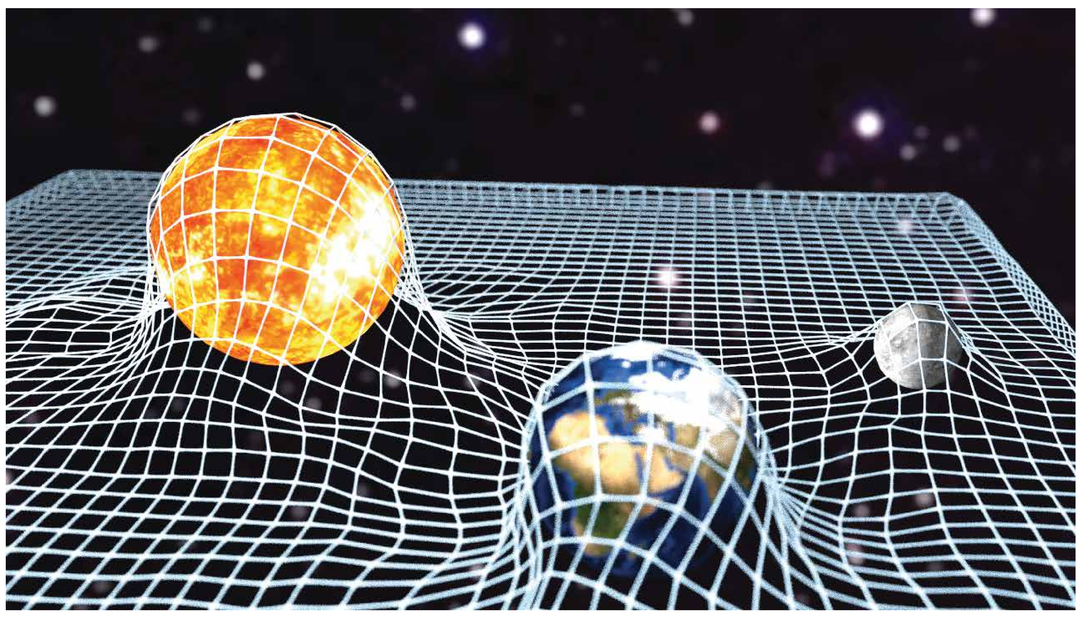
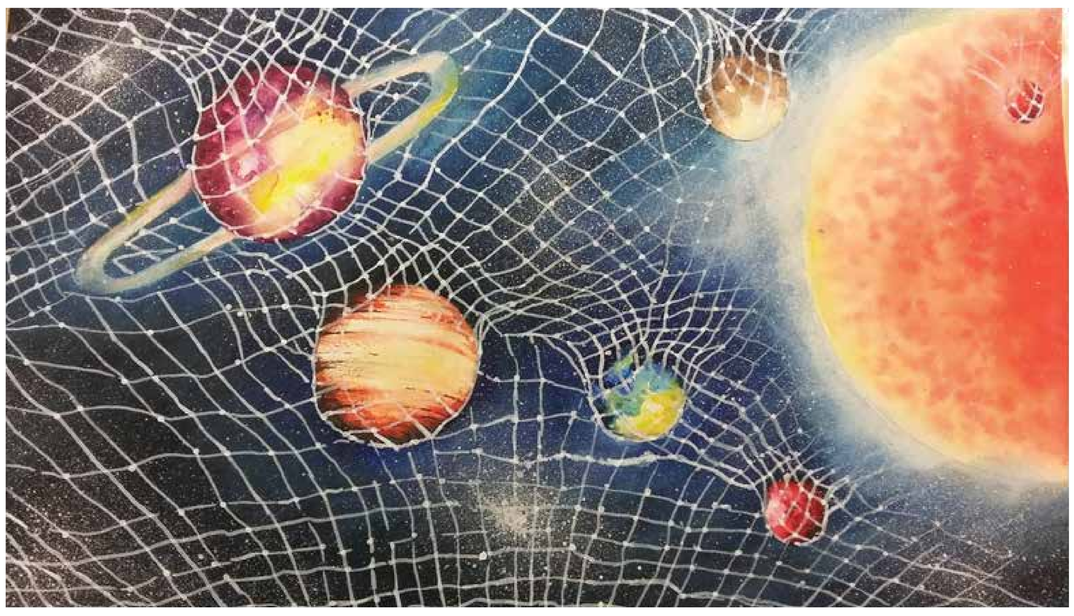
HAND IN GLOVE CONCEPT

THE OCEAN WITHIN

BY DR PARAMAN SUBRAMANIAM



HIG concept of the warping of spacetime. Image credit Paraman



HIG concept of warping of spacetime in the solar system. Art credit Tham Koon Peng

Summary Paragraph

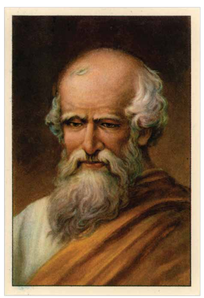
The Standard Model of Big Bang cosmology is one of the most widely accepted cosmological models today. It is factually correct and proven but still lacks the framework to explain several issues like where did the primordial atom come from, why 90% of gravity comes from an unknown substance called dark matter, why is the universe expanding because of an unknown substance called dark energy and what causes irregularities in the density field of the primordial universe seen directly in the CMB?

As such the Big Bang theory could just be a part of a currently undiscovered broader theory. Even though Einstein's general relativity had shed a lot of light on gravity and how objects follow the curvature of spacetime, but he was unable to explain why it does so.

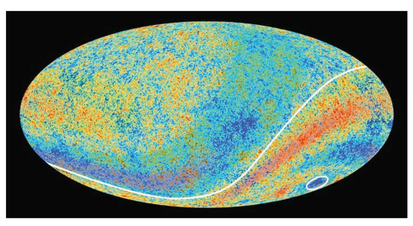
Due to lack of appropriate scientific instruments to dissect or unwrap the fabric of spacetime, one will need to rely heavily on theoretical reasoning to transcend its reality beyond our mortal sensory perception.

In my Hand in Glove (HIG) concept, I attempt to fill in these voids by theorizing the existence of a 5th dimension within our universe and that, it is liquid (ocean-like) in nature. I use the properties of water like surface tension (adhesion and cohesion), vacuum evaporation, desublimation and buoyancy to explain the possibility in the formation of the universe.

I then conclude that the underlying mechanism of how gravity acts is nothing but the buoyancy effect of an ocean-like medium present within our universe.



Archimedes is one of the top mathematicians of all time who made many discoveries including the concept of centre of gravity. He is however best remembered, to have leapt out of a bathtub and rush along the streets of Syracuse back towards his home shouting 'Eureka', oblivious of his nakedness to citizens of this long ago Sicilian city-state. This he did so because he had a brilliant flash of insight while in the bathtub to note that the amount of water which flowed over the tub was equal to the amount by which the body was immersed, and thereafter the world was introduced to buoyancy which was the weight of the displaced water. Did Archimedes make the most profound discovery of all time that probably might catapult him ahead of Newton and Einstein in unveiling the underlying mechanism of how gravity acts in causing the warping of space-time?

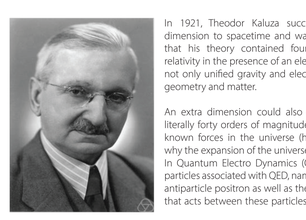


Cosmic Microwave Background. (Image: ESA-Planck collaboration)

In 2008, based on the maps of the cosmic microwave background (CMB) from probes sent out into space, Sean Carroll and colleagues at the California Institute of Technology suggested that the small variations in density seen in these maps, are superimposed on a disturbance spanning the observable universe, like small waves carried on a big ocean wave.

Andrew Liddle of the University of Edinburgh adds on to this regarding a cosmological model called bubble nucleation that he had worked on in the 1990s describing that our universe arose from quantum fluctuations in a much bigger cosmos called a metaverse. The quantum effects caused a phase transition in the fabric of the metaverse, and our universe popped into being, like an air bubble forming in boiling water.

Could Minkowski's spacetime (which is the amalgamation of the dimensions of time with that of length, breadth and height) that we live in, exist within a 5th dimensional metaverse?



In 1921, Theodor Kaluza successfully added a 5th dimension to spacetime and was able to demonstrate that his theory contained four dimensional general relativity in the presence of an electromagnetic field. This not only unified gravity and electromagnetism but also geometry and matter.

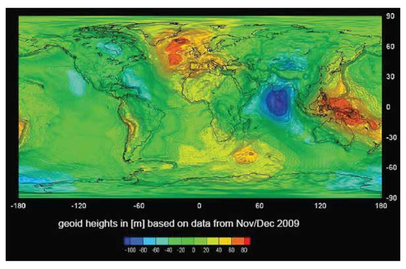
An extra dimension could also explain why gravity is literally forty orders of magnitude weaker than all other known forces in the universe (hierarchy problem) and why the expansion of the universe is faster than expected. In Quantum Electro Dynamics (QED), the fundamental particles associated with QED, namely the electron and its antiparticle positron as well as the electromagnetic force that acts between these particles are all 'born out of the vacuum' that forms the very basis of QED. This claim that the emptiness of space is filled with all kinds of stuff like quantum pair formation and various entities, continually popping in and out of existence could lend suspicion to the existence of a 5th dimension where all these particles may actually be originating from. They do not just scatter around randomly in 'empty' space but permeates all of space.

All particles, electrons and photons travel in wave form and conventional wisdom tells us that for anything to move in a wave form it must exist in a medium. Though physicists have gone to great lengths and pain to demonstrate that particles like photons do not require a medium to travel in but it still remains a mystery why should it travel in a wave form in the first place. Why not travel in a straight-line? Wouldn't that be a leaner way to travel in terms of conservation of energy? It is not just the photons and particles that travel in a wave form, even the planets in our solar system do too. They do not just orbit around the sun in an absolutely flat plane but do move in a wave like form as it orbits around the sun. Even the solar system as a whole moves in a wave like movement as it travels around the Milky Way galaxy. It bops up and down like a cork in the ocean, about 4 times per orbit around the galactic centre. As the search continues to find the elusive primordial gravitational waves, everything that we see in this universe be it macroscopically or microscopically, does move some way or another in a wave-like manner. Does this not also support the existence of a medium in the 5th dimension?

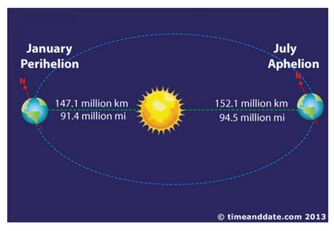
Reductio-ad-Absurdum

If a 5th dimension exists within us, we would not be able to detect it. For example a portrait of Mona Lisa exists in a 2 dimensional (length and width) framework. Mona Lisa is as she is, stationary. If we were to add a time dimension into the portrait, Mona Lisa will then come 'alive' and she will be able to move, but only within the frame. She will not be able to detect the presence of the visitors admiring her portrait. Likewise if at all there is a 5th dimension within us, we wouldn't be able to detect it. If we can't detect it then at best we should try to disprove the existence of a 4 dimensional only universe through reductio-ad-absurdum (proof by contradiction).

From Minkowski's space and Einstein's general relativity, we have been introduced to space and time as a single interwoven continuum which is continuously being stretched and squeezed due to the motion of all bodies in the universe, for easier understanding. This demonstrates that matter and energy moving on this mesh would exert warping or distortion to this interwoven continuum. The greater the mass of matter or energy, the greater the warping of spacetime and as such, stronger the gravitational attraction. More importantly, matter and energy are described as on, or part of this mesh and not appearing from within it. In our solar system, the amount of warping is greater nearer the sun and diminishes as we move further away from the sun. Therefore Earth as a whole should be experiencing a greater gravitational force when it is closest to the sun (perihelion-January) and the opposite during aphelion (July). The difference in distance between these 2 periods is about 5 million kilometers. Hence a cyclical change in gravitational force over the whole planet Earth should be able to be detected. (N/p this is not to be confused with tidal force which is a secondary effect of the force of gravity where the nearer surface of Earth to the sun is attracted more strongly than the farthest side).



The Gravity Field and Steady State Ocean Circulation Explorer (GOCE) which was launched in 2009 had highly sophisticated instruments to map the subtle but all pervasive influence pull of gravity across the globe. It orbited Earth for more than 4 years and part of its mission was to detect gravity field anomalies. As such it could have recorded if Earth as a whole, had at all, experienced any cyclical changes in gravity during the orbital periods of perihelion and aphelion.



If there are no cyclical changes detected in the gravitational strength, then not only would the theory of general relativity need to be reviewed but it would also give support to the suspicion of the existence of a 5th dimension. Planets are not orbiting on the surface of spacetime fabric but every subatomic particle, planets, stars and galaxies are appearing from the 5th dimension within to without, into the 4 dimensional universe that we perceive. It will be like how a hand from within the 5th dimension takes form on the outside and into our universe with the aid of 'gloves'. The gloves being the fabric of spacetime hence the name 'Hand in Glove' (HIG). HIG is similar to how a balloon is being inflated from within. The mouth or throat of the balloon isn't visible to us. Air from the balloon is coming from the 5th dimension therefore we can't see the mouth or throat of the balloon. All we can see is that the balloon is inflating in a spherical manner. This is similar to how the Mona Lisa in the portrait will be oblivious of her admirers.

However if GOCE does indeed detect cyclical changes during the perihelion and aphelion periods of Earth's orbit, then general relativity will have gained another strong evidence in its favour and the evidence sought for the presence of a 5th dimension will need to be pursued. Nevertheless for theoretical discussions, let us accept that a 5th dimension 'does exist' and explore to see what it can unfold.

If such a dimension does exist, what medium is it in? Or rather the question needs to be rephrased. What medium would it be suitable enough to exist in so that it will be ideal to form a universe?

Water a Likely Candidate?

Liquids have much greater freedom to move. the forces that bind the molecules together are temporary hence allowing liquid to flow while a solid remains rigid. Gaseous forms appear to have too much freedom to form a universe.
Liquids also apply pressure evemly to every surface in a container and will not always fill every space in the container.
Liquid forms its own surface, will not compress significantly except under extremely high pressures.
Of all the liquids, water has the most unusual physical and chemical properties. Till date water exhibits 72 thermodynamic, dynamic and structural properties recognized to be anomalous.
Water is also the 2nd most abundant molecule in the universe.
Water is the only substance on Earth that can exist in 3 states - liquid, solid and gaseous.
Water has every high surface tension and is the most powerful solvent on Earth
Water is also able to rise against gravity using capillary effect

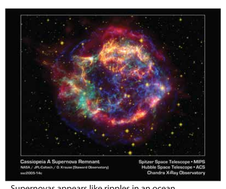
Table 1: Unque features of liquid/ water.

Every one of water's properties is unique and they do not necessarily fit into the generally accepted laws of physics. We still do not know with precision how water molecules are formed in the universe and there is still so much more about the properties of water that we are not aware of.

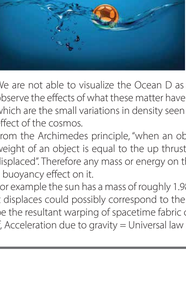
So if water appears to be a likely candidate to be the 5th dimension, this would mean that our universe exists within an ocean, something similar to what Andrew Liddle had described regarding bubble nucleation and that our universe popped into being, like an air bubble forming in boiling water. This idea may sound preposterous but let us look at some of the images of our universe taken from Hubble telescope the past 25 years.

In fact, subconsciously, most of these images have been described by astronomers and astrophysicists using terminologies that are based on liquid (water). For e.g. supernovas appears like ripples in an ocean, gravitational waves, giant Fermi bubbles in the centre of our galaxy, galaxies appears like a spiraling whirlpool, frame dragging is described as a ball in a honey jar and even the name 'Milky Way'. The term supercluster complexes in physical cosmology, is described as among the largest known cosmic structures in the universe. Ironically in chemistry, a water cluster is a discrete hydrogen bonded assembly or cluster of molecules of water.

Galaxies appearing like a spiraling whirlpool. Image drawing courtesy of Nick Risinger



Supernovas appears like ripples in an ocean



Gravitational waves

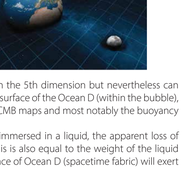
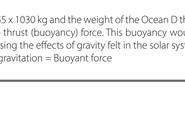
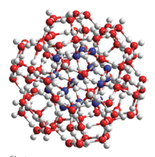


Illustration of the frame-dragging effect in which space and time are dragged around a massive body. Taken from einstein.stanford.edu



Black holes are like giant sink holes in the cosmos. Image credit: Ute Kraus/Space Time Travel

Superclusters forming filaments in the universe that appear like a complex network of tributaries of flowing rivers. Created by Illustris



Water Cluster

Even at quantum level most findings are described in terms of liquid. For example, photons travel in waves. Probability wave changes shape smoothly and gradually much as a water wave changes shape as it travels from one side of a lake toward the other. Electrons when viewed under an electron microscope would show random quantum undulations — wavelike foam in appearance resembling like a storm in an ocean.

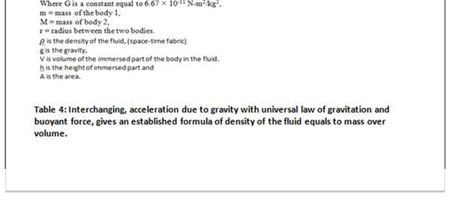
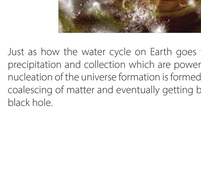


Illustration of spacetime quantum foam. Image taken from chandra.harvard.edu

Light travels in waves



Probability wave function. Image credit: Wikimedia Commons user PoorLeno

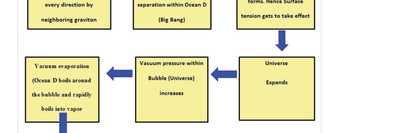
Even the mysterious black hole appears like a giant sinkhole. 'Researchers can solve relatively straightforward equations of fluid dynamics in two dimensions and use those solutions to understand what is going on in a much more complicated system like that in in the dynamics of a three dimensional black hole. Mathematically, the two descriptions are interchangeable where the fluid serves as a perfect analogue for the extraordinary black hole'.
In continuing with theoretical reasoning, let us accept the presence of a metaversal shoreless 'ocean-like' substance within our universe and name it 'Ocean D'. It consists of particles which could be described as gravitons, which is a hypothetical elementary particle that mediates the force of gravitation in the framework of quantum field theory. Each graviton is pulled equally in every direction by neighboring gravitons resulting in a net force of zero mainly due to cohesion.

Graviton particles

Pre Big Bang, the Ocean D experiences quantum fluctuation. This quantum effect caused a phase transition in the fabric of the metaverse meaning this resulted in a point separation within Ocean D. This point of separation caused the formation of two different phases: the Ocean D and the vacuum that was forming within the bubble. This interface caused the gravitons, which were in a net force of zero, to experience a change. The phenomena of surface tension then arose due to greater attraction of gravitons to each other due to cohesion rather than to the surface overlying the vacuum which is adhesion. The gravitons at the surface between these two phases do not have other gravitons on all sides of them and therefore are pulled 'inwards' (surface of the bubble towards Ocean D). This creates internal pressure and forces the Ocean D to contract to a minimal area, which results in the size of the bubble (universe) to expand. Surface tension of the bubble however pulls on at the surface of the bubble trying to reduce its surface area resulting it to have a minimal surface area which is a bubble. Using an 'umbrella-opening analogy', an observer within the bubble will see that his universe suddenly arising and eventually expanding from a singularity point (as described in the Big Bang theory). An observer from within the Ocean D (outside the bubble) will notice a bubble forming in the metaverseal Ocean D.

Bubble Universe expanding

How do the gravitons of the Ocean D project into the bubble? It does so by a process known as vacuum evaporation. As the bubble expands, the vacuum pressure within the bubble increases. This causes the Ocean D at the surface of the bubble to rapidly boil into vapor. This vapor then immediately desublimates or crystallizes directly from gas to solid phase into tiny particles. (Desublimation is the transformation of gas into solid without an intermediate phase). These particles are probably the gas clouds that we see that eventually coalesce to form stars and galaxies in the universe.



Gas cloud formation – desublimation (Image credit NASA/JPL-Caltech/Harvard-Smithsonian)

All matter that has formed in the universe through the process of vacuum evaporation and desublimation from the boiling of Ocean D as the vacuum pressure increases, are in reality projections from within Ocean D and unto the surface of Ocean D within the bubble (spacetime fabric). As how ice floats because it is less dense than liquid water, these projections appear to 'float' on the inner surface of the bubble (spacetime fabric of the universe). Every matter, be it subatomic or galactic in nature, are nothing but 'bulges' of the spacetime fabric from the Ocean D to within the bubble.

'Bulging' of spacetime from the Ocean within

What are the factors affecting the expansion of the Universe

(1) Graviton particles tugging 'outwards' and expanding the bubble, increases the size of the Universe. This could be the dark energy

(2) Vacuum pressure within the bubble that increases as the universe expands, acts to reduce the size of the universe

(3) Black holes that act as sink holes draining out pressure from within the bubble and back into Ocean D, acts in increasing the size of the universe

(4) Attractive force between particles of matter within the inner surface of the bubble prevents the expansion of the universe

The factors affecting the expansion of the universe.

Buoyancy in the Cosmos

We are not able to visualize the Ocean D as it lies in the 5th dimension but nevertheless can observe the effects of what these matter have on the surface of the Ocean D (within the bubble), which are the small variations in density seen in the CMB maps and most notably the buoyancy effect of the cosmos.
From the Archimedes principle, "when an object is immersed in a liquid, the apparent loss of weight of an object is equal to the up thrust and this is also equal to the weight of the liquid displaced". Therefore any mass or energy on the surface of Ocean D (spacetime fabric) will exert a buoyancy effect on it.
For example the sun has a mass of roughly 1.98855 x 1030 kg and the weight of the Ocean D that it displaces could possibly correspond to the up thrust (buoyancy) force. This buoyancy would be the resultant warping of spacetime fabric causing the effects of gravity felt in the solar system.
If, Acceleration due to gravity = Universal law of gravitation = Buoyant force

Appendix 4

If, Acceleration due to gravity = Universal law of gravitation = Buoyant force

i) $g = \frac{GM}{r^2}$

ii) $F = \frac{GmM}{r^2}$

iii) $F_b = \rho g V = \rho h A$

(i) = (ii) = (iii)

$F_b = \rho g V$

$F_b = \left(\frac{GM}{r^2}\right) \rho V$ (from (j))

$\left(\frac{GmM}{r^2}\right) = \left(\frac{GM}{r^2}\right) \rho V$ ((iii) = (iiii))

$m = \rho V$

$\rho = \frac{m}{v}$

Where G is a constant equal to 6.67×10^{-11} N-m^2/kg^2,
m = mass of the body 1,
M = mass of body 2,
r = radius between the two bodies.
ρ is the density of the fluid, (space-time fabric)
g is the gravity,
V is volume of the immersed part of the body in the fluid.
h is the height of immersed part and
A is the area.

Table 4: Interchanging, acceleration due to gravity with universal law of gravitation and buoyant force, gives an established formula of density of the fluid equals to mass over volume.

For a particle in the universe to be able to get back into the Ocean D, its mass (m) should be high and volume (V) low. When a critical level is achieved in this state it will be able to do so. If a matter is denser than its fluids that surrounds it, then it will sink. Likewise if it is less dense, then it will 'float'. A black hole forms when any object reaches a certain critical density, and its gravity causes it to collapse to an almost infinitely small pinpoint. Matter would be stripped down to its bare graviton particles as it goes through a black hole. It will 'unbulge' itself from the fabric of spacetime and realign itself back into the Ocean D. This could answer the black hole information paradox that Stephen Hawking posed in the 1970s — 'what happens to all the stuff that fell into the black hole and where does it go to? Black holes are not only common throughout the cosmos but they play a fundamental role in the formation and evolution of the universe especially in the creation and destruction of galaxies.

Just as how the water cycle on Earth goes through 4 stages : evaporation, condensation, precipitation and collection which are powered by the sun's energy and gravity, the bubble nucleation of the universe formation is formed from evaporation from ocean D, desublimation, coalescing of matter and eventually getting back into the ocean D via the dynamics within a black hole.

Water cycle on Earth

This sequence of HIG does not contradict the second law of thermodynamics where any spontaneous process increases the disorder or randomness of the universe. It exploits the flow of energy from hot (within Ocean D) and cold (vacuum within the bubble). Energy is going from being concentrated to being dispersed. This 'collapse' of the cosmos into disorder, gives rise to its complexities, and can indeed be constructive as is seen in how the evolutionary dynamics of our universe that has been taking place since the Big Bang. Though HIG may require the reinterpre tation of certain fundamental scientific concepts, it does not contradict them in the overall grand scale.

It is no wonder that the word 'Eureka' that Archimedes shouted almost 2300 years ago in the discovery of buoyancy, is widely accepted today as an exclamation of triumph at a discovery. The intrinsic mechanism of gravity that our universe is evolving around could just be the buoyancy effect of an ocean-like medium from within.

Evolution in the Concept of Gravity

Newton
Any object with a mass, exerts an attractive for on any other object with mass. the bigger the masses and the closer the two objects, the stronger the attraction.
(Universal Law of Gravitation 1687)

Einstein
Gravitational attraction is due to the wrapping of the cosmos. A massive object literally bends the three dimensional fabric of the Universe around it, taking any smaller objects in the vicinity along for the ride.
(General Relativity 1915)

HIG
Warping of matter in the cosmos is due to the buoyancy effect of the Ocean-like medium within. The greater the mass/force of the object, the greater the buoyancy of the Ocean within, hence greater the warping of the cosmos.

Appendix 2

In Ocean D, each graviton molecule is pulled equally in every direction by neighboring graviton	Quantum Fluctuations causes a point of separation within Ocean D (Big Bang)	2 different interfaces (Ocean D and Vacuum) forms. Hence Surface tension gets to take effect
Universe Expands	Vacuum pressure within Bubble (Universe) increases	Vacuum evaporation (Ocean D boils around the bubble and rapidly boils into vapor
Desublimation taken place. Vapor to solid phase	Stars, planets and galaxies starts to form	Solid particles coalesces to form stars, planets and galaxies via gravity

Table 2: Sequence of stages in the concept of HIG.